# Table of Contents

What Is Amazon Personalize? .................................................................................................................. 1  
Are You a First-Time Amazon Personalize User? ................................................................................ 1  
Are You an Experienced Amazon Personalize User? ........................................................................ 2  
How It Works ......................................................................................................................................... 3  
Amazon Personalize Workflow ........................................................................................................... 3  
Datasets and Dataset Groups ............................................................................................................ 4  
User Events ......................................................................................................................................... 4  
Recipes and Solutions ....................................................................................................................... 4  
Metrics ................................................................................................................................................ 5  
Campaigns .......................................................................................................................................... 5  
Recommendations ............................................................................................................................... 5  
Setting Up Amazon Personalize .......................................................................................................... 6  
Sign Up for AWS ................................................................................................................................... 6  
Regions and Endpoints ....................................................................................................................... 6  
Setting up Permissions ....................................................................................................................... 7  
Required Permissions ......................................................................................................................... 7  
Creating an IAM Role .......................................................................................................................... 7  
Setting Up the AWS CLI ..................................................................................................................... 9  
Setting Up the AWS SDKs ................................................................................................................. 10  
Getting Started .................................................................................................................................. 11  
Prerequisites ....................................................................................................................................... 11  
Create the Training Data .................................................................................................................. 11  
Getting Started (Console) ................................................................................................................. 12  
Getting Started (AWS CLI) ............................................................................................................... 22  
Getting Started (AWS SDK for Python) ........................................................................................... 30  
Prerequisites ....................................................................................................................................... 30  
(Optional) Explore the Amazon Personalize APIs with a Jupyter (IPython) Notebook ................ 31  
Clean Up Resources ........................................................................................................................... 31  
Preparing and Importing Data .............................................................................................................. 33  
Datasets and Schemas ....................................................................................................................... 33  
Create a schema using Python .......................................................................................................... 36  
Filtering Records from a User-Interactions Training Dataset .......................................................... 36  
Formatting Your Input Data .............................................................................................................. 39  
Categorical Data .................................................................................................................................. 40  
Uploading to an S3 Bucket .................................................................................................................. 40  
Importing Your Data .......................................................................................................................... 41  
Import your data using Python ......................................................................................................... 41  
Recording Events .............................................................................................................................. 43  
Creating a Dataset Group .................................................................................................................. 43  
Getting a Tracking ID ......................................................................................................................... 44  
Event-Interactions Dataset ................................................................................................................. 44  
PutEvents Operation ........................................................................................................................... 45  
Event Metrics ...................................................................................................................................... 47  
Events and Solutions .......................................................................................................................... 47  
Creating a Solution ............................................................................................................................. 48  
Using Predefined Recipes ................................................................................................................... 50  
Predefined Recipes ............................................................................................................................. 50  
HRNN ................................................................................................................................................ 51  
HRNN-Metadata ................................................................................................................................. 52  
HRNN-Coldstart .................................................................................................................................. 56  
Popularity-Count .................................................................................................................................. 59  
Personalized-Ranking ......................................................................................................................... 63  
SIMS ................................................................................................................................................... 63  
Overriding Default Recipe Parameters ............................................................................................. 69
What Is Amazon Personalize?

Amazon Personalize is a machine learning service that makes it easy for developers to add individualized recommendations to customers who use their applications. It reflects the vast experience that Amazon has in building personalization systems.

You can use Amazon Personalize in a variety of scenarios, such as giving users recommendations based on their preferences and behavior, personalized re-ranking of results, and personalizing content for emails and notifications.

Amazon Personalize does not require extensive machine learning experience. You can build, train, and deploy a solution version (a trained Amazon Personalize recommendation model) with the AWS console or programmatically by using the AWS SDK. As the developer, you only need to do the following:

• Format input data and upload the data into an Amazon S3 bucket, or send real-time event data.
• Select a training recipe (algorithm) to use on the data.
• Train a solution version using the recipe.
• Deploy the solution version.

Amazon Personalize can capture live events from your users to achieve real-time personalization. Amazon Personalize can blend real-time user activity data with existing user profile and item information to recommend the most relevant items, according to the user's current session and activity. You can also use Amazon Personalize to collect data for new properties, such as a brand new website, and after enough data has been collected, Amazon Personalize can start to make recommendations.

To give recommendations to your users, call one of the recommendation APIs, and then create personalized experiences for them.

Amazon Personalize can improve its recommendations over time as new user activity data is collected. For example, a new movie rental event by a user can result in better movie recommendations.

Amazon Personalize can provide recommendations based on a user's browsing context. For example, Amazon Personalize can provide different recommendations when a user is browsing on a mobile device than when that same user is browsing on a desktop.

With Amazon Personalize you can train a solution for different use cases. For example, user personalization, items related to an item, and re-ranking of items. You choose a recipe based on your use case and provide the input data. A recipe performs featurization of your data, and applies a choice of learning algorithms, along with default hyperparameters, and hyperparameter optimization job configuration.

Recipes in Amazon Personalize allow you to create custom personalization models without needing machine learning expertise. You can choose which recipe to use to train a solution version, or let Amazon Personalize decide on the best recipe to use for your data. To help you decide which recipe to use, Amazon Personalize provides extensive metrics on the performance of a trained solution version.
1. **How It Works (p. 3)** – This section introduces various Amazon Personalize components that you work with to create an end-to-end experience.

2. **Getting Started (p. 11)** – In this section you set up your account, and test the Amazon Personalize Console and API.

3. **Preparing and Importing Data (p. 33)** – This section describes how to prepare and import your training data into Amazon Personalize.

4. **Recording Events (p. 43)** – This section provides information about improving user recommendations by recording user events.

5. **Creating a Solution (p. 48)** – This section provides information about creating a solution version by training a model.

6. **Creating a Campaign (p. 75)** – This section provides information about deploying a solution version as a campaign.

7. **Getting Recommendations (p. 76)** – This section show how to get recommendations from a campaign.

### Are You an Experienced Amazon Personalize User?

If you are an experienced Amazon Personalize user, you can find in-depth tutorials and code samples in the [amazon-personalize-samples GitHub repository](https://github.com/aws/aws-amazon-personalize-samples).
How It Works

To make recommendations, Amazon Personalize uses a machine learning model that is trained with your data. The data used to train the model is stored in related datasets in a dataset group. Each model is trained by using a recipe that contains an algorithm for a specific use case. In Amazon Personalize, a trained model is known as a solution version. A solution version is deployed for use in a campaign. Users of your applications can receive recommendations through the campaign. For example, a campaign can show movie recommendations on a website or application where the title shown is based on viewing habits that were part of the dataset.

A dataset can grow over time and your models can be retrained on the new data. The data can come from new metadata and the consumption of real-time user event data. In the previous movie recommendations example, you could add new movies as they are released, and add a movie that is chosen by the signed-in user.

Amazon Personalize has an AWS console that you can use to create, manage, and deploy solution versions. Alternatively, you can use the AWS Command Line Interface (AWS CLI) or one of the Amazon Personalize SDKs.

Amazon Personalize consists of three related components:

- Amazon Personalize – Use this to create, manage, and deploy solution versions.
- Amazon Personalize Events – Use this to record user events to add to your training data. For more information, see Recording Events (p. 43).
- Amazon Personalize Runtime – Use this to get recommendations from a campaign (deployed solution version). For more information, see Getting Recommendations (p. 76).

Topics

- Amazon Personalize Workflow (p. 3)
- Datasets and Dataset Groups (p. 4)
- User Events (p. 4)
- Recipes and Solutions (p. 4)
- Metrics (p. 5)
- Campaigns (p. 5)
- Recommendations (p. 5)

Amazon Personalize Workflow

The workflow for training, deploying, and getting recommendations from a campaign is:

1. Create related datasets and a dataset group.
2. Get training data.
   - Import historical data to the dataset group.
   - Record user events to the dataset group.
3. Create a solution version (trained model) using a recipe.
4. Evaluate the solution version using metrics.
5. Create a campaign (deploy the solution version).
6. Provide recommendations for users.
The following sections provide a brief overview of the above workflow. Each section includes a link to the main topic that describes the step in depth and which provides a Python example.

The Getting Started (p. 11) guides provide step-by-step procedures using the Amazon Personalize console, the AWS CLI, and a Jupyter (iPython) notebook.

Datasets and Dataset Groups

Amazon Personalize requires data, stored in Amazon Personalize datasets, in order to train a model.

There are two ways to provide the training data. You can import historical data from an Amazon S3 bucket, and you can record event data as it is created.

A dataset group contains related datasets. Three types of historical datasets are created by the customer (users, items, and interactions), and one type is created by Amazon Personalize for live-event interactions. A dataset group can contain only one of each kind of dataset.

You can create dataset groups to serve different purposes. For example, you might have an application that provides recommendations for purchasing shoes and another that provides recommendations for places to visit in Europe. In Amazon Personalize, each application would have its own dataset group.

Historical data must be provided in a CSV file. Each dataset type has a unique schema that specifies the contents of the CSV file.

There is a minimum amount of data (p. 103) that is necessary to train a model. Using existing data allows you to immediately start training a model. If you rely on recorded data as it is created, and there is no historical data, it can take a while before training can begin.

For more information, see Preparing and Importing Data (p. 33).

User Events

Amazon Personalize can consume real time user event data to be used for model training either alone or combined with historical data.

For more information, see Recording Events (p. 43).

Recipes and Solutions

After enough data is available in the interactions datasets (historical and live events), the data can be used to train a model. A trained model is known as a solution version. The model is trained using a recipe. The recipes available in Amazon Personalize are made of an algorithm and the data processing steps that optimize a solution for a certain type of recommendation based on your input data.

Amazon Personalize supports a number of predefined recipes. Amazon Personalize can automatically choose the most appropriate recipe based on its analysis of the training data. Alternatively, you can choose which recipe to train the model with. Each recipe has its own use case and you should choose the recipe that best fits your needs.

Each time you train a model, it is assigned a new solution version. Use the solution version ARN to identify which version of the solution you want to use for your campaign.

For more information, see Creating a Solution (p. 48).
Metrics

After you have created your solution version, you evaluate the metrics that were created during training. The metrics give an indication of the solution version's performance. The console shows you the metrics and allows you to create a new solution version, as necessary. Alternatively, you can call the GetSolutionMetrics (p. 174) API. Typically, you train your model with multiple recipes and use the recipe that results in the metrics that show the best performance. After you have created a solution version based on your chosen recipe, the solution version is ready for deployment as a campaign.

For more information, see Evaluating a Solution Version (p. 72).

Campaigns

A deployed solution version is known as a campaign. A campaign allows Amazon Personalize to make recommendations for your users. To deploy a solution version, you create a campaign in the console or by calling the CreateCampaign (p. 111) API. You choose which version of the solution to use.

For more information, see Creating a Campaign (p. 75).

Recommendations

After you create a campaign, you are able to get two different types of recommendations, depending on the recipe type that was used to train the model.

For user-personalization and related-items recipes, the GetRecommendations (p. 210) API returns a list of recommended items. For example, movies can be recommended for users who are signed-in to a website.

For personalized-ranking recipes, the GetPersonalizedRanking (p. 207) API re-ranks a list of recommended items based on a specified query.

You can also use a batch workflow (p. 79) to get recommendations for large datasets that do not require real-time updates.

For more information, see Getting Recommendations (p. 76).
Setting Up Amazon Personalize

Before using Amazon Personalize, you must have an Amazon Web Services (AWS) account. After you have an AWS account, you can access Amazon Personalize through the Amazon Personalize console, the AWS Command Line Interface (AWS CLI), or the AWS SDKs.

This guide includes examples for AWS CLI, Python, and JavaScript with AWS Amplify.

Topics
- Sign Up for AWS (p. 6)
- Regions and Endpoints (p. 6)
- Setting up Permissions (p. 7)
- Setting Up the AWS CLI (p. 9)
- Setting Up the AWS SDKs (p. 10)

Sign Up for AWS

When you sign up for Amazon Web Services (AWS), your account is automatically signed up for all services in AWS, including Amazon Personalize. You are charged only for the services that you use.

If you have an AWS account already, skip to the next task. If you don't have an AWS account, use the following procedure to create one.

To sign up for AWS

1. Open https://aws.amazon.com, and then choose Create an AWS Account.
2. Follow the on-screen instructions to complete the account creation. Note your 12-digit AWS account number. Part of the sign-up procedure involves receiving a phone call and entering a PIN using the phone keypad.
   
   An IAM user with administrator permissions has unrestricted access to the AWS services in your account. For information about restricting access to Amazon Personalize operations, see Amazon Personalize Identity-Based Policies.
4. Create an IAM user for use with Amazon Personalize. The account requires certain permissions. For more information, see Setting up Permissions (p. 7).

Regions and Endpoints

An endpoint is a URL that is the entry point for a web service. Each endpoint is associated with a specific AWS region. Pay attention to the default regions of the Amazon Personalize console, the AWS CLI, and the Amazon Personalize SDKs, as all Amazon Personalize components of a given campaign (dataset, solution, campaign, event tracker) must be created in the same region. For the regions and endpoints supported by Amazon Personalize, see Regions and Endpoints.
Setting up Permissions

To use Amazon Personalize, you have to set up permissions that allow access to the Amazon Personalize console and API operations. You also have to allow Amazon Personalize to perform tasks on your behalf and to access resources that you own.

We recommend creating a user with access restricted to Amazon Personalize operations. You can add other permissions as needed. For more information, see Amazon Personalize Identity-Based Policies (p. ).

Topics
- Required Permissions (p. 7)
- Creating an IAM Role (p. 7)

Required Permissions

The following policies provide the required permissions to use Amazon Personalize.

AmazonPersonalizeFullAccess Policy

Allows you to perform the following actions:
- Access all Amazon Personalize resources
- Publish and list metrics on Amazon CloudWatch
- List, read, write, and delete all objects in an Amazon S3 bucket that contains personalize in the bucket name
- Pass a role to Amazon Personalize

For a step-by-step procedure for creating an IAM role that passes these permissions to Amazon Personalize, see Creating an IAM Role (p. 7).

Amazon S3 Bucket Policy

Allows Amazon Personalize access to the S3 bucket that contains your training data. For more information, see Uploading to an S3 Bucket (p. 40).

CloudWatchFullAccess Policy (Optional)

The AmazonPersonalizeFullAccess policy provides permissions to publish and list Amazon Personalize metrics in CloudWatch. The CloudWatchFullAccess policy adds additional permissions, such as viewing metrics, displaying metric statistics, and setting metric based alarms. For more information, see Monitoring Amazon Personalize (p. 95).

Creating an IAM Role

In the following procedure, you create an IAM role that allows Amazon Personalize to access your resources and perform tasks on your behalf.

A user needs permission to create the IAM role. To give a user permission, see Creating a Role to Delegate Permissions to an AWS Service.

2. In the navigation pane, choose Roles.
3. Choose Create role.
4. For Select type of trusted entity, choose AWS service.
5. For **Choose the service that will use this role**, select **Amazon Personalize**. If you don't see **Amazon Personalize** listed, choose **EC2** with **EC2** as your use case.
6. Choose **Next: Permissions**.
7. For **Attach permissions policies**, choose **AmazonPersonalizeFullAccess**.
   a. To display the policy in the list, type part of the policy name in the **Filter policies** query filter.
   b. Choose the check box next to **AmazonPersonalizeFullAccess**.
   c. (Optional) Repeat steps a. & b. for **CloudWatchFullAccess**.
8. Choose **Next: Tags**. You don't need to add any tags. Choose **Next: Review**.
9. In the **Review** section, for **Role name**, enter a name for the role (for example, **PersonalizeRole**). Update the description for the role in **Role description**, then choose **Create role**.
10. Choose the new role to open the role's summary page.
11. Copy the **Role ARN** value and save it. You need it in order to import a dataset into Amazon Personalize.
12. If you didn't choose **Amazon Personalize** as the service that will use this role, perform the following additional steps.
   a. Choose **Trust relationships**.
   b. Choose **Edit trust relationship** and update the trust policy to match the following.

```json
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": {
        "Service": "personalize.amazonaws.com"
      },
      "Action": "sts:AssumeRole"
    }
  ]
}
```
   c. Choose **Update Trust Policy**.
13. In the navigation pane, choose **Policies**, and choose **Create policy**.
14. Choose the JSON tab, and update the policy as follows.

```json
{
  "Version": "2012-10-17",
  "Id": "PersonalizeS3BucketAccessPolicy",
  "Statement": [
    {
      "Sid": "PersonalizeS3BucketAccessPolicy",
      "Effect": "Allow",
      "Action": [
        "s3:GetObject",
        "s3:ListBucket"
      ],
      "Resource": [
        "arn:aws:s3:::bucket-name",
        "arn:aws:s3:::bucket-name/**"
      ]
    }
  ]
}
```
15. Choose **Review policy**.
16. For **Name**, enter **PersonalizeS3BucketAccessPolicy**.
17. (Optional) For **Description**, enter a short sentence describing this policy, for example, **Allow Amazon Personalize to access its S3 bucket**.
18. Choose **Create policy**.
19. In the navigation pane, choose **Roles**, and choose the new role.
20. For **Permissions**, choose **PersonalizeS3BucketAccessPolicy**.
   a. To display the policy in the list, type part of the policy name in the **Filter policies** filter box.
   b. Choose the check box next to **PersonalizeS3BucketAccessPolicy**.
   c. Choose **Attach policy**.

Your role is now ready for use with Amazon Personalize. Record the role ARN. You will need it for import jobs.

### Setting Up the AWS CLI

The AWS Command Line Interface (AWS CLI) is a unified developer tool for managing AWS services, including Amazon Personalize. We recommend that you install it.

1. To install the AWS CLI, follow the instructions in [Installing the AWS Command Line Interface](aws cli install) in the [AWS Command Line Interface User Guide](aws cli user guide).
2. To configure the AWS CLI and set up a profile to call the AWS CLI, follow the instructions in [Configuring the AWS CLI](aws cli config) in the [AWS Command Line Interface User Guide](aws cli user guide).
3. To confirm that the AWS CLI profile is configured properly, run the following command.

   ```bash
   aws configure --profile default
   ```

   If your profile has been configured correctly, you will see output similar to the following.

   ```
   AWS Access Key ID [****************52FQ]:
   AWS Secret Access Key [****************xgyZ]:
   Default region name [us-west-2]:
   Default output format [json]:
   ```

4. To verify that the AWS CLI is configured for use with Amazon Personalize, run the following commands.

   ```bash
   aws personalize help
   ```

   and

   ```bash
   aws personalize-runtime help
   ```

   and

   ```bash
   aws personalize-events help
   ```

   If the AWS CLI is configured correctly, you will see a list of the supported AWS CLI commands for Amazon Personalize, Amazon Personalize runtime, and Amazon Personalize events.

   If you set up the AWS CLI and it doesn’t recognize the commands for Amazon Personalize, update the AWS CLI. To update the AWS CLI, run the following command.
Setting Up the AWS SDKs

Download and install the AWS SDKs that you want to use. This guide provides examples for Python, and JavaScript using the AWS Amplify library. For information about other AWS SDKs, see Tools for Amazon Web Services.

- AWS SDK for Python (Boto 3)

  To confirm that your Python environment is configured correctly for use with Amazon Personalize, see Getting Started (AWS SDK for Python) (p. 30).

- AWS Amplify
Getting Started

This getting started guide shows you how to create a campaign that returns movie recommendations for a user, based on historical data that consists of 100,000 movie ratings on 9,700 movies from 600 users.

To simplify this guide:

- We rely on the fact that a user saw a movie and not on what they rated the movie. This simplifies the preparation of the training data.
- We don't record live user interaction events. For information on capturing user events, see Recording Events (p. 43).

To begin, download and prepare the training data. Next, create an AWS Identity and Access Management (IAM) role that allows Amazon Personalize to access the data on your behalf. After creating the training data and role, proceed to either Getting Started (Console) (p. 12) or Getting Started (AWS CLI) (p. 22).

When you finish the getting started exercise, you might want to delete the resources you created. For more information, see Clean Up Resources (p. 31).

Topics

- Prerequisites (p. 11)
- Create the Training Data (p. 11)
- Getting Started (Console) (p. 12)
- Getting Started (AWS CLI) (p. 22)
- Getting Started (AWS SDK for Python) (p. 30)
- Clean Up Resources (p. 31)

Prerequisites

The following steps are prerequisites for the getting started exercises.

- Create an AWS account and an AWS Identity and Access Management user, as specified in Sign Up for AWS (p. 6).
- Ensure the IAM user that you are using has the Required Permissions (p. 7).
- Create an AWS Identity and Access Management (IAM) service role, as specified in Creating an IAM Role (p. 7). Use the role ARN when you upload the movie training data.
- Prepare your training data and upload the data to your Amazon S3 bucket, as specified in Create the Training Data (p. 11). Use the name of the Amazon S3 bucket when you upload the movie training data.

Create the Training Data

To create training data, download, modify, and save the movie ratings data to an Amazon Simple Storage Service (Amazon S3) bucket. Then give Amazon Personalize permission to read from the bucket.
1. Download the movie ratings zip file, ml-latest-small.zip from MovieLens (under recommended for education and development). Unzip the file. The user-interactions data is in the file named ratings.csv.
2. Open the ratings.csv file.
   a. Delete the rating column.
   b. Replace the header row with the following:

   USER_ID, ITEM_ID, TIMESTAMP

   These headers must be exactly as shown for Amazon Personalize to recognize the data.

   Save the ratings.csv file.
3. Upload ratings.csv to your Amazon S3 bucket. For more information, see Uploading Files and Folders by Using Drag and Drop in the Amazon Simple Storage Service Console User Guide.
4. Grant Amazon Personalize permission to read the data in the bucket. For more information, see Uploading to an S3 Bucket (p. 40).

Getting Started (Console)

In this exercise, you use the Amazon Personalize console to create a campaign that returns movie recommendations for a given user.

Before you start this exercise, review the Getting Started Prerequisites (p. 11).

After you finish this exercise, see Clean Up Resources (p. 31).

Step 1: Import Training Data

In this procedure, you first create a dataset group. Next, you create an Amazon Personalize user-item interaction dataset in the dataset group and a schema to match your training data. Next, you import your training data into the dataset.

To import training data

1. Open the Amazon Personalize console at https://console.aws.amazon.com/personalize/ and sign in to your account.
2. Choose Create dataset group.
3. If this is your first time using Amazon Personalize, on the Create dataset group page, in New dataset group, choose Get started.
4. In Dataset group details, for Dataset group name, specify a name for your dataset group. Your screen should look similar to the following:
5. Choose Next.

6. On the Create user-item interaction data page, in Dataset details, for Dataset name, specify a name for your dataset.

7. In Schema details, for Schema selection, choose Create new schema. A minimal Interactions schema is displayed in the Schema definition field. The schema matches the headers you previously added to the ratings.csv file.

8. For New schema name, specify a name for the new schema.

   Your screen should look similar to the following:
Dataset details

Dataset name
The name you enter here can help you distinguish this dataset import job from others.

ratings-dataset

The dataset name must have 2-256 characters with no spaces. Valid characters: a-z, A-Z, 0-9, and :, +, =, @, %, - (hyphen).

Schema details

Schema selection

- Use existing schema
  Choose an existing schema that matches your dataset.

- Create new schema
  Create a new schema to match your dataset

New schema name
The name you enter here appears in the Schema dashboard. It can help you distinguish this schema from others.

ratings-schema

The schema name must have 2-256 characters with no spaces. Valid characters: a-z, A-Z, 0-9, and :, +, =, @, %, - (hyphen).

Schema definition
Ensure your dataset’s schema matches the following schema.

```
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
```

```
"type": "record",
"name": "Interactions",
"namespace": "com.amazonaws.personalize.schema",
"fields": [
    {
        "name": "USER_ID",
        "type": "string"
    },
    {
        "name": "ITEM_ID",
        "type": "string"
    },
    {
        "name": "TIMESTAMP",
        "type": "long"
    }
],
"version": "1.0"
```
9. Choose Next.

10. On the Import user-item interaction data page, in Dataset import job details, for Dataset import job name, specify a name for your import job.

11. For IAM service role, keep the default selection of Enter a custom IAM role ARN.

12. For Custom IAM role ARN, specify the role that you created in Creating an IAM Role (p. 7).

13. In the informational dialog box named Additional S3 bucket policy required, follow the instructions (p. 40) to add the required Amazon S3 bucket policy.

14. For Data location, specify where your movie data file is stored in Amazon Simple Storage Service (S3). Use the following syntax:

   `s3://<name of your S3 bucket>/<folder path>/<CSV filename>`

   Your screen should look similar to the following:

15. Choose Finish. The data import job starts and the Dashboard Overview page is displayed.
16. Initially, in **Upload datasets**, the **User-item interaction data** status is **Create pending** (followed by **Create in progress**), and the **Create solutions - Start** button is disabled.

   **Note**
   The time it takes for the data to be imported depends on the size of the dataset.

   When the data import job has finished, the **User-item interaction data** status changes to **Active** and the **Create solutions - Start** button is enabled. Your screen should look similar to the following:

17. After the import job has finished, choose the **Create solutions - Start** button. The **Create solution** page is displayed.

**Step 2: Create a Solution**

In this procedure, you use the dataset that you imported in the previous step to train a model. A trained model is referred to as a **solution version**.

**To create a solution**

1. If the **Create solution** page is not already displayed, in the navigation pane, under the dataset group that you created, choose the **Create solutions - Start** button.

2. In **Solution configuration**, for **Solution name**, specify a name for your solution.

3. For **Recipe selection**, choose **Automatic (AutoML)**. Keep the default recipe list.

4. Your screen should look similar to the following:
5. (optional) In **Perform HPO**, to allow Amazon Personalize to find the optimal hyperparameters for the recipe, choose **true**. Otherwise, choose **false**.

6. Choose **Next**.

Your screen should look similar to the following:
7. There's no need to modify the Solution config, so choose Finish. Model training starts and the Dashboard Overview page is displayed.

8. Initially, in Create solutions, the Solution creation status is Create pending (followed by Create in progress), the Launch campaigns - Start button is disabled, and a banner is displayed on the top of the console showing the progress.

When training has finished, the Dashboard Overview page is refreshed, and your screen should look similar to the following.

**Note**
The time it takes to train a model depends on the size of the dataset and the chosen recipe.
9. After training has finished, choose **Create new campaign**.

**Step 3: Create a Campaign**

In this procedure, you create a campaign by deploying the solution version you created in the previous step.

**To create a campaign**

1. If the **Create new campaign** page is not already displayed, in the navigation pane, in the dataset group that you created, choose **Dashboard**, and then choose **Create new campaign**.
2. In **Campaign details**, for **Campaign name**, specify a name for your campaign.
3. For **Solution**, choose the solution version that you created in the previous step.
4. For **Minimum provisioned transactions per second**, keep the default of 1.

   Your screen should look similar to the following:
5. Choose Create campaign. Campaign creation starts and the Campaign page appears with the Campaign inference section displayed.

Your screen should look similar to the following:

![Create new campaign](image)

**Note**
Creating a campaign takes time.

After the campaign is created, the page is updated to show the Test campaign results section. Your screen should look similar to the following:
Step 4: Get Recommendations

In this procedure, use the campaign that you created in the previous step to get recommendations.

**To get recommendations**

1. In Test campaign results, for User ID, specify a value from the ratings dataset, for example, 83.
2. Choose Get recommendations. The Recommended item ID list displays the recommended item IDs.

   Your screen should look similar to the following:
In this exercise, you use the AWS Command Line Interface (AWS CLI) to explore Amazon Personalize. You create a campaign that returns movie recommendations for a given user ID.
Before you start this exercise, do the following:

- Review the Getting Started Prerequisites (p. 11).
- Set up the AWS CLI, as specified in Setting Up the AWS CLI (p. 9).

After you finish this exercise, see Clean Up Resources (p. 31).

**Note**
The CLI commands in this exercise were tested on Linux. For information about using the CLI commands on Windows, see Specifying Parameter Values for the AWS Command Line Interface in the AWS Command Line Interface User Guide.

**Step 1: Import Training Data**

Follow the steps to create a dataset group, add a dataset to the group, and then populate the dataset using the movie ratings data.

1. Create a dataset group by running the following command. You can encrypt the dataset group by passing a AWS Key Management Service key ARN and the ARN of an IAM role that has access permissions to that key as input parameters. For more information about the API, see CreateDatasetGroup (p. 117).

```bash
aws personalize create-dataset-group --name MovieRatingDatasetGroup --kms-key-arn arn:aws:kms:us-west-2:01234567890:key/1682a1e7-a94d-4d92-bbdf-837d3b62315e --role-arn arn:aws:iam::01234567890:KMS-key-access
```

The dataset group ARN is displayed, for example:

```json
{
    "datasetGroupArn": "arn:aws:personalize:us-west-2:acct-id:dataset-group/MovieRatingDatasetGroup"
}
```

Use the describe-dataset-group command to display the dataset group you created, specifying the returned dataset group ARN.

```bash
aws personalize describe-dataset-group \
```

The dataset group and its properties are displayed, for example:

```json
{
    "datasetGroup": {
        "name": "MovieRatingDatasetGroup",
        "status": "ACTIVE",
        "creationDateTime": 1542392161.262,
        "lastUpdatedDateTime": 1542396513.377
    }
}
```

**Note**
Wait until the dataset group's status shows as ACTIVE before creating a dataset in the group. This operation is usually quick.
If you don't remember the dataset group ARN, use the `list-dataset-groups` command to display all the dataset groups that you created, along with their ARNs.

```
aws personalize list-dataset-groups
```

**Note**
The `describe-object` and `list-objects` commands are available for most Amazon Personalize objects. These commands are not shown in the remainder of this exercise but they are available.

2. Create a schema file in JSON format by saving the following code to a file named `MovieRatingSchema.json`. The schema matches the headers you previously added to `ratings.csv`. The schema name is `Interactions`, which matches one of the three types of datasets recognized by Amazon Personalize. For more information, see Datasets and Dataset Groups (p. 4).

```
{
  "type": "record",
  "name": "Interactions",
  "namespace": "com.amazonaws.personalize.schema",
  "fields": [
    { "name": "USER_ID", "type": "string" },
    { "name": "ITEM_ID", "type": "string" },
    { "name": "TIMESTAMP", "type": "long" }
  ],
  "version": "1.0"
}
```

3. Create a schema by running the following command. Specify the file you saved in the previous step. The example shows the file as belonging to the current folder. For more information about the API, see CreateSchema (p. 126).

```
aws personalize create-schema \
  --name MovieRatingSchema \
  --schema file://MovieRatingSchema.json
```

The schema Amazon Resource Name (ARN) is displayed, for example:

```
{
  "schemaArn": "arn:aws:personalize:us-west-2:acct-id:schema/MovieRatingSchema"
}
```

4. Create an empty dataset by running the following command. Provide the dataset group ARN and schema ARN that were returned in the previous steps. The `dataset-type` must match the schema name from the previous step. For more information about the API, see CreateDataset (p. 114).

```
aws personalize create-dataset \
  --name MovieRatingDataset \
  --dataset-group-arn arn:aws:personalize:us-west-2:acct-id:dataset-group/MovieRatingDatasetGroup \
```
The dataset ARN is displayed, for example:

```json
{
    "datasetArn": "arn:aws:personalize:us-west-2:acct-id:dataset/MovieRatingDatasetGroup/INTERACTIONS"
}
```

5. Add the training data to the dataset.

a. Create a dataset import job by running the following command. Provide the dataset ARN and Amazon S3 bucket name that were returned in the previous steps. Supply the AWS Identity and Access Management (IAM) role ARN you created in Creating an IAM Role (p. 7). For more information about the API, see CreateDatasetImportJob (p. 120).

```
aws personalize create-dataset-import-job \
--job-name MovieRatingImportJob \
--dataset-arn arn:aws:personalize:us-west-2:acct-id:dataset/MovieRatingDatasetGroup/INTERACTIONS \
--data-source dataLocation=s3://<bucketname>/ratings.csv \
--role-arn roleArn
```

The dataset import job ARN is displayed, for example:

```json
{
    "datasetImportJobArn": "arn:aws:personalize:us-west-2:acct-id:dataset-import-job/MovieRatingImportJob"
}
```

b. Check the status by using the describe-dataset-import-job command. Provide the dataset import job ARN that was returned in the previous step. For more information about the API, see DescribeDatasetImportJob (p. 158).

```
aws personalize describe-dataset-import-job \
```

The properties of the dataset import job, including its status, are displayed. Initially, the status shows as CREATE PENDING, for example:

```json
{
    "datasetImportJob": {
        "jobName": "MovieRatingImportJob",
        "dataSource": {
            "dataLocation": "s3://<bucketname>/ratings.csv"
        },
        "roleArn": "roleArn",
        "status": "CREATE PENDING",
        "creationDateTime": 1542392161.837,
        "lastUpdatedDateTime": 1542393013.377
    }
}
```
The dataset import is complete when the status shows as ACTIVE. Then you are ready to train
the model using the specified dataset.

**Note**
Importing takes time. Wait until the dataset import is complete before training the
model using the dataset.

### Step 2: Create a Solution (Train the Model)

Two steps are required to initially train a model. First, you create the configuration for training
the model using the `CreateSolution` (p. 128) operation. Second, you train the model using the
`CreateSolutionVersion` (p. 133) operation.

You train a model using a recipe and your training data. Amazon Personalize provides a set of predefined
recipes. For more information, see Using Predefined Recipes (p. 50). For this exercise, you use AutoML,
which allows Amazon Personalize to pick the best recipe based on the dataset you created in the
preceding step.

1. Create the configuration for training a model by running the following command.

   ```bash
   aws personalize create-solution \
   --name MovieSolution \
   --dataset-group-arn arn:aws:personalize:us-west-2:acct-id:dataset-group/MovieRatingDatasetGroup \
   --perform-auto-ml
   ```

   The solution ARN is displayed, for example:

   ```json
   {
   "solutionArn": "arn:aws:personalize:us-west-2:acct-id:solution/MovieSolution"
   }
   ```

2. Check the create status using the `describe-solution` command. Provide the solution
   ARN that was returned in the previous step. For more information about the API, see
   `DescribeSolution` (p. 168).

   ```bash
   aws personalize describe-solution \
   ```

   The properties of the solution and the create status are displayed. Initially, the status shows as
   CREATE PENDING, for example:

   ```json
   {  
   "solution": {  
   "name": "MovieSolution",  
   "performAutoML": true,  
   "performHPO": false,  
   "solutionConfig": {  
   "autoMLConfig": {  
   "metricName": "precision_at_25",  
   "recipeList": [  
   "arn:aws:personalize::recipe/aws-hrnn"
   ]  
   }  
   }  
   },
   ```
Note the `metricName` and `recipeList`. Because you specified `performAutoML`, Amazon Personalize chooses the recipe from the list that optimizes that metric. Because we didn't supply any metadata, the only recipe in the list is the HRNN (p. 52) recipe.

When the create status shows as ACTIVE, the solution configuration is complete and the model is ready for training.

3. Now that the configuration is ACTIVE, train the model by running the following command.

```bash
aws personalize create-solution-version \
```

The solution version ARN is displayed, for example:

```json
{
}
```

Check the training status of the solution version by using the `describe-solution-version` command. Provide the solution version ARN that was returned in the previous step. For more information about the API, see `DescribeSolutionVersion` (p. 171).

```bash
aws personalize describe-solution-version \
```

The properties of the solution version and the training status are displayed. Initially, the status shows as CREATE PENDING, for example:

```json
{
  "solutionVersion": {
    ...
    "status": "CREATE PENDING"
  }
}
```

4. When the latest solution version training status shows as ACTIVE, the training is complete. The `describe-solution-version` response now includes `recipeArn`, which shows the recipe used to train the model as determined by Amazon Personalize, for example:

```json
{
  "solutionVersion": {
    "performAutoML": true,
    "recipeArn": "arn:aws:personalize:::recipe/aws-hrnn",
    "solutionConfig": {
      "autoMLConfig": {
        "metricName": "precision_at_25",
        "recipeList": [
```
Now you can check the solution version metrics and create a campaign using the solution version.

**Note**
Training takes time. Wait until training is complete (the training status of the solution version shows as ACTIVE) before using this version of the solution in a campaign. For quicker training, instead of using `perform-auto-ml`, select a specific recipe using the `recipe-arn` parameter.

5. You can validate the performance of the solution version by reviewing its metrics. Get the metrics for the solution version by running the following command. Provide the solution version ARN that was returned previously. For more information about the API, see [GetSolutionMetrics](p. 174).

```
aws personalize get-solution-metrics \\
```

A sample response is shown:

```
{
    "metrics": {
        "arn:aws:personalize:us-west-2:acct-id:model/awspersonalizehrnnmodel-7923fda9": {
            "coverage": 0.27,
            "mean_reciprocal_rank_at_25": 0.0379,
            "normalized_discounted_cumulative_gain_at_5": 0.0405,
            "normalized_discounted_cumulative_gain_at_10": 0.0513,
            "normalized_discounted_cumulative_gain_at_25": 0.0828,
            "precision_at_5": 0.0136,
            "precision_at_10": 0.0102,
            "precision_at_25": 0.0091
        }
    }
}
```

---

**Step 3: Create a Campaign (Deploy the Solution)**

Before you can get recommendations, you must deploy a version of the solution. Deploying a solution is also known as creating a campaign. Once you've created your campaign, your client application can get recommendations using the [GetRecommendations](p. 210) API.

1. Create a campaign by running the following command. Provide the solution version ARN that was returned in the previous step. For more information about the API, see [CreateCampaign](p. 111).

```
aws personalize create-campaign \\
--name MovieRecommendationCampaign \\
--min-provisioned-tps 10
```
2. Check the deployment status by running the following command. Provide the campaign ARN that was returned in the previous step. For more information about the API, see DescribeCampaign (p. 152).

```bash
aws personalize describe-campaign \
  MovieRecommendationCampaign
```

A sample response is shown:

```
{
  "campaign": {
    "name": "MovieRecommendationCampaign",
    "campaignArn": "arn:aws:personalize:us-west-2:acct-id:campaign/
    MovieRecommendationCampaign",
    MovieSolution/<version-id>",
    "minProvisionedTPS": "10",
    "creationDateTime": 1543864775.923,
    "lastUpdatedDateTime": 1543864791.923,
    "status": "CREATE_IN_PROGRESS"
  }
}
```

**Note**

Wait until the status shows as ACTIVE before getting recommendations from the campaign.

### Step 4: Get Recommendations

Get recommendations by running the `get-recommendations` command. Provide the campaign ARN that was returned in the previous step. In the request, you specify a user ID from the movie ratings dataset. For more information about the API, see GetRecommendations (p. 210).

**Note**

Not all recipes support the GetRecommendations API. For more information, see Using Predefined Recipes (p. 50).

The AWS CLI command you call in this step, `personalize-runtime`, is different than in previous steps.

```bash
aws personalize-runtime get-recommendations \
  --campaign-arn arn:aws:personalize:us-west-2:acct-id:campaign/MovieRecommendationCampaign \
  --user-id 123
```

In response, the campaign returns a list of item recommendations (movie IDs) the user might like. The list is sorted in descending order of relevance for the user.

```
{
```
Getting Started (AWS SDK for Python)

This topic explains how to get started programming Amazon Personalize with the AWS SDK for Python (Boto 3).

**Prerequisites**

The following are prerequisite steps for using the Python examples in this guide:

- Complete the Getting Started Prerequisites (p. 11). You can use the same source data that is listed in the Getting Started (Console) (p. 12) or Getting Started (AWS CLI) (p. 22) exercises. If you are using your own source data, make sure your data is formatted like in the prerequisite step Create the Training Data (p. 11). For information about preparing your own source data, see Preparing and Importing Data (p. 33).

- Set up your AWS SDK for Python (Boto 3) environment, as specified in Setting Up the AWS SDKs (p. 10).

After you finish this exercise, to avoid incurring unnecessary charges, delete the resources you created. For more information, see Clean Up Resources (p. 31).

**Step 1: Verify Your Python Environment**

After you complete the prerequisites, run the following Python example to confirm that your environment is configured correctly. If your environment is configured correctly, a list of the available recipes is displayed and you can run the other Python examples in this guide.

```python
import boto3

personalize = boto3.client('personalize')

response = personalize.list_recipes()

for recipe in response['recipes']:
    print(recipe)
```
Step 2: Import Training Data

After you verify that your Python environment is configured correctly, import your data. To use a dataset for training, you need to do the following:

1. Add a schema. The schema allows Amazon Personalize to parse the training dataset. For a code sample, see Datasets and Schemas (p. 33).
2. Import the data. You create a dataset group which contains one or several datasets that Amazon Personalize can use for training. For a code sample, see Import Your Data Using the AWS Python SDK (p. 41).
3. (Optional) Add an event tracker. To add an event to train a model, you must add a tracking ID to associate the event with your dataset group. For a code sample, see Getting a Tracking ID (p. 44).
4. (Optional) Add an event record. To add more data in training and create a better model, you can use events. Events are recorded user activities such as a search, a view, or a purchase. For a code sample, see PutEvents Operation (p. 45).

Step 3: Create a Solution

After you import your data, create a solution and solution version. The solution contains the configurations to train a model. A solution version is a trained model. For a code sample, see Creating a Solution (p. 48).

When you create a solution version, evaluate its performance before proceeding. For a code sample, see Evaluating a Solution Version (p. 72).

Step 4: Create a Campaign

After you train and evaluate your solution version, you can deploy it using a campaign. A campaign is an endpoint used to host a solution version and make recommendations to users. For a code sample, see Creating a Campaign (p. 75).

Step 5: Get Recommendations

After you create a campaign, you can use it to get recommendations. For a code sample, see GetRecommendations (p. 76).

(Optional) Explore the Amazon Personalize APIs with a Jupyter (iPython) Notebook

We provide a Jupyter (iPython) notebook to help you explore the Amazon Personalize APIs. With one exception, the Jupyter notebook has the same prerequisites as the Python examples in this guide. The notebook uses different source data and you don't need to do the prerequisite step Create the Training Data (p. 11).

To get the Jupyter notebook, clone or download the personalize_sample_notebook.ipynb notebook from the Amazon Personalize Samples repository.

Clean Up Resources

To avoid incurring unnecessary charges, delete the resources you created after you're done with the getting started exercise. To delete the resources, use either the Amazon Personalize console or the
Delete APIs from the SDKs or the AWS Command Line Interface (AWS CLI). For example, use the `DeleteCampaign (p. 136)` API to delete a campaign.

You can't delete a resource whose status is CREATE PENDING or IN PROGRESS. The resource status must be ACTIVE or CREATE FAILED. Check the status using the `Describe` APIs, for example, `DescribeCampaign (p. 152)`.

Some resources must be deleted before others, as shown in the following table. This process can take some time.

To delete the training data you uploaded, `ratings.csv`, see How Do I Delete Objects from an S3 Bucket?

<table>
<thead>
<tr>
<th>Resource to be Deleted</th>
<th>Delete This First</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campaign (p. 227)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DatasetImportJob (p. 241)</td>
<td>Can not be deleted.</td>
<td></td>
</tr>
<tr>
<td>EventTracker (p. 255)</td>
<td>The event-interactions dataset that is associated with the event tracker is not deleted and continues to be used by the solution version.</td>
<td></td>
</tr>
<tr>
<td>Dataset (p. 235)</td>
<td>No associated DatasetImportJob can have a status of CREATE PENDING or IN PROGRESS. No associated SolutionVersion can have a status of CREATE PENDING or IN PROGRESS.</td>
<td></td>
</tr>
<tr>
<td>DatasetSchema (p. 245)</td>
<td>All datasets that reference the schema.</td>
<td></td>
</tr>
<tr>
<td>Solution (p. 271)</td>
<td>All campaigns based on the solution version. No associated SolutionVersion can have a status of CREATE PENDING or IN PROGRESS.</td>
<td></td>
</tr>
<tr>
<td>SolutionVersion (p. 278)</td>
<td>Deleted when the associated Solution is deleted.</td>
<td></td>
</tr>
<tr>
<td>DatasetGroup (p. 237)</td>
<td>All associated event trackers. All associated solutions. All datasets in the dataset group.</td>
<td></td>
</tr>
</tbody>
</table>
Preparing and Importing Data

Amazon Personalize uses data that you provide to train a model. You can provide data from a source file, or you can collect data from live events, such as user activities on a website.

If you provide a source file to import your data into Amazon Personalize, you must fulfill these requirements:

- Format your data as a comma-separated values (CSV) file
- Provide a schema so that Amazon Personalize can import the data correctly
- Upload your file into an Amazon Simple Storage Service (Amazon S3) bucket that Amazon Personalize can access

You can upload your data by using the AWS SDK for Python.

This section provides information about formatting and importing your historical data into Amazon Personalize. For information about recording live event data, see Recording Events (p. 43).

Topics

- Datasets and Schemas (p. 33)
- Formatting Your Input Data (p. 39)
- Uploading to an S3 Bucket (p. 40)
- Importing Your Data (p. 41)

Datasets and Schemas

Amazon Personalize recognizes three types of historical datasets. Each type has an associated schema with a name key whose value matches the dataset type. The three types are:

- **Users** – This dataset is intended to provide metadata about your users. This might include information such as age, gender, or loyalty membership, which can be important signals in personalization systems.
- **Items** – This dataset is intended to provide metadata about your items. This might include information such as price, SKU type, or availability.
- **Interactions** – This dataset is intended to provide historical interaction data between users and items. It can also provide metadata on your user's browsing context, such as their location or device (mobile, tablet, desktop, and so on).

The Users and Items dataset types are known as metadata types and are only used by certain recipes. For more information, see Using Predefined Recipes (p. 50). For metadata datasets, all strings, except for USER_ID and ITEM_ID, must be marked as categorical in the schema, as shown in the following examples.

**Note**
A dataset group can contain only one of each type of dataset.

Each dataset has a set of required fields, reserved keywords, and their required datatypes, as shown in the following table.
Before you add a dataset to Amazon Personalize, you must define a schema for that dataset. Each dataset type has specific requirements. Schemas in Amazon Personalize are defined in the Avro format. For more information, see Apache Avro.

When you create a schema, you must follow these guidelines:

- The schema fields can be in any order, but they must match the order of the corresponding column headers in the data file.
- Each dataset type requires specific fields in its schema. You must define the required fields with their required data types.
- Some schemas have reserved keywords for field names. If you use a reserved keyword for a field name in your schema, you must define it as its required datatype.
- The required fields and reserved keywords are not considered "metadata fields."
- Added fields that are not required or don't use a reserved keyword are metadata. Metadata fields can be either a string or non-string type.
- The users and items schemas require at least one metadata field.
- If you add your own metadata field of type string, it must include the "categorical" attribute. Otherwise, you can't use it to train a model.
- A Users or Interactions dataset can contain up to 5 metadata fields. An Items dataset can contain up to 50 metadata fields.

The following example shows an Interactions schema. The EVENT_TYPE and EVENT_VALUE fields are optional, and are reserved keywords recognized by Amazon Personalize. LOCATION and DEVICE are optional contextual metadata fields.

```
{
   "type": "record",
   "name": "Interactions",
   "namespace": "com.amazonaws.personalize.schema",
   "fields": [
     {
       "name": "USER_ID",
       "type": "string"
     },
     {
       "name": "ITEM_ID",
       "type": "string"
     },
     {
       "name": "TIMESTAMP",
       "type": "long"
     },
     {
       "name": "EVENT_TYPE",
       "type": "string"
     },
     {
       "name": "EVENT_VALUE",
       "type": "float"
     }
   ]
}``

The following example shows a Users schema in Avro format. Only the USER_ID field is required. The AGE and GENDER fields are metadata.

```json
{
  "type": "record",
  "name": "Users",
  "namespace": "com.amazonaws.personalize.schema",
  "fields": [
    {
      "name": "USER_ID",
      "type": "string"
    },
    {
      "name": "AGE",
      "type": "int"
    },
    {
      "name": "GENDER",
      "type": "string",
      "categorical": true
    }
  ],
  "version": "1.0"
}
```

The following example shows an Items schema. Only the ITEM_ID field is required. The shown GENRE field is metadata.

```json
{
  "type": "record",
  "name": "Items",
  "namespace": "com.amazonaws.personalize.schema",
  "fields": [
    {
      "name": "ITEM_ID",
      "type": "string"
    },
    {
      "name": "GENRE",
      "type": "string",
      "categorical": true
    }
  ],
  "version": "1.0"
}
```
Create a schema using Python

```json
{
  "name": "GENRE",
  "type": "string",
  "categorical": true
}
```

If you are using the AWS console, you create a new schema when you create a dataset for your input data. You can also choose an existing schema. For more information, see Step 1: Import Training Data (p. 12).

If you are using the AWS CLI, see Step 1: Import Training Data (p. 23) for an example.

Create a Schema Using the AWS Python SDK

1. Define the Avro format schema that you want to use.
2. Save the schema in a JSON file in the default Python folder.
3. Create the schema using the following code.

```python
import boto3
personalize = boto3.client('personalize')
with open('schema.json') as f:
    createSchemaResponse = personalize.create_schema(
        name = 'YourSchema',
        schema = f.read()
    )
schema_arn = createSchemaResponse['schemaArn']
print('Schema ARN:' + schema_arn)
```

4. Amazon Personalize returns the ARN of the new schema. Store it for later use.

Amazon Personalize provides operations for managing schemas. For example, you can use the ListSchemas (p. 194) API to get a list of the available schemas.

After you create a schema, use it with datasets that match the schema. For more information, see Formatting Your Input Data (p. 39).

Filtering Records from a User-Interactions Training Dataset

If your Interactions dataset includes data that you don't want to use for training, you can filter out those records by setting a threshold for a value, such as price, or by specifying a type of event, such as purchase or click. By filtering, you can train using only a relevant subset of your data or remove noise to train a more optimized model.

You can filter records from an Interactions dataset two ways:

- Set a threshold to exclude records based on a specific value by specifying an event value in your recipe - If the records include an amount that is associated with a specific event—for example, the price a user paid is associated with the purchase of an item—you can set a specific value in a recipe as a threshold to exclude records from training. The amount is called an event value.
• **Exclude records of a certain type by specifying an event type in your recipe** – A dataset often includes specific types of activities, for example, “purchase”, “click”, or “wishlisted”. These are called *event types*. To include only records for specific event types in training, filter your dataset by event type in your recipe.

Likewise, an Interactions dataset often includes specific types of activities, for example, “purchase”, “click”, or “wishlisted”. These are called *event types*. To include only records for specific event types in training, filter your dataset by event type in your recipe.

To filter by event value or event type, you create an Interactions schema for the recipe that you use to create your solution. To use a more specific subset in training, you can also filter a dataset by an event value and event type.

**Filtering Records by Event Value and Event Type**

In the following procedure, you use the AWS SDK for Python (Boto 3) to create an Interaction schema that filters a training dataset. You can use a Jupyter (iPython) notebook to accomplish the same task. For more information, see *(Optional) Explore the Amazon Personalize APIs with a Jupyter (iPython) Notebook* (p. 31).

**Prerequisites:** Complete the prerequisites and verify that your Python environment is set up as described in *Getting Started (AWS SDK for Python)* (p. 30).

**To filter records used in a training dataset by event value or event type**

1. Create an Interaction schema and include the *EVENT_TYPE* and *EVENT_VALUE* fields using "name" and "type" key-value pairs as shown.

```python
import boto3
import json

personalize = boto3.client('personalize')

# Create a name for your schema
schema_name = 'YourSchemaName'

# Define the schema for your dataset
schema = {
    "type": "record",
    "name": "Interactions",
    "namespace": "com.amazonaws.personalize.schema",
    "fields": [
        {
            "name": "USER_ID",
            "type": "string"
        },
        {
            "name": "ITEM_ID",
            "type": "string"
        },
        {
            "name": "EVENT_VALUE",
            "type": "float"
        },
        {
            "name": "EVENT_TYPE",
            "type": "string"
        },
        {
            "name": "TIMESTAMP"
        }
    ]
}
```
2. Format your input data to match your schema. For a code sample, see Formatting Your Input Data (p. 39).

3. Upload your data to an Amazon Simple Storage Service (Amazon S3) bucket. For a code sample, see Uploading to an S3 Bucket (p. 40).

4. Import your data into Amazon Personalize with the CreateDatasetImportJob (p. 120) API. Be sure to record your dataset group Amazon Resource Name (ARN) because you will need it when you create the solution. For a code sample, see Import Your Data Using the AWS Python SDK (p. 41).

5. Get the ARN of the recipe that you want to use when you create your solution. You'll need it when you create the solution.

```python
import boto3
personalize = boto3.client('personalize')
# Display the ARNs of the recipes
recipe_list = personalize.list_recipes()
for recipe in recipe_list['recipes']:
    print(recipe['recipeArn'])
# Store the ARN of the recipe that you want to use
recipe_arn = "arn:aws:personalize:::recipe/aws-recipe-name"
```

6. Call the CreateSolution (p. 128) API. If you want to specify the event type, for example "purchase", set it in the `eventType` parameter. If you want to specify an event value, for example 10, set it in the `eventValueThreshold` parameter. You can also specify both an event type and an event value.

```python
import boto3
personalize = boto3.client('personalize')
# Create the solution
create_solution_response = personalize.create_solution(
    name = "your-solution-name",
    datasetGroupArn = dataset_group_arn,
    recipeArn = recipe_arn,
    "eventType": "purchase",
    solutionConfig = {
        "eventValueThreshold": "10"
    }
)
# Store the solution ARN
solution_arn = create_solution_response['solutionArn']
```
# Use the solution ARN to get the solution status
solution_description = personalize.describe_solution(solutionArn = solution_arn)['solution']
print('Solution status: ' + solution_description['status'])

7. When you have the solution, use it to train a model by specifying its solution ARN in a `CreateSolutionVersion` request.

```python
import boto3

personalize = boto3.client('personalize')

# Create a solution version
create_solution_version_response = personalize.create_solution_version(solutionArn = solution_arn)

# Store the solution version ARN
solution_version_arn = create_solution_version_response['solutionVersionArn']

# Use the solution version ARN to get the solution version status.
solution_version_description = personalize.describe_solution_version(solutionVersionArn = solution_version_arn)['solutionVersion']
print('Solution version status: ' + solution_version_description['status'])
```

Training is complete when the status is `ACTIVE`. For more information, see `Creating a Solution`.

After you train a model, you should evaluate its performance. To optimize your model, you might want to adjust the `eventValueThreshold` or other hyperparameters. For more information, see `Evaluating a Solution Version`.

## Formatting Your Input Data

The files that you use to import data into Amazon Personalize must map to the schema that you are using.

Amazon Personalize imports data only from files that are in the comma-separated values (CSV) format. Amazon Personalize requires the first row of your CSV file to contain column headers. The column headers in your CSV file need to map to the schema to create the dataset. Don’t enclose headers in quotation marks (").

For example, the following CSV data sample maps to the Interactions schema shown in Datasets and Schemas. This data represents historical user activity from a website that sells movie tickets. You can use the data to train a model that gives a user movie recommendations based on the activities of other users.

```
USER_ID,ITEM_ID,EVENT_TYPE,EVENT_VALUE,TIMESTAMP
196,242,click,15,881250949
186,302,click,13,891717742
22,377,click,10,878887116
244,51,click,20,880606923
166,346,click,10,886397596
298,474,click,40,884182806
115,265,click,20,881171488
253,465,click,50,891628467
305,451,click,30,886324817
```
The associated Interactions schema is repeated below.

```json
{
  "type": "record",
  "name": "Interactions",
  "namespace": "com.amazonaws.personalize.schema",
  "fields": [
    {
      "name": "USER_ID",
      "type": "string"
    },
    {
      "name": "ITEM_ID",
      "type": "string"
    },
    {
      "name": "EVENT_TYPE",
      "type": "string"
    },
    {
      "name": "EVENT_VALUE",
      "type": "float"
    },
    {
      "name": "TIMESTAMP",
      "type": "long"
    }
  ],
  "version": "1.0"
}
```

Amazon Personalize requires the USER_ID, ITEM_ID, and TIMESTAPM fields. USER_ID is the identifier for a user of your application. ITEM_ID is the identifier for a movie. EVENT_TYPE and EVENT_VALUE are the identifiers for user activities. In the sample data, a click might represent a movie purchase event and 15 might be the purchase price of the movie. TIMESTAPM represents the Unix time that the movie purchase took place.

### Categorical Data

To include multiple categories for a single item when you use categorical string data, separate the values using the vertical bar, '|', character. For example, to match the Items schema from the previous section using two categories, a data row would resemble the following:

```
ITEM_ID,GENRE
item_123,horror|comedy
```

After you format your data, upload it to an Amazon S3 bucket so you can import it into Amazon Personalize. For more information, see Uploading to an S3 Bucket (p. 40).

### Uploading to an S3 Bucket

After you create a CSV file with your data, upload the file to your Amazon Simple Storage Service (Amazon S3) bucket. This is the location that Amazon Personalize imports your data from.

Amazon Personalize needs permission to access the S3 bucket. Attach the following policy to your bucket. For more information, see How Do I Add an S3 Bucket Policy?.
After you upload your data to an S3 bucket, import your data into Amazon Personalize. For more information, see Importing Your Data (p. 41).

### Importing Your Data

To import your training data into Amazon Personalize, first create an empty dataset group and then an empty dataset in that dataset group. Next, create an import job that populates the dataset with data from your Amazon S3 bucket. For more information about datasets, see Datasets and Schemas (p. 33).

### Import Your Data Using the AWS Python SDK

The following steps show how to create and populate a dataset. For the equivalent steps using the AWS CLI, see Step 1: Import Training Data (p. 23).

1. Create a dataset group using the CreateDatasetGroup (p. 117) API.

   ```python
   import boto3
   personalize = boto3.client('personalize')
   response = personalize.create_dataset_group(name = 'YourDatasetGroup')
   dsg_arn = response['datasetGroupArn']
   description = personalize.describe_dataset_group(datasetGroupArn = dsg_arn)
   ['datasetGroup']
   print('Name: ' + description['name'])
   print('ARN: ' + description['datasetGroupArn'])
   print('Status: ' + description['status'])
   ```

   The response from the DescribeDatasetGroup (p. 156) API returns the datasetGroupArn and the status of the operation.

   **Note**
   You must wait until the status shows as ACTIVE before you can proceed to the next step.

2. Create a dataset using the CreateDataset (p. 114) API. Specify the datasetGroupArn returned in the previous step. Use the schemaArn created earlier in Datasets and Schemas (p. 33).
3. To add data to your dataset, create and run a dataset import job using the CreateDatasetImportJob (p. 120) API. Specify the datasetGroupArn and set the dataLocation to the S3 bucket where you stored the training data.

For the roleArn, see Creating an IAM Role (p. 7). The roleArn parameter specifies the AWS Identity and Access Management (IAM) role that gives Amazon Personalize permissions to access your S3 bucket.

```python
import boto3
personalize = boto3.client('personalize')
response = personalize.create_dataset_import_job(
    jobName = 'YourImportJob',
    datasetArn = 'dataset_arn',
    dataSource = {'dataLocation':'s3://bucket/file.csv'},
    roleArn = 'role_arn')
dsij_arn = response['datasetImportJobArn']
print ('Dataset Import Job arn: ' + dsij_arn)
description = personalize.describe_dataset_import_job(
    datasetImportJobArn = dsij_arn)['datasetImportJob']
print('Name: ' + description['jobName'])
print('ARN: ' + description['datasetImportJobArn'])
print('Status: ' + description['status'])
```

The response returns the datasetImportJobArn. The response from the DescribeDatasetImportJob (p. 158) API includes the status of the operation.

**Note**
You must wait until the status changes to ACTIVE before you can use the data to train a model.

**Important**
Imports in Amazon Personalize are a full refresh of the data. You can’t add incremental updates. If you need to update your data, import the complete updated file.

Amazon Personalize provides operations for managing datasets, dataset groups, and dataset import jobs. For example, you can use ListDatasets (p. 187) to list the datasets in a dataset group and use DeleteDataset (p. 138) to delete a dataset.

After you import your data into the relevant datasets in the dataset group, create a solution version by training a model. For more information, see Creating a Solution (p. 48).
Recording Events

Amazon Personalize can make recommendations based purely on historical imported data as demonstrated in the Getting Started (p. 11) guides. Amazon Personalize can also make recommendations purely on real time event data, or a combination of both, using the Amazon Personalize event ingestion SDK.

Unlike historical data, after a campaign is created, new recorded event data is automatically used when getting recommendations from the campaign.

**Note**
The minimum data requirements to train a model are:

- 1000 records of combined interaction data (after filtering by eventType and eventValueThreshold, if provided)
- 25 unique users with at least 2 interactions each

The event ingestion SDKs include a JavaScript library for recording events from web client applications.
The SDKs also include a library for recording events in server code.

To record events, you need the following:

- A dataset group that includes an Interactions dataset, which can be empty.
- An event tracker.
- A call to the PutEvents (p. 205) operation.

Amazon Personalize predefined recipes are compatible with the PutEvents API. This includes the required sessionId parameter which makes these recipes aware of sessions.

For a sample Jupyter notebook that shows you how to use the PutEvents operation to record and implement new customer data, see Using the PutEvents API with Personalize in the amazon-personalize-samples GitHub repository.

Topics

- Creating a Dataset Group (p. 43)
- Getting a Tracking ID (p. 44)
- Event-Interactions Dataset (p. 44)
- PutEvents Operation (p. 45)
- Event Metrics (p. 47)
- Events and Solutions (p. 47)

Creating a Dataset Group

If you went through the Getting Started (p. 11) guide, you can use the same dataset group that you created. For a Python example that creates a dataset and a dataset group, see Importing Your Data (p. 41).
Getting a Tracking ID

A tracking ID associates an event with a dataset group and authorizes you to send data to Amazon Personalize. You generate a tracking ID by calling the `CreateEventTracker` API and supplying the dataset group ARN.

**Note**
Only one event tracker can be associated with a dataset group. You will get an error if you call `CreateEventTracker` using the same dataset group as an existing event tracker.

**Python**

```python
import boto3

personalize = boto3.client('personalize')

response = personalize.create_event_tracker(
    name='MovieClickTracker',
    datasetGroupArn='arn:aws:personalize:us-west-2:acct-id:dataset-group/MovieClickGroup'
)

print(response['eventTrackerArn'])
print(response['trackingId'])
```

**AWS CLI**

```bash
aws personalize create-event-tracker \
    --name MovieClickTracker \ 
    --dataset-group-arn arn:aws:personalize:us-west-2:acct-id:dataset-group/MovieClickGroup
```

The event tracker ARN and tracking ID are displayed, for example:

```json
{
    "eventTrackerArn": "arn:aws:personalize:us-west-2:acct-id:event-tracker/MovieClickTracker",
    "trackingId": "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx"
}
```

**Event-Interactions Dataset**

When Amazon Personalize creates an event tracker, it also creates an event-interactions dataset in the dataset group associated with the event tracker. The event-interactions dataset stores the event data from the `PutEvents` call. The contents of the dataset are not available to the user.

To view the properties of the dataset, call the `ListDatasets` API, supplying the dataset group ARN. For additional information about the dataset, use the dataset ARN for the `EVENT_INTERACTIONS` dataset to call the `DescribeDataset` API. The following is an example response from `ListDatasets`:

```json
{
    "datasets": [
        {
            "name": "ratings-dsgroup/EVENT_INTERACTIONS",
            "datasetArn": "arn:aws:personalize:us-west-2:acct-id:dataset/MovieClickGroup/EVENT_INTERACTIONS"
        }
    ]
}
```
PutEvents Operation

To record events, you call the PutEvents (p. 205) operation. The following example shows a PutEvents call that passes one event that contains the minimum required information. The corresponding Interactions schema is shown, along with an example row from the Interactions dataset.

The session ID is custom to your application. The event list is an array of Event (p. 284) objects. The properties key is a string map (key-value pairs) of event-specific data. In this case, just the item ID is specified.

The userId, itemId, and sentAt parameters map to the USER_ID, ITEM_ID, and TIMESTAMP fields of a corresponding historical Interactions dataset. For more information, see Datasets and Schemas (p. 33).

Note
You can also use AWS Amplify to send event data to Amazon Personalize. For more information, see Amplify - Analytics.

Interactions schema: USER_ID, ITEM_ID, TIMESTAMP
Interactions dataset: user123, item-xyz, 1543631760

Python

```python
import boto3

personalize_events = boto3.client(service_name='personalize-events')

personalize_events.put_events(
    trackingId = 'tracking_id',
    userId= 'USER_ID',
    sessionId = 'session_id',
    eventList = [{
        'sentAt': TIMESTAMP,
        'eventType': 'EVENT_TYPE',
        'properties': "{"itemId": "ITEM_ID"}"
    }]
)
```

AWS CLI

```bash
aws personalize-events put-events \
```
PutEvents Operation

--tracking-id tracking_id \
--user-id USER_ID \
--session-id session_id \
--event-list [{'
  "sentAt": "TIMESTAMP",
  "eventType": "EVENT_TYPE",
  "properties": "{"itemId": "ITEM_ID"}"
}]

After this example, you would proceed to train a model using only the required properties. The training would not use the eventValue property because it wasn’t included in the event.

The next example shows how to submit data that would train on the event value. It also demonstrates the passing of multiple events of different types (‘like’ and ‘rating’). In this case, you must specify the event type to train on in the CreateSolution (p. 128) operation (see Events and Solutions below). Also shown is the recording of an extra property, numRatings, that is used as metadata by certain recipes.

Interactions schema: USER_ID, ITEM_ID, TIMESTAMP, EVENT_TYPE, EVENT_VALUE, NUM_RATINGS
Interactions dataset: user123, movie_xyz, 1543531139, rating, 5, 12
  user321, choc-ghana, 1543531760, like, true
  user111, choc-fake, 1543557118, like, false

Python

```python
import boto3
import json

personalize_events = boto3.client(service_name='personalize-events')

personalize_events.put_events(
    trackingId = 'tracking_id',
    userId= 'user555',
    sessionId = 'session1',
    eventList = [{
        'eventId': 'event1',
        'sentAt': '1553631760',
        'eventType': 'like',
        'properties': json.dumps({
            'itemId': 'choc-panama',
            'eventValue': 'true'
        })
    }, {
        'eventId': 'event2',
        'sentAt': '1553631782',
        'eventType': 'rating',
        'properties': json.dumps({
            'itemId': 'movie_ten',
            'eventValue': '4',
            'numRatings': '13'
        })
    }]
)
```

AWS CLI

```
aws personalize-events put-events \
   --tracking-id tracking_id \
   --user-id user555 \
   --session-id session1 \
   --event-list '[[
      "eventId": "event1",
```
"sentAt": "1553631760",
"eventType": "like",
"properties": "{\"itemId\": \"choc-panama\", \"eventValue\": \"true\"}"
}, {
"eventId": "event2",
"sentAt": "1553631782",
"eventType": "rating",
"properties": "{\"itemId\": \"movie_ten\", \"eventValue\": \"4\", \"numRatings\": \"13\"}"
}

**Note**
The properties keys use camel case names that match the fields in the Interactions schema. For example, if the fields 'ITEM_ID', 'EVENT_VALUE', and 'NUM_RATINGS,' are defined in the Interactions schema, the property keys should be itemId, eventValue, and numRatings.

**Event Metrics**

To monitor the type and number of events sent to Amazon Personalize, use Amazon CloudWatch metrics. For more information, see Monitoring Amazon Personalize (p. 95).

**Events and Solutions**

When training a model that uses event data, two parameters of the CreateSolution (p. 128) operation are relevant. The eventType parameter must be specified when multiple event types are recorded. The eventType indicates which type of event Amazon Personalize uses as the label for model training.

The eventValueThreshold parameter of the SolutionConfig object creates an event filter. When this parameter is specified, only events with a value greater than or equal to the threshold are used for training the model. You must specify the event type when using eventValueThreshold.
Creating a Solution

A solution version is the term Amazon Personalize uses for a trained machine learning model that makes recommendations to customers. Creating a solution entails optimizing the model to deliver the best results for a specific business need. Amazon Personalize uses "recipes" to create these personalized solutions.

A recipe in Amazon Personalize is made up of an algorithm with hyperparameters, and a feature transformation. An algorithm is a mathematical expression that when trained becomes the model. The algorithm contains parameters whose unknown values are determined by training on input data. Hyperparameters are external to the algorithm and specify details of the training process, such as the number of training passes to run over the complete dataset or the number of hidden layers to use.

Amazon Personalize provides a number of predefined recipes that allow you to make recommendations with no knowledge of machine learning. The predefined recipes are also useful for quick experimentation. For more information, see Using Predefined Recipes (p. 50).

A solution is created by calling the CreateSolution (p. 128) and CreateSolutionVersion (p. 133) operations. CreateSolution creates the configuration for training a model. CreateSolutionVersion starts the training process, which results in a specific version of the solution. A new version of the solution is created each time you call CreateSolutionVersion. A condensed, reorganized version of the CreateSolution request is shown. The various options and configuration objects are discussed in the following sections.

```json
{
    "name": "string",
    "datasetGroupArn": "string",
    "performAutoML": boolean,
    "recipeArn": "string",
    "performHPO": boolean,
    "eventType": "string",
    "solutionConfig": {
        "autoMLConfig": {
            "metricName": "string",
            "recipeList": [ "string" ]
        },
        "eventValueThreshold": "string",
        "algorithmHyperParameters": { },
        "featureTransformationParameters": { },
        "hpoConfig": { }
    }
}
```

How a recipe is chosen is shown in the following table. Either performAutoML or recipeArn must be specified but not both. AutoML is only performed using the HRNN recipes.

<table>
<thead>
<tr>
<th>performAutoML</th>
<th>recipeArn</th>
<th>solutionConfig</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>omit</td>
<td>omitted</td>
<td>Amazon Personalize chooses the recipe</td>
</tr>
<tr>
<td>true</td>
<td>omit</td>
<td>autoMLConfig:metricName and recipeList specified</td>
<td>Amazon Personalize chooses a recipe from the list that optimizes the metric</td>
</tr>
<tr>
<td>omit</td>
<td>specified</td>
<td>omitted</td>
<td>You specify the recipe</td>
</tr>
</tbody>
</table>

48
You specify the recipe and override the default training properties.

<table>
<thead>
<tr>
<th>performAutoML</th>
<th>recipeArn</th>
<th>solutionConfig</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>omit</td>
<td>specified</td>
<td>specified</td>
<td>You specify the recipe and override the default training properties</td>
</tr>
</tbody>
</table>

**Note**

When `performAutoML` is true, all parameters of the `solutionConfig` object are ignored except for `autoMLConfig`.

**Leave it to Amazon Personalize**

If you have no knowledge of machine learning, or just want to get started as quickly as possible, you can have Amazon Personalize analyze your data and decide on the best predefined recipe and options to use. In this case, you call the `CreateSolution` operation, specify `true` for the `performAutoML` parameter, and omit the `recipeArn` and `solutionConfig` parameters. Amazon Personalize does the rest.

You can also specify the list of recipes that Amazon Personalize examines to determine the optimal recipe, based on a metric you specify. In this case, you call the `CreateSolution` operation, specify `true` for the `performAutoML` parameter, omit the `recipeArn` parameter, and include the `solutionConfig` parameter, specifying the `metricName` and `recipeList` as part of the `autoMLConfig` object.

Instead of having Amazon Personalize choosing the recipe, you can do so manually. In this case, you call the `CreateSolution` API, specify `false` for `performAutoML`, and supply the `recipeArn` parameter. For the list of predefined recipes, see Using Predefined Recipes (p. 50).

**Customize the Training**

To customize the training, supply the `solutionConfig` parameter. The `SolutionConfig` object allows you to override the default solution and recipe parameters. For more information see Overriding Default Recipe Parameters (p. 69).

**Create a solution version using the AWS Python SDK**

1. Create and import a dataset into a dataset group. For more information, see Preparing and Importing Data (p. 33).
2. Create the solution version using the dataset group and the following code.

```python
import boto3

personalize = boto3.client('personalize')

print ('Creating solution')
response = personalize.create_solution(
    name = "SolutionName",
    datasetGroupArn = "Dataset group arn",
    performAutoML = True)

# Get the solution ARN.
solution_arn = response['solutionArn']
print('Solution ARN: ' + solution_arn)

# Use the solution ARN to get the solution status.
solution_description = personalize.describe_solution(solutionArn = solution_arn)[
    'solution'
]
print('Solution status: ' + solution_description['status'])

# Use the solution ARN to create a solution version.
print ('Creating solution version')
response = personalize.create_solution_version(solutionArn = solution_arn)
```
Training a model takes time. To check the current solution version status, call the `DescribeSolutionVersion` operation and pass the ARN of the solution version returned from the `CreateSolutionVersion` operation. Training is complete when the status is `ACTIVE`.

Now that you have a solution version, evaluate it using metrics supplied by Amazon Personalize. For more information, see Evaluating a Solution Version.

Using Predefined Recipes

Amazon Personalize provides predefined recipes, based on common use cases, for training models. A recipe is a machine learning algorithm or algorithm variant that you use with settings, or hyperparameters, and a dataset group to train an Amazon Personalize model. With recipes, you can create a personalization system without prior machine learning experience.

The predefined recipes use the following during training:

- Predefined attributes of your data
- Predefined feature transformations
- Predefined algorithms
- Initial parameter settings for the algorithms

To optimize your model, you can override many of these parameters when you create a solution. For more information, see Hyperparameters and HPO.

Amazon Personalize can automatically choose the most appropriate hierarchical recurrent neural network (HRNN) recipe based on its analysis of the input data. This option is called AutoML. To perform AutoML, set the `performAutoML` parameter to `true` when you call the `CreateSolution` API. Alternatively, you can choose a specific recipe based on what you want to accomplish and how familiar you are with the recipes. Each recipe is designed for a specific use case. When creating a solution, choose the recipe that best fits your needs.

To see a list of available recipes:

- In the Amazon Personalize console, choose a dataset group. From the navigation pane, choose `Solutions and recipes`, and choose the `Recipes` tab.
- With the AWS SDK for Python (Boto 3), call the `ListRecipes` API.
- With the AWS CLI, use the following command.

```bash
aws personalize list-recipes
```

To get information about a recipe using the SDK for Python (Boto 3), call the `DescribeRecipe` API. To get information about a recipe using the AWS CLI, use the following command.

```bash
aws personalize describe-recipe --recipe-arn recipe_arn
```
Amazon Personalize provides three types of recipes. Besides behavioral differences, each type has different requirements for getting recommendations, as shown in the following table.

<table>
<thead>
<tr>
<th>Recipe type</th>
<th>API</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>USER_PERSONALIZATION</td>
<td>GetRecommendations (p. 210)</td>
<td>userId: Required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>itemId: Optional</td>
</tr>
<tr>
<td></td>
<td></td>
<td>inputList: NA</td>
</tr>
<tr>
<td>PERSONALIZED_RANKING</td>
<td>GetPersonalizedRanking (p. 207)</td>
<td>userId: Required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>itemId: NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>inputList: list of itemId's</td>
</tr>
<tr>
<td>RELATED_ITEMS</td>
<td>GetRecommendations (p. 210)</td>
<td>userId: Not used</td>
</tr>
<tr>
<td></td>
<td></td>
<td>itemId: Required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>inputList: NA</td>
</tr>
</tbody>
</table>

### Predefined Recipes

Amazon Personalize provides the following predefined recipes. They are listed by recipe type.

**USER_PERSONALIZATION Recipes**

USER_PERSONALIZATION recipes predicts the items that a user will interact with.

**HRNN (p. 52)**

HRNN is a hierarchical recurrent neural network, which can model the user-item interactions across a given timeframe. Use the HRNN recipe when user behavior changes over time, which is referred to the evolving intent problem.

To train a model, HRNN uses the Interactions dataset from a dataset group. A dataset group is a set of related datasets, which can include the Users, Items, and Interactions datasets.

**HRNN-Metadata (p. 56)**

HRNN-Metadata is the HRNN recipe with additional features derived from metadata found in the Interactions, Users, and Items datasets. For example, rating, movie genre, or release year. The training data must include metadata in at least one of the datasets. HRNN-Metadata performs better than non-metadata models when high-quality metadata is available. Training with this recipe can involve longer training times.

To train a model, HRNN-Metadata uses the Users, Items, and Interactions datasets from a dataset group. A dataset group is a set of related datasets, which can include the Users, Items, and Interactions datasets.

**HRNN-Coldstart (p. 59)**

HRNN-Coldstart is similar to the HRNN-Metadata recipe, but also includes personalized exploration of new items. Use the HRNN-Coldstart recipe when you frequently add new items to a catalog and want the items to immediately be included in recommendations.

To train a model, HRNN-Coldstart uses the Users, Items, and Interactions datasets from a dataset group. A dataset group is a set of related datasets, which can include the Users, Items,
and Interactions datasets. The dataset group that supplies the training data must include an
Items dataset.

**Popularity-Count (p. 63)**

The Popularity-Count recipe calculates the popularity of items based on a count of events
against that item in the Interactions dataset. Use the Popularity-Count recipe to create a
baseline to compare results with other USER-PERSONALIZATION recipes.

To train a model, the Popularity-Count recipe uses the Interactions dataset from a dataset
group. A dataset group is a set of related datasets, which can include the Users, Items, and
Interactions datasets.

**PERSONALIZED_RANKING Recipe**

The Personalized-Ranking recipe personalizes results.

**Personalized-Ranking (p. 63)**

The Personalized-Ranking recipe is a hierarchical recurrent neural network (HRNN) recipe
that also can filter and rerank results. Personalized-Ranking provides a list of the best
recommendations. Use the Personalized-Ranking recipe when you're personalizing the results
for your users, such as personalized reranking of search results or curated lists.

To train a model, the Personalized-Ranking recipe uses the Interactions dataset from a dataset
group. A dataset group is a set of related datasets, which can include the Users, Items, and
Interactions datasets.

**RELATED_ITEMS Recipes**

The RELATED_ITEMS recipe, SIMS, returns items similar to a given item.

**SIMS (p. 66)**

The item-to-item similarities (SIMS) recipe generates items similar to a given item based on the
co-occurrence of the item in user history in the user-item interaction dataset. If sufficient user
behavior data for an item isn't available, or if the specified item ID isn't found, the recipe returns
popular items as recommendations. Use the SIMS recipe to improve item discoverability and in
detail pages. Training is faster with the SIMS recipe compared to other recipes.

To train a model, the SIMS recipe uses the Interactions dataset from a dataset
group. A dataset group is a set of related datasets, which can include the Users, Items, and
Interactions datasets.

^ Amazon Personalize considers these recipes when performing AutoML.

* Metadata models: These recipes train on both interaction data and metadata. For more information,
  see Datasets and Schemas (p. 33).

**HRNN Recipe**

The Amazon Personalize hierarchical recurrent neural network (HRNN) recipe models changes in user
behavior to provide recommendations during a session. A session is a set of user interactions within a
given timeframe with a goal of finding a specific item to fill a need, for example. By weighting a user's
recent interactions higher, you can provide more relevant recommendations during a session.

HRNN accommodates user intent and interests, which can change over time. It takes ordered user
histories and automatically weights them to make better inferences. HRNN uses a gating mechanism to
model the discount weights as a learnable function of the items and timestamps.

For more information about session-based recommendations, see Personalizing session-based
recommendations with hierarchical recurrent neural networks.
Amazon Personalize derives the features for each user from your dataset. If you have done real-time data integration, these features are updated in real time according to user activity. To get a recommendation, you provide only the USER_ID. If you also provide an ITEM_ID, Amazon Personalize ignores it.

The HRNN recipe has the following properties:

- **Name** – aws-hrnn
- **Recipe Amazon Resource Name (ARN)** – arn:aws:personalize:::recipe/aws-hrnn
- **Algorithm ARN** – arn:aws:personalize:::algorithm/aws-hrnn
- **Feature transformation ARN** – arn:aws:personalize:::feature-transformation/JSON-percentile-filtering
- **Recipe type** – USER_PERSONALIZATION

The following table describes the hyperparameters for the HRNN recipe. A hyperparameter is an algorithm parameter that you can adjust to improve model performance. Algorithm hyperparameters control how the model performs. Featurization hyperparameters control how to filter the data to use in training. The process of choosing the best value for a hyperparameter is called hyperparameter optimization (HPO). For more information, see Hyperparameters and HPO (p. 69).

The table also provides the following information for each hyperparameter:

- **Range**: [lower bound, upper bound]
- **Value type**: Integer, Continuous (float), Categorical (Boolean, list, string)
- **HPO tunable**: Can the parameter participate in HPO?

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Algorithm Hyperparameters</strong></td>
<td></td>
</tr>
<tr>
<td>hidden_dimension</td>
<td>The number of hidden variables used in the model. <em>Hidden variables</em> recreate users' purchase history and item statistics to generate ranking scores. Specify a greater number of hidden dimensions when your Interactions dataset includes more complicated patterns. Using more hidden dimensions requires a larger dataset and more time to process. To decide on the optimal value, use HPO. To use HPO, set performHPO to true when you call CreateSolution (p. 128) and CreateSolutionVersion (p. 133) operations. Default value: 43 Range: [32, 256] Value type: Integer HPO tunable: Yes</td>
</tr>
<tr>
<td>bptt</td>
<td>Determines whether to use the back-propagation through time technique. <em>Back-propagation through time</em> is a technique that updates weights in recurrent neural network-based algorithms. Use bptt for long-term credits to connect delayed rewards to early events. For example, a delayed reward can be a purchase made after several clicks. An early event can be an initial click. Even</td>
</tr>
</tbody>
</table>
### Name Description

**within the same event types, such as a click, it's a good idea to consider long-term effects and maximize the total rewards. To consider long-term effects, use larger bptt values. Using a larger bptt value requires larger datasets and more time to process.**

- **Default value:** 32
- **Range:** [2, 32]
- **Value type:** Integer
- **HPO tunable:** Yes

### recency_mask

**Determines whether the model should consider the latest popularity trends in the Interactions dataset. Latest popularity trends might include sudden changes in the underlying patterns of interaction events. To train a model that places more weight on recent events, set recency_mask to true. To train a model that equally weighs all past interactions, set recency_mask to false. To get good recommendations using an equal weight, you might need a larger training dataset.**

- **Default value:** True
- **Range:** True or False
- **Value type:** Boolean
- **HPO tunable:** Yes

### Featurization Hyperparameters
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Default value</th>
<th>Range</th>
<th>Value type</th>
<th>HPO tunable</th>
</tr>
</thead>
<tbody>
<tr>
<td>min_user_history_length_percentile</td>
<td>The minimum percentile of user history lengths to include in model training. <strong>History length</strong> is the total amount of data about a user. Use <code>min_user_history_length_percentile</code> to exclude a percentage of users with short history lengths. Users with a short history often show patterns based on item popularity instead of the user’s personal needs or wants. Removing them can train models with more focus on underlying patterns in your data. Choose an appropriate value after you review user history lengths, using a histogram or similar tool. We recommend setting a value that retains the majority of users, but removes the edge cases. For example, setting <code>min_user_history_length_percentile</code> to 0.05 and <code>max_user_history_length_percentile</code> to 0.95 includes all users except those with history lengths at the bottom or top 5%.</td>
<td>0.0</td>
<td>[0.0, 1.0]</td>
<td>Float</td>
<td>No</td>
</tr>
<tr>
<td>max_user_history_length_percentile</td>
<td>The maximum percentile of user history lengths to include in model training. <strong>History length</strong> is the total amount of data about a user. Use <code>max_user_history_length_percentile</code> to exclude a percentage of users with long history lengths because data for these users tend to contain noise. For example, a robot might have a long list of automated interactions. Removing these users limits noise in training. Choose an appropriate value after you review user history lengths using a histogram or similar tool. We recommend setting a value that retains the majority of users but removes the edge cases. For example, setting <code>min_user_history_length_percentile</code> to 0.05 and <code>max_user_history_length_percentile</code> to 0.95 includes all users except those with history lengths at the bottom or top 5%.</td>
<td>0.99</td>
<td>[0.0, 1.0]</td>
<td>Float</td>
<td>No</td>
</tr>
</tbody>
</table>
HRNN Sample Notebooks

The following Jupyter notebooks show how to use the HRNN recipe:

- For a sample notebook that shows how to use HRNN with a hold-out set, see Amazon Personalize with temporal evaluation on hold-out set.
- For a sample notebook that shows how to use HRNN with the PutEvents API, see Using the put events API with Amazon Personalize.

HRNN-Metadata Recipe

The HRNN-Metadata recipe predicts the items that a user will interact with. It is similar to the HRNN (p. 52) recipe, with additional features derived from contextual, user, and item metadata (from Interactions, Users, and Items datasets, respectively). HRNN-Metadata provides accuracy benefits over non-metadata models when high quality metadata is available. Using this recipe might require longer training times.

The HRNN-Metadata recipe has the following properties:

- **Name** – aws-hrnn-metadata
- **Recipe Amazon Resource Name (ARN)** – arn:aws:personalize:::recipe/aws-hrnn-metadata
- **Algorithm ARN** – arn:aws:personalize:::algorithm/aws-hrnn-metadata
- **Feature transformation ARN** – arn:aws:personalize:::feature-transformation/featurize_metadata
- **Recipe type** – USER_PERSONALIZATION

The following table describes the hyperparameters for the HRNN-Metadata recipe. A hyperparameter is an algorithm parameter that you can adjust to improve model performance. Algorithm hyperparameters control how the model performs. Featurization hyperparameters control how to filter the data to use in training. The process of choosing the best value for a hyperparameter is called hyperparameter optimization (HPO). For more information, see Hyperparameters and HPO (p. 69).

The table also provides the following information for each hyperparameter:

- **Range**: [lower bound, upper bound]
- **Value type**: Integer, Continuous (float), Categorical (Boolean, list, string)
- **HPO tunable**: Can the parameter participate in hyperparameter optimization (HPO)?

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hidden_dimension</td>
<td>The number of hidden variables used in the model. <em>Hidden variables</em> recreate users' purchase history and item statistics to generate ranking scores. Specify a greater number of hidden dimensions when your Interactions dataset includes more complicated patterns. Using more hidden dimensions requires a larger dataset and more time to process. To decide on the optimal value, use HPO. To use HPO, set performHPO to true when you call CreateSolution (p. 128) and CreateSolutionVersion (p. 133) operations.</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>bptt</td>
<td>Determines whether to use the back-propagation through time technique. Back-propagation through time is a technique that updates weights in recurrent neural network-based algorithms. Use bptt for long-term credits to connect delayed rewards to early events. For example, a delayed reward can be a purchase made after several clicks. An early event can be an initial click. Even within the same event types, such as a click, it's a good idea to consider long-term effects and maximize the total rewards. To consider long-term effects, use larger bptt values. Using a larger bptt value requires larger datasets and more time to process.</td>
</tr>
<tr>
<td></td>
<td>Default value: 32</td>
</tr>
<tr>
<td></td>
<td>Range: [2, 32]</td>
</tr>
<tr>
<td></td>
<td>Value type: Integer</td>
</tr>
<tr>
<td></td>
<td>HPO tunable: Yes</td>
</tr>
<tr>
<td>recency_mask</td>
<td>Determines whether the model should consider the latest popularity trends in the Interactions dataset. Latest popularity trends might include sudden changes in the underlying patterns of interaction events. To train a model that places more weight on recent events, set recency_mask to true. To train a model that equally weighs all past interactions, set recency_mask to false. To get good recommendations using an equal weight, you might need a larger training dataset.</td>
</tr>
<tr>
<td></td>
<td>Default value: True</td>
</tr>
<tr>
<td></td>
<td>Range: True or False</td>
</tr>
<tr>
<td></td>
<td>Value type: Boolean</td>
</tr>
<tr>
<td></td>
<td>HPO tunable: Yes</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>min_user_history_length_percentile</td>
<td>The minimum percentile of user history lengths to include in model training. History length is the total amount of data about a user. Use min_user_history_length_percentile to exclude a percentage of users with short history lengths. Users with a short history often show patterns based on item popularity instead of the user's personal needs or wants. Removing them can train models with more focus on underlying patterns in your data. Choose an appropriate value after you review user history lengths, using a histogram or similar tool. We recommend setting a value that retains the majority of users, but removes the edge cases. For example, setting min_user_history_length_percentile to 0.05 and max_user_history_length_percentile to 0.95 includes all users except those with history lengths at the bottom or top 5%. Default value: 0.0 Range: [0.0, 1.0] Value type: Float HPO tunable: No</td>
</tr>
<tr>
<td>max_user_history_length_percentile</td>
<td>The maximum percentile of user history lengths to include in model training. History length is the total amount of data about a user. Use max_user_history_length_percentile to exclude a percentage of users with long history lengths because data for these users tend to contain noise. For example, a robot might have a long list of automated interactions. Removing these users limits noise in training. Choose an appropriate value after you review user history lengths using a histogram or similar tool. We recommend setting a value that retains the majority of users but removes the edge cases. For example, setting min_user_history_length_percentile to 0.05 and max_user_history_length_percentile to 0.95 includes all users except those with history lengths at the bottom or top 5%. Default value: 0.99 Range: [0.0, 1.0] Value type: Float HPO tunable: No</td>
</tr>
</tbody>
</table>
HRNN-Coldstart Recipe

Use the HRNN-Coldstart recipe to predict the items that a user will interact with when you frequently add new items and interactions and want to get recommendations for those items immediately. The HRNN-Coldstart recipe is similar to the HRNN-Metadata (p. 56) recipe, but it allows you to get recommendations for new items.

In addition, you can use the HRNN-Coldstart recipe when you want to exclude from training items that have a long list of interactions either because of a recent popularity trend or because the interactions might be highly unusual and introduce noise in training. With HRNN-Coldstart, you can filter out less relevant items to create a subset for training. The subset of items, called cold items, are items that have related interaction events in the Interactions dataset. An item is considered a cold item when it has the following:

- Fewer interactions than a specified number of maximum interactions. You specify this value in the recipe's cold_start_max_interactions hyperparameter.
- A shorter relative duration than the maximum duration. You specify this value in the recipe's cold_start_max_duration hyperparameter.

To reduce the number of cold items, set a lower value for cold_start_max_interactions or cold_start_max_duration. To increase the number of cold items, set a greater value for cold_start_max_interactions or cold_start_max_duration.

HRNN-Coldstart has the following cold item limits:

- Maximum cold start items: 80,000
- Minimum cold start items: 100

If the number of cold items is outside this range, attempts to create a solution will fail.

The HRNN-Coldstart recipe has the following properties:

- **Name** – aws-hrnn-coldstart
- **Recipe Amazon Resource Name (ARN)** – arn:aws:personalize:::recipe/aws-hrnn-coldstart
- **Algorithm ARN** – arn:aws:personalize:::algorithm/aws-hrnn-coldstart
- **Feature transformation ARN** – arn:aws:personalize:::feature-transformation/featurize_coldstart
- **Recipe type** – USER_PERSONALIZATION

For more information, see Using Predefined Recipes (p. 50).

The following table describes the hyperparameters for the HRNN-Coldstart recipe. A hyperparameter is an algorithm parameter that you can adjust to improve model performance. Algorithm hyperparameters control how the model performs. Featurization hyperparameters control how to filter the data to use in training. The process of choosing the best value for a hyperparameter is called hyperparameter optimization (HPO). For more information, see Hyperparameters and HPO (p. 69).

The table also provides the following information for each hyperparameter:

- **Range**: [lower bound, upper bound]
- **Value type**: Integer, Continuous (float), Categorical (Boolean, list, string)
- **HPO tunable**: Can the parameter participate in HPO?
### Algorithm Hyperparameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| hidden_dimension | The number of hidden variables used in the model. Hidden variables recreate users' purchase history and item statistics to generate ranking scores. Specify a greater number of hidden dimensions when your Interactions dataset includes more complicated patterns. Using more hidden dimensions requires a larger dataset and more time to process. To decide on the optimal value, use HPO. To use HPO, set `performHPO` to `true` when you call `CreateSolution (p. 128)` and `CreateSolutionVersion (p. 133)` operations. Default value: 149  
|               | Range: [32, 256]  
|               | Value type: Integer  
|               | HPO tunable: Yes  |
| bptt          | Determines whether to use the back-propagation through time technique. Back-propagation through time is a technique that updates weights in recurrent neural network-based algorithms. Use `bptt` for long-term credits to connect delayed rewards to early events. For example, a delayed reward can be a purchase made after several clicks. An early event can be an initial click. Even within the same event types, such as a click, it's a good idea to consider long-term effects and maximize the total rewards. To consider long-term effects, use larger `bptt` values. Using a larger `bptt` value requires larger datasets and more time to process. Default value: 32  
|               | Range: [2, 32]  
|               | Value type: Integer  
|               | HPO tunable: Yes  |
| recency_mask  | Determines whether the model should consider the latest popularity trends in the Interactions dataset. Latest popularity trends might include sudden changes in the underlying patterns of interaction events. To train a model that places more weight on recent events, set `recency_mask` to `true`. To train a model that equally weighs all past interactions, set `recency_mask` to `false`. To get good recommendations using an equal weight, you might need a larger training dataset. Default value: `True`  
|               | Range: `True` or `False`  
<p>|               | Value type: Boolean  |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HPO tunable: Yes</td>
</tr>
<tr>
<td>Featurization Hyperparameters</td>
<td></td>
</tr>
<tr>
<td>cold_start_max_interactions</td>
<td>The maximum number of user-item interactions an item can have to be considered a cold item.</td>
</tr>
<tr>
<td></td>
<td>Default value: 15</td>
</tr>
<tr>
<td></td>
<td>Range: Positive integers</td>
</tr>
<tr>
<td></td>
<td>Value type: Integer</td>
</tr>
<tr>
<td></td>
<td>HPO tunable: No</td>
</tr>
<tr>
<td>cold_start_max_duration</td>
<td>The maximum duration in days relative to the starting point for a user-item interaction to be considered a cold start item. To set the starting point of the user-item interaction, set the <code>cold_start_relative_from</code> hyperparameter.</td>
</tr>
<tr>
<td></td>
<td>Default value: 5.0</td>
</tr>
<tr>
<td></td>
<td>Range: Positive floats</td>
</tr>
<tr>
<td></td>
<td>Value type: Float</td>
</tr>
<tr>
<td></td>
<td>HPO tunable: No</td>
</tr>
<tr>
<td>cold_start_relative_from</td>
<td>Determines the starting point for the HRNN-Coldstart recipe to calculate cold_start_max_duration. To calculate from the current time, choose <code>currentTime</code>. To calculate cold_start_max_duration from the timestamp of the latest item in the Interactions dataset, choose <code>latestItem</code>. This setting is useful if you frequently add new items.</td>
</tr>
<tr>
<td></td>
<td>Default value: latestItem</td>
</tr>
<tr>
<td></td>
<td>Range: <code>currentTime</code>, <code>latestItem</code></td>
</tr>
<tr>
<td></td>
<td>Value type: String</td>
</tr>
<tr>
<td></td>
<td>HPO tunable: No</td>
</tr>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>min_user_history_length_percentile</td>
<td>The minimum percentile of user history lengths to include in model training. History length is the total amount of data about a user. Use min_user_history_length_percentile to exclude a percentage of users with short history lengths. Users with a short history often show patterns based on item popularity instead of the user’s personal needs or wants. Removing them can train models with more focus on underlying patterns in your data. Choose an appropriate value after you review user history lengths, using a histogram or similar tool. We recommend setting a value that retains the majority of users but removes the edge cases. For example, setting min_user_history_length_percentile to 0.05 and max_user_history_length_percentile to 0.95 includes all users except those with history lengths at the bottom or top 5%. Default value: 0.0 Range: [0.0, 1.0] Value type: Float HPO tunable: No</td>
</tr>
<tr>
<td>max_user_history_length_percentile</td>
<td>The maximum percentile of user history lengths to include in model training. History length is the total amount of data about a user. Use max_user_history_length_percentile to exclude a percentage of users with long history lengths because data for these users tend to contain noise. For example, a robot might have a long list of automated interactions. Removing these users limits noise in training. Choose an appropriate value after you review user history lengths using a histogram or similar tool. We recommend setting a value that retains the majority of users but removes the edge cases. For example, setting min_user_history_length_percentile to 0.05 and max_user_history_length_percentile to 0.95 includes all users except those with history lengths at the bottom or top 5%. Default value: 0.99 Range: [0.0, 1.0] Value type: Float HPO tunable: No</td>
</tr>
</tbody>
</table>
HRNN-Coldstart Sample Notebook

For a sample Jupyter notebook that shows how to use the HRNN-Coldstart recipe, see Amazon Personalize Coldstart Demo.

Popularity-Count Recipe

Popularity-count returns the top popular items from a dataset. A popular item is defined by the number of times it occurs in the dataset. The recipe returns the same popular items for all users. Popularity-count is a good starting point to compare against other recipes.

This predefined recipe has the following properties:

- **Name** – aws-popularity-count
- **Recipe ARN** – arn:aws:personalize:::recipe/aws-popularity-count
- **Algorithm ARN** – arn:aws:personalize:::algorithm/aws-popularity-count
- **Feature Transformation ARN** – arn:aws:personalize:::feature-transformation/sims
- **Recipe type** – USER_PERSONALIZATION

Popularity-count has no exposed hyperparameters.

Personalized-Ranking Recipe

The Personalized-Ranking recipe generates personalized rankings. A personalized ranking is a list of recommended items that are re-ranked for a specific user. This recipe has the following properties:

- **Name** – aws-personalized-ranking
- **Recipe ARN** – arn:aws:personalize:::recipe/aws-personalized-ranking
- **Algorithm ARN** – arn:aws:personalize:::algorithm/aws-personalized-ranking
- **Feature transformation ARN** – arn:aws:personalize:::feature-transformation/JSON-percentile-filtering
- **Recipe type** – PERSONALIZED_RANKING

The following table describes the hyperparameters for the Personalize-Ranking recipe. A hyperparameter is an algorithm parameter that you can adjust to improve model performance. Algorithm hyperparameters control how the model performs. Featurization hyperparameters control how to filter the data to use in training. The process of choosing the best value for a hyperparameter is called hyperparameter optimization (HPO). For more information, see Hyperparameters and HPO (p. 69).

The table also provides the following information for each hyperparameter:

- **Range**: [lower bound, upper bound]
- **Value type**: Integer, Continuous (float), Categorical (Boolean, list, string)
- **HPO tunable**: Can the parameter participate in hyperparameter optimization (HPO)?

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>statistics to generate ranking scores. Specify a greater number of hidden dimensions when your Interactions dataset includes more complicated patterns. Using more hidden dimensions requires a larger dataset and more time to process. To decide on the optimal value, use HPO. To use HPO, set performHPO to true when you call CreateSolution (p. 128) and CreateSolutionVersion (p. 133) operations. Default value: 149 Range: [32, 256] Value type: Integer HPO tunable: Yes</td>
</tr>
<tr>
<td>bptt</td>
<td>Determines whether to use the back-propagation through time technique. Back-propagation through time is a technique that updates weights in recurrent neural network-based algorithms. Use bptt for long-term credits to connect delayed rewards to early events. For example, a delayed reward can be a purchase made after several clicks. An early event can be an initial click. Even within the same event types, such as a click, it’s a good idea to consider long-term effects and maximize the total rewards. To consider long-term effects, use larger bptt values. Using a larger bptt value requires larger datasets and more time to process. Default value: 32 Range: [2, 32] Value type: Integer HPO tunable: Yes</td>
</tr>
<tr>
<td>recency_mask</td>
<td>Determines whether the model should consider the latest popularity trends in the Interactions dataset. Latest popularity trends might include sudden changes in the underlying patterns of interaction events. To train a model that places more weight on recent events, set recency_mask to true. To train a model that equally weighs all past interactions, set recency_mask to false. To get good recommendations using an equal weight, you might need a larger training dataset. Default value: True Range: True or False Value type: Boolean HPO tunable: Yes</td>
</tr>
</tbody>
</table>

**Featurization Hyperparameters**
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>min_user_history_length_percentile</code></td>
<td>The minimum percentile of user history lengths to include in model training. History length is the total amount of data about a user. Use <code>min_user_history_length_percentile</code> to exclude a percentage of users with short history lengths. Users with a short history often show patterns based on item popularity instead of the user's personal needs or wants. Removing them can train models with more focus on underlying patterns in your data. Choose an appropriate value after you review user history lengths, using a histogram or similar tool. We recommend setting a value that retains the majority of users, but removes the edge cases. For example, setting <code>min_user_history_length_percentile</code> to 0.05 and <code>max_user_history_length_percentile</code> to 0.95 includes all users except those with history lengths at the bottom or top 5%. Default value: 0.0 Range: [0.0, 1.0] Value type: Float HPO tunable: No</td>
</tr>
<tr>
<td><code>max_user_history_length_percentile</code></td>
<td>The maximum percentile of user history lengths to include in model training. History length is the total amount of data about a user. Use <code>max_user_history_length_percentile</code> to exclude a percentage of users with long history lengths because data for these users tend to contain noise. For example, a robot might have a long list of automated interactions. Removing these users limits noise in training. Choose an appropriate value after you review user history lengths using a histogram or similar tool. We recommend setting a value that retains the majority of users but removes the edge cases. For example, setting <code>min_user_history_length_percentile</code> to 0.05 and <code>max_user_history_length_percentile</code> to 0.95 includes all users except those with history lengths at the bottom or top 5%. Default value: 0.99 Range: [0.0, 1.0] Value type: Float HPO tunable: No</td>
</tr>
</tbody>
</table>
SIMS Recipe

The Item-to-item similarities (SIMS) recipe is based on the concept of collaborative filtering. A SIMS model leverages user-item interaction data to recommend items similar to a given item. In the absence of sufficient user behavior data for an item, this recipe recommends popular items.

This predefined recipe has the following properties:

- **Name** – aws-sims
- **Recipe Amazon Resource Name (ARN)** – arn:aws:personalize:::recipe/aws-sims
- **Algorithm ARN** – arn:aws:personalize:::algorithm/aws-sims
- **Feature transformation ARN** – arn:aws:personalize:::feature-transformation/sims
- **Recipe type** – RELATED_ITEMS

The following table describes the hyperparameters for the SIMS recipe. A hyperparameter is an algorithm parameter that you can adjust to improve model performance. Algorithm hyperparameters control how the model performs. Featurization hyperparameters control how to filter the data to use in training. The process of choosing the best value for a hyperparameter is called hyperparameter optimization (HPO). For more information, see Hyperparameters and HPO (p. 69).

The table also provides the following information for each hyperparameter:

- **Range**: [lower bound, upper bound]
- **Value type**: Integer, Continuous (float), Categorical (Boolean, list, string)
- **HPO tunable**: Can the parameter participate in hyperparameter optimization (HPO)?

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Algorithm Hyperparameters</strong></td>
<td></td>
</tr>
</tbody>
</table>
| popularity_discount_factor  | Affects the balance between popularity and correlation when you calculate similarity. If you calculate similarities to a specific item, a value of 0 makes the most popular items appear as recommendations regardless of their correlation. A value of 1 makes most items that have co-interactions (shared interaction) with the specific item appear as recommendations regardless of their popularity. Using either extreme might create an overly long list of recommend items. For most cases, a value around 0.5 works best.  
  Default value: 0.5  
  Range: [0.0, 1.0]  
  Value type: Float  
  HPO tunable: Yes |
<p>| min_cointeraction_count     | The minimum number of co-interactions you need to calculate the similarity between a pair of items. For example, a value of 3 means that you need three or more users who interacted with both items for the algorithm to calculate their similarity. |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Default value: 3</td>
</tr>
<tr>
<td></td>
<td>Range: [0, 10]</td>
</tr>
<tr>
<td></td>
<td>Value type: Integer</td>
</tr>
<tr>
<td></td>
<td>HPO tunable: Yes</td>
</tr>
</tbody>
</table>

**Featurization Hyperparameters**

**min_user_history_length_percentile**

The minimum percentile of user history lengths to include in model training. *History length* is the total amount of available data on a user. Use *min_user_history_length_percentile* to exclude a percentage of users with short history lengths. Users with a short history often show patterns based on item popularity instead of the user's personal needs or wants. Removing them can train models with more focus on underlying patterns in your data. Choose an appropriate value after you review user history lengths, using a histogram or similar tool. We recommend setting a value that retains the majority of users, but removes the edge cases.

Default value: 0.005

Range: [0.0, 1.0]

Value type: Float

HPO tunable: No

**max_user_history_length_percentile**

The maximum percentile of user history lengths to include in model training. *History length* is the total amount of available data on a user. Use *max_user_history_length_percentile* to exclude a percentage of users with long history lengths. Users with a long history tend to contain noise. For example, a robot might have a long list of automated interactions. Removing these users limits noise in training. Choose an appropriate value after you review user history lengths using a histogram or similar tool. We recommend setting a value that retains the majority of users but removes the edge cases.

For example, *min_hist_length_percentile = 0.05* and *max_hist_length_percentile = 0.95* includes all users except ones with history lengths at the bottom or top 5%.

Default value: 0.995

Range: [0.0, 1.0]

Value type: Float

HPO tunable: No
<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| **min_item_interaction_count_percentile**                 | The minimum percentile of item interaction counts to include in model training. Use min_item_interaction_count_percentile to exclude a percentage of items with a short history of interactions. Items with a short history often are new items. Removing them can train models with more focus on items with a known history. Choose an appropriate value after you review user history lengths, using a histogram or similar tool. We recommend setting a value that retains the majority of items, but removes the edge cases. Default value: 0.01  
Range: [0.0, 1.0]  
Value type: Float  
HPO tunable: No |
| **max_item_interaction_count_percentile**                 | The maximum percentile of item interaction counts to include in model training. Use max_item_interaction_count_percentile to exclude a percentage of items with a long history of interactions. Items with a long history tend to be older and might be out of date. For example, a movie release that is out of print. Removing these items can focus on more relevant items. Choose an appropriate value after you review user history lengths using a histogram or similar tool. We recommend setting a value that retains the majority of items but removes the edge cases. For example,  
min_item_interaction_count_percentile = 0.05 and  
max_item_interaction_count_percentile = 0.95 includes all items except ones with an interaction count at the bottom or top 5%. Default value: 0.9  
Range: [0.0, 1.0]  
Value type: Float  
HPO tunable: No |

**SIMS Sample Notebook**

For a sample Jupyter notebook that shows you how to use the SIMS recipe, see Finding Similar Items + HPO.
Overriding Default Recipe Parameters

A solution is created by calling the CreateSolution (p. 128) API. A condensed version of the CreateSolution request is shown, highlighting the solutionConfig object. You use solutionConfig to override the default parameters of a recipe. When performAutoML is true, all parameters of the solutionConfig object are ignored except for autoMLConfig. The sub-objects of solutionConfig are discussed in the following sections.

```json
{
    "name": "string",
    "performAutoML": boolean,
    "recipeArn": "string",
    "performHPO": boolean,
    "eventType": "string",
    "solutionConfig": {
        "autoMLConfig": {
            "metricName": "string",
            "recipeList": [ "string" ]
        },
        "eventValueThreshold": "string",
        "featureTransformationParameters": {
            "string": "string"
        },
        "algorithmHyperParameters": {
            "string": "string"
        },
        "hpoConfig": {
            "algorithmHyperParameterRanges": {
                ...
            },
            "hpoObjective": {
                "metricName": "string",
                "metricRegex": "string",
                "type": "string"
            },
            "hpoResourceConfig": {
                "maxNumberOfTrainingJobs": "string",
                "maxParallelTrainingJobs": "string"
            }
        }
    }
}
```

Topics

- Hyperparameters and HPO (p. 69)

Hyperparameters and HPO

Hyperparameters are used to optimize the trained model and are set before training begins. This contrasts with model parameters whose values are determined during the training process.

Hyperparameters are specified using the algorithmHyperParameters key that is part of the SolutionConfig (p. 274) object that is passed to the CreateSolution (p. 128) operation.

Different recipes use different hyperparameters. For the available hyperparameters, see the individual recipes in Using Predefined Recipes (p. 50).

Hyperparameter optimization (HPO), or tuning, is the task of choosing optimal hyperparameters for a specific learning objective. The optimal hyperparameters are determined by running many training jobs.
using different values from the specified ranges of possibilities. By default, Amazon Personalize does not perform HPO. To use HPO, set `performHPO` to `true`, and include the `hpoConfig` object.

Hyperparameters can be categorical, continuous, or integer-valued. The `hpoConfig` object has keys that correspond to each of these types, where you specify the hyperparameters and their ranges. Note that not all hyperparameters can be tuned (see the recipe tables).

The following is a partial example of a `CreateSolution` request using the HRNN (p. 52) recipe.

```json
{
    "performAutoML": false,
    "recipeArn": "arn:aws:personalize:::recipe/aws-hrnn",
    "performHPO": true,
    "solutionConfig": {
        "algorithmHyperParameters": {
            "hidden_dimension": "55"
        },
        "hpoConfig": {
            "algorithmHyperParameterRanges": {
                "categoricalHyperParameterRanges": [
                    {
                        "name": "recency_mask",
                        "values": [ "true", "false" ]
                    }
                ],
                "integerHyperParameterRanges": [
                    {
                        "name": "bptt",
                        "minValue": 20,
                        "maxValue": 40
                    }
                ]
            },
            "hpoObjective": {
                "metricName": "precision_at_25",
                "metricRegex": "string",
                "type": "Maximize"
            },
            "hpoResourceConfig": {
                "maxNumberOfTrainingJobs": "4",
                "maxParallelTrainingJobs": "2"
            }
        }
    }
}
```

Once training is complete, you can view the hyperparameters of the best performing model by calling the section called “DescribeSolutionVersion” (p. 171) operation. The following sample shows a condensed `DescribeSolutionVersion` output with the optimized hyperparameters displayed in the `tunedHPOParams` object.

```json
{
    "solutionVersion":{
        "creationDateTime":1562191944.745,
        "lastUpdatedDateTime":1562194465.075,
        "performAutoML":false,
        "performHPO":true,
        "recipeArn":"arn:aws:personalize:::recipe/aws-hrnn",
        "status":"ACTIVE",
```
"tunedHPOParams": {
  "algorithmHyperParameters": {
    "hidden_dimension": "58",
    "recency_mask": "false"
  }
}

For more information, see Automatic Model Tuning.
Evaluating a Solution Version

Amazon Personalize generates a number of metrics when it creates a solution version. These metrics allow you to evaluate the performance of the solution version before you create a campaign and provide recommendations. Metrics allow you to view the effects of modifying a solution's hyperparameters. You can also compare the metrics between solutions that use the same training data but created with different recipes.

To get performance metrics, Amazon Personalize splits the input interactions data by randomly selecting 90% of users and their related interactions as training data and the other 10% as testing data. The solution version is then created using the training data. Afterwards, the solution version is given the oldest 90% of each user's testing data as input, and the recommendations it generates are compared against the real interactions given by the most recent 10% of testing data.

For user-personalization, it's recommended to run multiple recipes on your data to determine the optimal solution. As a baseline, run the Popularity-Count (p. 63) recipe, which recommends the top K most popular items.

Important
In order for Amazon Personalize to generate solution version metrics, you must have at least 10 datapoints in your input dataset group.

Metrics

You retrieve the metrics for a specific solution version by calling the GetSolutionMetrics (p. 174) operation.

Retrieve metrics using the AWS Python SDK

1. Create a solution version. For more information, see Creating a Solution (p. 48).
2. Use the following code to retrieve metrics.

```python
import boto3
personalize = boto3.client('personalize')
response = personalize.get_solution_metrics(
    solutionVersionArn = 'solution version arn')
print(response['metrics'])
```

The following is an example of the output from a solution version created using the HRNN (p. 52) recipe with the default solution configuration.

```json
{
    "metrics": {
        "coverage": 0.27,
        "mean_reciprocal_rank_at_25": 0.0379,
        "normalized_discounted_cumulative_gain_at_5": 0.0405,
    }
}
```
"normalized_discounted_cumulative_gain_at_10": 0.0513,
"normalized_discounted_cumulative_gain_at_25": 0.0828,
"precision_at_5": 0.0136,
"precision_at_10": 0.0102,
"precision_at_25": 0.0091
}

The above metrics are described below using the following terms:

- **Relevant recommendation** refers to a recommendation that matches a value in the testing data for the particular user.
- **Rank** refers to the position of a recommended item in the list of recommendations. Position 1 (the top of the list) is presumed to be the most relevant to the user.
- **Query** refers to the internal equivalent of a GetRecommendations (p. 210) call.

For each metric, higher numbers are better.

**coverage**

The proportion of unique recommended items from all queries out of the total number of unique items in the training data (includes both the Items and Interactions datasets).

**mean_reciprocal_rank_at_25**

The mean of the reciprocal ranks of the first relevant recommendation out of the top 25 recommendations over all queries.

This metric is appropriate if you're interested in the single highest ranked recommendation.

**normalized_discounted_cumulative_gain_at_K**

Discounted gain assumes that recommendations lower on a list of recommendations are less relevant than higher recommendations. Therefore, each recommendation is discounted (given a lower weight) by a factor dependent on its position. To produce the cumulative discounted gain (DCG) at K, each relevant discounted recommendation in the top K recommendations is summed together. The normalized discounted cumulative gain (NDCG) is the DCG divided by the ideal DCG such that NDCG is between 0 - 1. (The ideal DCG is where the top K recommendations are sorted by relevance.)

Amazon Personalize uses a weighting factor of \( \frac{1}{\log(1 + \text{position})} \), where the top of the list is position 1.

This metric rewards relevant items that appear near the top of the list, because the top of a list usually draws more attention.

**precision_at_K**

The number of relevant recommendations out of the top K recommendations divided by K.

This metric rewards precise recommendation of the relevant items.

**Example**

The following is a simple example where, to generate metrics, a solution version produces a list of recommendations for a specific user. The second and fifth recommendations match records in the testing data for this user. These are the relevant recommendations. If \( K \) is set at 5, the following metrics are generated for the user.
reciprocal_rank

Calculation: 1/2

Result: 0.5000

normalized_discounted_cumulative_gain_at_5

Calculation: \(\frac{1/\log(1 + 2) + 1/\log(1 + 5)}{1/\log(1 + 1) + 1/\log(1 + 2)}\)

Result: 0.6241

precision_at_5

Calculation: 2/5

Result: 0.4000

Now that you have evaluated your solution version, create a campaign by deploying the optimum solution version. For more information, see Creating a Campaign (p. 75).

More Info

For a sample Jupyter notebook that shows you how to retrieve metrics based on hold-out data, see Personalize with Temporal Evaluation on Hold-Out Set.
Creating a Campaign

A campaign is used to make recommendations for your users. You create a campaign by deploying a solution version. For an example using the AWS CLI, see Step 3: Create a Campaign (Deploy the Solution) (p. 28).

To create a campaign with the SDK, call the CreateCampaign (p. 111) API and pass the following:

- A name for the campaign.
- The Amazon Resource Name (ARN) of the solution version to deploy.
- The minimum provisioned transactions per second (minProvisionedTPS) that Amazon Personalize will support. For more information on minProvisionedTPS, see the CreateCampaign API.

Create a campaign using the AWS Python SDK

1. Create a solution version to deploy. For more information, see Creating a Solution (p. 48).
2. Use the following code to create a campaign.

   ```python
   import boto3
   personalize = boto3.client('personalize')
   response = personalize.create_campaign(
       name = 'campaign name',
       solutionVersionArn = 'solution version arn',
       minProvisionedTPS = 10)
   arn = response['campaignArn']
   description = personalize.describe_campaign(campaignArn = arn)[
       'campaign'
   ]
   print('Name: ' + description['name'])
   print('ARN: ' + description['campaignArn'])
   print('Status: ' + description['status'])
   ```

   The campaign isn't ready for use until its status is active. To get the current status, call DescribeCampaign (p. 152) and check that the status field is ACTIVE.

   Amazon Personalize provides operations for managing campaigns such as ListCampaigns (p. 179) to list the campaigns you have created. You can delete a campaign by calling DeleteCampaign (p. 136). If you delete a campaign, the solution versions that are part of the campaign are not deleted.

   After you have created your campaign, use it to make recommendations. For more information, see Getting Recommendations (p. 76).
Getting Recommendations

After you have created a campaign, you can use it in your applications to get recommendations. The following topics explain how and when to use each recommendation type.

Topics
- How Recommendation Scoring Works (p. 76)
- Getting Real-Time Recommendations (p. 76)
- Getting Batch Recommendations (p. 79)

How Recommendation Scoring Works

To make recommendations, Amazon Personalize generates scores for the items in your Items dataset based on a user's interaction data and metadata. These scores represent the relative certainty that Amazon Personalize has in which item the user will select next. Higher scores represent greater certainty.

The formulas that calculate scores depend on the recommendation use case and the recipe that was used to train the model. You can view item scores in the Amazon Personalize console or by using the Amazon Personalize Runtime APIs. For more information on how scores are calculated and what they mean, see Getting Real-Time Recommendations (p. 76) and Getting Batch Recommendations (p. 79).

Getting Real-Time Recommendations

You can get real-time recommendations from Amazon Personalize with a campaign. For example, suppose you have a campaign that is designed to give movie recommendations. You can use the following operations to give real-time movie recommendations to users signed into your application or website. For an example using the AWS CLI, see Step 4: Get Recommendations (p. 29).

Topics
- GetRecommendations (p. 76)
- GetPersonalizedRanking (p. 77)

GetRecommendations

To get recommendations, call the GetRecommendations (p. 210) API. Supply either the user ID or item ID, dependent on the recipe type used to create the solution the campaign is based on.

To get contextual recommendations, you can also include contextual metadata on your user. For instance, you might include information on the user's current location or device (desktop, mobile, tablet) so that Amazon Personalize can get recommendations based on that user's previous situational behavior. Any metadata context fields must be included in the schema of the campaign's user-item interaction dataset.

Note
The solution backing the campaign must have been created using a recipe of type USER_PERSONALIZATION or RELATED_ITEMS. For more information, see Using Predefined Recipes (p. 50).

How Scoring Works

Models that are based on USER_PERSONALIZATION recipes score all of the items in your Items dataset relative to each other on a scale from 0 to 1 (both inclusive), so that the total of all scores equals 1. For
example, if you're getting movie recommendations for a user and there are three movies in the Items
dataset, their scores might be .6, .3, and .1. Similarly, if you have 1,000 movies in your inventory, the
highest-scoring movies might have very small scores (the average score would be .001), but, because
scoring is relative, the recommendations are still valid.

In mathematical terms, scores for each user-item pair \((u, i)\) are computed according to the following
formula, where “exp” is the exponential function, \(\overline{w}_u\) and \(w_i\) are user and item embeddings respectively,
and the Greek letter sigma (\(\sum\)) represents summation over all items in the item dataset:

\[
\text{score}(u, i) = \frac{\exp(\overline{w}_u \cdot w_i)}{\sum_j \exp(\overline{w}_u \cdot w_j)}
\]

**Note**
Scores aren’t shown for SIMS or Popularity-Count-based models.

### Get Recommendations Using the AWS Python SDK

Use the following code to get a recommendation. Change the value of `userId` to a user ID that is in the
data that you used to train the solution. A list of recommended items for the user is displayed.

```python
import boto3

personalizeRt = boto3.client('personalize-runtime')

response = personalizeRt.get_recommendations(
    campaignArn = 'Campaign ARN',
    userId = 'User ID'
)

print("Recommended items")
for item in response['itemList']:
    print (item['itemId'])
```

Use the following code to get a recommendation based on contextual metadata. Change the value of
the `context` key-value pair to that of a metadata field that is in your training data. A list of recommended
items for the user is displayed.

```python
import boto3

personalizeRt = boto3.client('personalize-runtime')

response = personalizeRt.get_recommendations(
    campaignArn = 'Campaign ARN',
    userId = 'User ID',
    context = {
        'key': 'value'
    }
)

print("Recommended items")
for item in response['itemList']:
    print (item['itemId'])
```

### GetPersonalizedRanking

A personalized ranking is a list of recommended items that are re-ranked for a specific user. To get
personalized rankings, call the GetPersonalizedRanking (p. 207) API.
Note
The solution backing the campaign must have been created using a recipe of type PERSONALIZED_RANKING. For more information, see Using Predefined Recipes (p. 50).

How Scoring Works

Like the scores returned by the GetRecommendations operation, GetPersonalizedRanking scores sum to 1, but because the list of considered items is much smaller than your full Items dataset, recommendation scores tend to be higher.

Mathematically, the scoring function for GetPersonalizedRanking is identical to GetRecommendations, except that it only considers the input items. This means that scores closer to 1 become more likely, as there are fewer other choices to divide up the score:

$$\text{score}(u, i) = \frac{\exp(\mathbf{w}^T_u \mathbf{w}_i)}{\sum_{j \in \text{input}} \exp(\mathbf{w}^T_u \mathbf{w}_j)}$$

Get Personalized Rankings Using the AWS Python SDK

Use the following code to get a personalized ranking. Change the value of userId and inputList to a user ID and list of item IDs that are in the data that you used to train the solution. A list of ranked recommendations is displayed. Amazon Personalize considers the first item in the list of most interest to the user.

```python
import boto3
personalizeRt = boto3.client('personalize-runtime')
response = personalizeRt.get_personalized_ranking(
    campaignArn = "Campaign arn",
    userId = "UserID",
    inputList = ['ItemID1', 'ItemID2'])
print("Personalized Ranking")
for item in response['personalizedRanking']:
    print(item['itemId'])
```

Use the following code to get a personalized ranking based on contextual metadata. Change the value of the context key-value pair to that of a metadata field that is in your training data. Amazon Personalize considers the first item in the list of most interest to the user.

```python
import boto3
personalizeRt = boto3.client('personalize-runtime')
response = personalizeRt.get_personalized_ranking(
    campaignArn = "Campaign arn",
    userId = "UserID",
    inputList = ['ItemID1', 'ItemID2'],
    context = {
        'key': 'value'
    })
print("Personalized Ranking")
for item in response['personalizedRanking']:
    print(item['itemId'])
```
Getting Batch Recommendations

Use an asynchronous batch workflow to get recommendations from large datasets that do not require real-time updates. For instance, you might create a batch inference job to get product recommendations for all users on an email list, or to get item-to-item similarities (SIMS) across an inventory. To get batch recommendations, you can create a batch inference job by calling CreateBatchInferenceJob.

The CreateBatchInferenceJob uses a chosen solution version to make recommendations based on data provided in an input JSON file. The result is then returned as a JSON file to an Amazon S3 bucket. The following tab list contains correctly formatted JSON input and output excerpts for each recipe type.

How scoring works

Item scores calculated by batch recommendation jobs are calculated the same ways as described in Getting Real-Time Recommendations, and can be viewed in the batch job's output JSON file. Scores are only returned by models trained with the HRNN and Personalize-Ranking recipes.

HRNN

Input

```json
{ "userId": "4638" },
{ "userId": "663" },
{ "userId": "3384" },
...
```

Output

```json
{ "input":{ "userId": "4638" },
"output": { "recommendedItems": ["296", "1", "260", "318"]},
"scores": [0.0009785, 0.000976, 0.0008851] }}
{ "input":{ "userId": "663" },
"output": { "recommendedItems": ["1393", "3793", "2701", "3826"]},
"scores": [0.00008149, 0.00007025, 0.000652] }}
{ "input":{ "userId": "3384" },
"output": { "recommendedItems": ["8368", "5989", "40815", "48780"]},
"scores": [0.003015, 0.00154, 0.00142] }}
...
```

Popularity-Count

Input

```json
{}
{ "itemId": "105" },
{ "itemId": "41" },
...
```

Output

```json
{ "input": {},
"output": { "recommendedItems": ["105", "106", "441"] }}
{ "input": { "itemId": "105" },
"output": { "recommendedItems": ["105", "106", "441"] }}
{ "input": { "itemId": "41" },
"output": { "recommendedItems": ["105", "106", "441"] }}
...
```

Personalize-Ranking

79
In order to get batch recommendations, the IAM user role that invokes the CreateBatchInferenceJob (p. 108) operation must have read and write permissions to your input and output Amazon S3 buckets respectively. For more information on bucket permissions, see User Policy Examples in the Amazon Simple Storage Service (S3) Developer Guide.

You can perform batch inference operations with any of the following tools:

- Amazon Personalize console (p. 80)
- AWS CLI (p. 81)
- AWS SDK (p. 82)

**Getting Batch Recommendations (Amazon Personalize Console)**

The following procedure outlines the batch inference workflow using the Amazon Personalize console. This procedure assumes that you have already created a solution that is properly formatted to perform the desired batch job on your dataset.

1. Open the Amazon Personalize console at [https://console.aws.amazon.com/personalize/home](https://console.aws.amazon.com/personalize/home) and sign in to your account.
2. Choose Batch inference jobs in the navigation pane, then choose Create batch inference job.

3. In Batch inference job details, in Batch inference job name, specify a name for your batch inference job.

4. For IAM service role, choose the Amazon Personalize IAM service role that has read and write access to your input and output Amazon S3 buckets respectively.

5. For Solution, choose the solution that you want to use to generate the recommendations The solution recipe must match the input data's format.

6. In Input data configuration, specify the Amazon S3 path to your input file. In Output data configuration, specify the path to your output Amazon S3 bucket.


Your screen should look similar to the following:

![Batch inference job creation screen](image)

**Note**
Creating a batch inference job takes time.

8. When the batch inference job’s status changes to Active, you can retrieve the job’s output from the designated output Amazon S3 bucket. The output file’s name will be of the format input-name.out.

### Getting Batch Recommendations (AWS CLI)

The following is an example of a batch inference workflow using the AWS CLI. A JSON file called batch.json is passed as input, and the output file, batch.json.out, is returned to an Amazon S3 bucket.

```bash
aws personalize create-batch-inference-job --job-name batchTest \
  --job-input s3DataSource={path=s3://personalize/batch/input/input.json} \
  --job-output s3DataDestination={path=s3://personalize/batch/output/} \
  --role-arn arn:aws:iam::012345678901:role/import-export-role
```

```json
{
}
Once a batch inference job is created, you can inspect it further with the DescribeBatchInferenceJob (p. 150) operation.

```bash
```

```json
{
   "jobName": "batchTest",
   "jobInput": {
      "s3DataSource": {
         "path": "s3://personalize/batch/input/batch.json"
      }
   },
   "jobOutput": {
      "s3DataDestination": {
         "path": "s3://personalize/batch/output/
      }
   },
   "roleArn": "arn:aws:iam::012345678901:role/import-export-role",
   "status": "ACTIVE",
   "creationDateTime": 1542392161.837,
   "lastUpdateDateTime": 1542393013.377
}
```

**Getting Batch Recommendations (AWS Python SDK)**

Use the following code to get batch recommendations using the AWS Python SDK. The operation reads an input JSON file from an Amazon S3 bucket and places an output JSON file (`input-file-name.out`) in an Amazon S3 bucket.

The first item in the response file is considered by Amazon Personalize to be of most interest to the user.

```python
import boto3
personalize_rec = boto3.client(service_name='personalize')

personalize_rec.create_batch_inference_job (  
  solutionVersionArn = "Solution version ARN",
  jobName = "Batch job name",
  roleArn = "IAM role ARN",
  jobInput =  
    "{s3DataSource": {"path": S3 input path}},
    jobOutput =  
    "{s3DataDestination": {"path":S3 output path}}"
)
```

The command returns the ARN for the batch job (the `batchRecommendationsJobArn`).

Processing the batch job might take a while to complete. You can check a job's status by calling DescribeBatchInferenceJob (p. 150) and passing a `batchRecommendationsJobArn` as the input parameter. You can also list all Amazon Personalize batch inference jobs in your AWS environment by calling ListBatchInferenceJobs (p. 176).
Security in Amazon Personalize

Cloud security at AWS is the highest priority. As an AWS customer, you benefit from a data center and network architecture that is built to meet the requirements of the most security-sensitive organizations.

Security is a shared responsibility between AWS and you. The shared responsibility model describes this as security of the cloud and security in the cloud:

- **Security of the cloud** – AWS is responsible for protecting the infrastructure that runs AWS services in the AWS Cloud. AWS also provides you with services that you can use securely. Third-party auditors regularly test and verify the effectiveness of our security as part of the AWS Compliance Programs. To learn about the compliance programs that apply to Amazon Personalize, see AWS Services in Scope by Compliance Program.
- **Security in the cloud** – Your responsibility is determined by the AWS service that you use. You are also responsible for other factors including the sensitivity of your data, your company's requirements, and applicable laws and regulations.

This documentation helps you understand how to apply the shared responsibility model when using Amazon Personalize. The following topics show you how to configure Amazon Personalize to meet your security and compliance objectives. You also learn how to use other AWS services that help you to monitor and secure your Amazon Personalize resources.

**Topics**
- Data Protection in Amazon Personalize (p. 83)
- Identity and Access Management for Amazon Personalize (p. 84)
- Logging and Monitoring in Amazon Personalize (p. 95)
- Compliance Validation for Amazon Personalize (p. 101)
- Resilience in Amazon Personalize (p. 102)
- Infrastructure Security in Amazon Personalize (p. 102)

Data Protection in Amazon Personalize

Amazon Personalize conforms to the AWS shared responsibility model, which includes regulations and guidelines for data protection. AWS is responsible for protecting the global infrastructure that runs all the AWS services. AWS maintains control over data hosted on this infrastructure, including the security configuration controls for handling customer content and personal data. AWS customers and APN partners, acting either as data controllers or data processors, are responsible for any personal data that they put in the AWS Cloud.

For data protection purposes, we recommend that you protect AWS account credentials and set up individual user accounts with AWS Identity and Access Management (IAM), so that each user is given only the permissions necessary to fulfill their job duties. We also recommend that you secure your data in the following ways:

- Use multi-factor authentication (MFA) with each account.
- Use SSL/TLS to communicate with AWS resources.
- Set up API and user activity logging with AWS CloudTrail.
- Use AWS encryption solutions, along with all default security controls within AWS services.
- Use advanced managed security services such as Amazon Macie, which assists in discovering and securing personal data that is stored in Amazon Simple Storage Service (Amazon S3).
We strongly recommend that you never put sensitive identifying information, such as your customers' account numbers, into free-form fields such as a Name field. This includes when you work with Amazon Personalize or other AWS services using the console, API, AWS CLI, or AWS SDKs. Any data that you enter into Amazon Personalize or other services might get picked up for inclusion in diagnostic logs. When you provide a URL to an external server, don't include credentials information in the URL to validate your request to that server.

For more information about data protection, see the AWS Shared Responsibility Model and GDPR blog post on the AWS Security Blog.

**Encryption at Rest**

Amazon Personalize uses the default Amazon S3 key (SSE-S3) for server-side encryption of Amazon Personalize data placed in your S3 buckets. You can also use one of your own AWS Key Management Service (AWS KMS) keys.

**Encryption in Transit**

By default, Amazon Personalize uses TLS 1.2 with AWS certificates to encrypt data in transit.

**Key Management**

The default Amazon S3 key is managed by AWS. It is the responsibility of the customer to manage any customer-provided AWS Key Management Service (AWS KMS) keys.

---

**Identity and Access Management for Amazon Personalize**

AWS Identity and Access Management (IAM) is an AWS service that helps an administrator securely control access to AWS resources. IAM administrators control who can be authenticated (signed in) and authorized (have permissions) to use Amazon Personalize resources. IAM is an AWS service that you can use with no additional charge.

**Topics**

- Audience (p. 84)
- Authenticating With Identities (p. 85)
- Managing Access Using Policies (p. 86)
- How Amazon Personalize Works with IAM (p. 88)
- Amazon Personalize Identity-Based Policy Examples (p. 90)
- Troubleshooting Amazon Personalize Identity and Access (p. 93)

**Audience**

How you use AWS Identity and Access Management (IAM) differs, depending on the work you do in Amazon Personalize.

**Service user** – If you use the Amazon Personalize service to do your job, then your administrator provides you with the credentials and permissions that you need. As you use more Amazon Personalize features to do your work, you might need additional permissions. Understanding how access is managed can help you request the right permissions from your administrator. If you cannot access a feature in Amazon Personalize, see Troubleshooting Amazon Personalize Identity and Access (p. 93).
Service administrator – If you're in charge of Amazon Personalize resources at your company, you probably have full access to Amazon Personalize. It's your job to determine which Amazon Personalize features and resources your employees should access. You must then submit requests to your IAM administrator to change the permissions of your service users. Review the information on this page to understand the basic concepts of IAM. To learn more about how your company can use IAM with Amazon Personalize, see How Amazon Personalize Works with IAM (p. 88).

IAM administrator – If you're an IAM administrator, you might want to learn details about how you can write policies to manage access to Amazon Personalize. To view example Amazon Personalize identity-based policies that you can use in IAM, see Amazon Personalize Identity-Based Policy Examples (p. 90).

Authenticating With Identities

Authentication is how you sign in to AWS using your identity credentials. For more information about signing in using the AWS Management Console, see The IAM Console and Sign-in Page in the IAM User Guide.

You must be authenticated (signed in to AWS) as the AWS account root user, an IAM user, or by assuming an IAM role. You can also use your company's single sign-on authentication, or even sign in using Google or Facebook. In these cases, your administrator previously set up identity federation using IAM roles. When you access AWS using credentials from another company, you are assuming a role indirectly.

To sign in directly to the AWS Management Console, use your password with your root user email or your IAM user name. You can access AWS programmatically using your root user or IAM user access keys. AWS provides SDK and command line tools to cryptographically sign your request using your credentials. If you don’t use AWS tools, you must sign the request yourself. Do this using Signature Version 4, a protocol for authenticating inbound API requests. For more information about authenticating requests, see Signature Version 4 Signing Process in the AWS General Reference.

Regardless of the authentication method that you use, you might also be required to provide additional security information. For example, AWS recommends that you use multi-factor authentication (MFA) to increase the security of your account. To learn more, see Using Multi-Factor Authentication (MFA) in AWS in the IAM User Guide.

AWS Account Root User

When you first create an AWS account, you begin with a single sign-in identity that has complete access to all AWS services and resources in the account. This identity is called the AWS account root user and is accessed by signing in with the email address and password that you used to create the account. We strongly recommend that you do not use the root user for your everyday tasks, even the administrative ones. Instead, adhere to the best practice of using the root user only to create your first IAM user. Then securely lock away the root user credentials and use them to perform only a few account and service management tasks.

IAM Users and Groups

An IAM user is an identity within your AWS account that has specific permissions for a single person or application. An IAM user can have long-term credentials such as a user name and password or a set of access keys. To learn how to generate access keys, see Managing Access Keys for IAM Users in the IAM User Guide. When you generate access keys for an IAM user, make sure you view and securely save the key pair. You cannot recover the secret access key in the future. Instead, you must generate a new access key pair.

An IAM group is an identity that specifies a collection of IAM users. You can't sign in as a group. You can use groups to specify permissions for multiple users at a time. Groups make permissions easier to
manage for large sets of users. For example, you could have a group named `IAMAdmins` and give that group permissions to administer IAM resources.

Users are different from roles. A user is uniquely associated with one person or application, but a role is intended to be assumable by anyone who needs it. Users have permanent long-term credentials, but roles provide temporary credentials. To learn more, see When to Create an IAM User (Instead of a Role) in the `IAM User Guide`.

### IAM Roles

An IAM role is an identity within your AWS account that has specific permissions. It is similar to an IAM user, but is not associated with a specific person. You can temporarily assume an IAM role in the AWS Management Console by switching roles. You can assume a role by calling an AWS CLI or AWS API operation or by using a custom URL. For more information about methods for using roles, see Using IAM Roles in the `IAM User Guide`.

IAM roles with temporary credentials are useful in the following situations:

- **Temporary IAM user permissions** – An IAM user can assume an IAM role to temporarily take on different permissions for a specific task.
- **Federated user access** – Instead of creating an IAM user, you can use existing identities from AWS Directory Service, your enterprise user directory, or a web identity provider. These are known as federated users. AWS assigns a role to a federated user when access is requested through an identity provider. For more information about federated users, see Federated Users and Roles in the `IAM User Guide`.
- **Cross-account access** – You can use an IAM role to allow someone (a trusted principal) in a different account to access resources in your account. Roles are the primary way to grant cross-account access. However, with some AWS services, you can attach a policy directly to a resource (instead of using a role as a proxy). To learn the difference between roles and resource-based policies for cross-account access, see How IAM Roles Differ from Resource-based Policies in the `IAM User Guide`.
- **AWS service access** – A service role is an IAM role that a service assumes to perform actions in your account on your behalf. When you set up some AWS service environments, you must define a role for the service to assume. This service role must include all the permissions that are required for the service to access the AWS resources that it needs. Service roles vary from service to service, but many allow you to choose your permissions as long as you meet the documented requirements for that service. Service roles provide access only within your account and cannot be used to grant access to services in other accounts. You can create, modify, and delete a service role from within IAM. For example, you can create a role that allows Amazon Redshift to access an Amazon S3 bucket on your behalf and then load data from that bucket into an Amazon Redshift cluster. For more information, see Creating a Role to Delegate Permissions to an AWS Service in the `IAM User Guide`.
- **Applications running on Amazon EC2** – You can use an IAM role to manage temporary credentials for applications that are running on an EC2 instance and making AWS CLI or AWS API requests. This is preferable to storing access keys within the EC2 instance. To assign an AWS role to an EC2 instance and make it available to all of its applications, you create an instance profile that is attached to the instance. An instance profile contains the role and enables programs that are running on the EC2 instance to get temporary credentials. For more information, see Using an IAM Role to Grant Permissions to Applications Running on Amazon EC2 Instances in the `IAM User Guide`.

To learn whether to use IAM roles, see When to Create an IAM Role (Instead of a User) in the `IAM User Guide`.

### Managing Access Using Policies

You control access in AWS by creating policies and attaching them to IAM identities or AWS resources. A policy is an object in AWS that, when associated with an identity or resource, defines their permissions. AWS evaluates these policies when an entity (root user, IAM user, or IAM role) makes a request.
Permissions in the policies determine whether the request is allowed or denied. Most policies are stored in AWS as JSON documents. For more information about the structure and contents of JSON policy documents, see Overview of JSON Policies in the IAM User Guide.

An IAM administrator can use policies to specify who has access to AWS resources, and what actions they can perform on those resources. Every IAM entity (user or role) starts with no permissions. In other words, by default, users can do nothing, not even change their own password. To give a user permission to do something, an administrator must attach a permissions policy to a user. Or the administrator can add the user to a group that has the intended permissions. When an administrator gives permissions to a group, all users in that group are granted those permissions.

IAM policies define permissions for an action regardless of the method that you use to perform the operation. For example, suppose that you have a policy that allows the `iam:GetRole` action. A user with that policy can get role information from the AWS Management Console, the AWS CLI, or the AWS API.

### Identity-Based Policies

Identity-based policies are JSON permissions policy documents that you can attach to an identity, such as an IAM user, role, or group. These policies control what actions that identity can perform, on which resources, and under what conditions. To learn how to create an identity-based policy, see Creating IAM Policies in the IAM User Guide.

Identity-based policies can be further categorized as inline policies or managed policies. Inline policies are embedded directly into a single user, group, or role. Managed policies are standalone policies that you can attach to multiple users, groups, and roles in your AWS account. Managed policies include AWS managed policies and customer managed policies. To learn how to choose between a managed policy or an inline policy, see Choosing Between Managed Policies and Inline Policies in the IAM User Guide.

### Resource-Based Policies

Resource-based policies are JSON policy documents that you attach to a resource such as an Amazon S3 bucket. Service administrators can use these policies to define what actions a specified principal (account member, user, or role) can perform on that resource and under what conditions. Resource-based policies are inline policies. There are no managed resource-based policies.

### Access Control Lists (ACLs)

Access control lists (ACLs) are a type of policy that controls which principals (account members, users, or roles) have permissions to access a resource. ACLs are similar to resource-based policies, although they do not use the JSON policy document format. Amazon S3, AWS WAF, and Amazon VPC are examples of services that support ACLs. To learn more about ACLs, see Access Control List (ACL) Overview in the Amazon Simple Storage Service Developer Guide.

### Other Policy Types

AWS supports additional, less-common policy types. These policy types can set the maximum permissions granted to you by the more common policy types.

- **Permissions boundaries** – A permissions boundary is an advanced feature in which you set the maximum permissions that an identity-based policy can grant to an IAM entity (IAM user or role). You can set a permissions boundary for an entity. The resulting permissions are the intersection of entity’s identity-based policies and its permissions boundaries. Resource-based policies that specify the user or role in the `Principal` field are not limited by the permissions boundary. An explicit deny in any of these policies overrides the allow. For more information about permissions boundaries, see Permissions Boundaries for IAM Entities in the IAM User Guide.

- **Service control policies (SCPs)** – SCPs are JSON policies that specify the maximum permissions for an organization or organizational unit (OU) in AWS Organizations. AWS Organizations is a service for
grouping and centrally managing multiple AWS accounts that your business owns. If you enable all features in an organization, then you can apply service control policies (SCPs) to any or all of your accounts. The SCP limits permissions for entities in member accounts, including each AWS account root user. For more information about Organizations and SCPs, see How SCPs Work in the AWS Organizations User Guide.

- **Session policies** – Session policies are advanced policies that you pass as a parameter when you programmatically create a temporary session for a role or federated user. The resulting session's permissions are the intersection of the user or role's identity-based policies and the session policies. Permissions can also come from a resource-based policy. An explicit deny in any of these policies overrides the allow. For more information, see Session Policies in the IAM User Guide.

### Multiple Policy Types

When multiple types of policies apply to a request, the resulting permissions are more complicated to understand. To learn how AWS determines whether to allow a request when multiple policy types are involved, see Policy Evaluation Logic in the IAM User Guide.

### How Amazon Personalize Works with IAM

Before you use IAM to manage access to Amazon Personalize, you should understand what IAM features are available to use with Amazon Personalize. To get a high-level view of how Amazon Personalize and other AWS services work with IAM, see AWS Services That Work with IAM in the IAM User Guide.

#### Topics

- Amazon Personalize Identity-Based Policies (p. 88)
- Amazon Personalize Resource-Based Policies (p. 90)
- Authorization Based on Amazon Personalize Tags (p. 90)
- Amazon Personalize IAM Roles (p. 90)

### Amazon Personalize Identity-Based Policies

With IAM identity-based policies, you can specify allowed or denied actions and resources as well as the conditions under which actions are allowed or denied. Amazon Personalize supports specific actions, resources, and condition keys. To learn about all of the elements that you use in a JSON policy, see IAM JSON Policy Elements Reference in the IAM User Guide.

#### Actions

The Action element of an IAM identity-based policy describes the specific action or actions that will be allowed or denied by the policy. Policy actions usually have the same name as the associated AWS API operation. The action is used in a policy to grant permissions to perform the associated operation.

Policy actions in Amazon Personalize use the following prefix before the action: personalize:. For example, to create a dataset with the Amazon Personalize CreateDataset API operation, you include the personalize:CreateDataset action in the policy. Policy statements must include either an Action or NotAction element. Amazon Personalize defines its own set of actions that describe tasks that you can perform with this service.

To specify multiple actions in a single statement, separate them with commas as shown in the following command.

```
"Action": [
    "personalize:action1",
    "personalize:action2"
```
You can specify multiple actions using wildcards (*). For example, to specify all actions that begin with the word Describe, include the following action.

```
"Action": "personalize:Describe*"
```

To see a list of Amazon Personalize actions, see Actions Defined by Amazon Personalize in the IAM User Guide.

**Resources**

The Resource element specifies the object or objects to which the action applies. Statements must include either a Resource or a NotResource element. You specify a resource using an ARN or using the wildcard (*) to indicate that the statement applies to all resources.

An Amazon Personalize dataset resource has the following ARN.

```
arn:${Partition}:personalize:${Region}:${Account}:dataset/${dataset-name}
```

For more information about the format of ARNs, see Amazon Resource Names (ARNs) and AWS Service Namespaces.

For example, to specify the MyDataset dataset in your statement, use the following ARN.

```
"Resource": "arn:aws:personalize:us-east-1:123456789012:dataset/MyDataset"
```

To specify all datasets that belong to a specific account, use the wildcard (*), as shown in the following example.

```
"Resource": "arn:aws:personalize:us-east-1:123456789012:dataset/*"
```

Some Amazon Personalize actions, such as those for creating resources, cannot be performed on a specific resource. In those cases, you must use the wildcard (*).

```
"Resource": "*
```

To see a list of Amazon Personalize resource types and their ARNs, see Resources Defined by Amazon Personalize in the IAM User Guide. To learn about the actions you can use to specify the ARN of each resource, see Actions Defined by Amazon Personalize.

**Condition Keys**

The Condition element (or Condition block) lets you specify conditions in which a statement is in effect. The Condition element is optional. You can build conditional expressions that use condition operators, such as equals or less than, to match the condition in the policy with values in the request.

If you specify multiple Condition elements in a statement, or multiple keys in a single Condition element, AWS evaluates them using a logical AND operation. If you specify multiple values for a single condition key, AWS evaluates the condition using a logical OR operation. All of the conditions must be met before the statement's permissions are granted.

You can also use placeholder variables when you specify conditions. For example, you can grant an IAM user permission to access a resource only if it is tagged with their IAM user name. For more information, see IAM Policy Elements: Variables and Tags in the IAM User Guide.

**Examples**
To view examples of Amazon Personalize identity-based policies, see Amazon Personalize Identity-Based Policy Examples (p. 90).

**Amazon Personalize Resource-Based Policies**

Amazon Personalize does not support resource-based policies.

**Authorization Based on Amazon Personalize Tags**

Amazon Personalize does not support tagging resources or controlling access based on tags.

**Amazon Personalize IAM Roles**

An IAM role is an entity within your AWS account that has specific permissions.

**Using Temporary Credentials with Amazon Personalize**

You can use temporary credentials to sign in with federation, assume an IAM role, or to assume a cross-account role. You obtain temporary security credentials by calling AWS Security Token Service (AWS STS) API operations such as AssumeRole or GetFederationToken.

Amazon Personalize supports using temporary credentials.

**Service-Linked Roles**

Service-linked roles allow AWS services to access resources in other services to complete an action on your behalf. Service-linked roles appear in your IAM account and are owned by the service. An IAM administrator can view but not edit the permissions for service-linked roles.

Amazon Personalize does not support service-linked roles.

**Service Roles**

This feature allows a service to assume a service role on your behalf. This role allows the service to access resources in other services to complete an action on your behalf. Service roles appear in your IAM account and are owned by the account. This means that an IAM administrator can change the permissions for this role. However, doing so might break the functionality of the service.

Amazon Personalize supports service roles.

**Amazon Personalize Identity-Based Policy Examples**

By default, IAM users and roles don't have permission to create or modify Amazon Personalize resources. They also can't perform tasks using the AWS Management Console, AWS CLI, or AWS API. An IAM administrator must create IAM policies that grant users and roles permission to perform specific API operations on the specified resources they need. The administrator must then attach those policies to the IAM users or groups that require those permissions.

To learn how to create an IAM identity-based policy using these example JSON policy documents, see Creating Policies on the JSON Tab in the IAM User Guide.

**Topics**

- Policy Best Practices (p. 91)
- Using the Amazon Personalize Console (p. 91)
- Allow Users to View Their Own Permissions (p. 91)
- Allowing Full Access to Amazon Personalize Resources (p. 92)
- Allowing Read-Only Access to Amazon Personalize Resources (p. 92)
Policy Best Practices

Identity-based policies are very powerful. They determine whether someone can create, access, or delete Amazon Personalize resources in your account. These actions can incur costs for your AWS account. When you create or edit identity-based policies, follow these guidelines and recommendations:

- **Get Started Using AWS Managed Policies** – To start using Amazon Personalize quickly, use AWS managed policies to give your employees the permissions they need. These policies are already available in your account and are maintained and updated by AWS. For more information, see Get Started Using Permissions With AWS Managed Policies in the IAM User Guide.

- **Grant Least Privilege** – When you create custom policies, grant only the permissions required to perform a task. Start with a minimum set of permissions and grant additional permissions as necessary. Doing so is more secure than starting with permissions that are too lenient and then trying to tighten them later. For more information, see Grant Least Privilege in the IAM User Guide.

- **Enable MFA for Sensitive Operations** – For extra security, require IAM users to use multi-factor authentication (MFA) to access sensitive resources or API operations. For more information, see Using Multi-Factor Authentication (MFA) in AWS in the IAM User Guide.

- **Use Policy Conditions for Extra Security** – To the extent that it's practical, define the conditions under which your identity-based policies allow access to a resource. For example, you can write conditions to specify a range of allowable IP addresses that a request must come from. You can also write conditions to allow requests only within a specified date or time range, or to require the use of SSL or MFA. For more information, see IAM JSON Policy Elements: Condition in the IAM User Guide.

Using the Amazon Personalize Console

To access the Amazon Personalize console, you must have a minimum set of permissions. These permissions must allow you to list and view details about the Amazon Personalize resources in your AWS account. If you create an identity-based policy that is more restrictive than the minimum required permissions, the console won't function as intended for entities (IAM users or roles) with that policy.

To ensure that those entities can still use the Amazon Personalize console, also attach the following AWS managed policy to the entities. For more information, see Adding Permissions to a User in the IAM User Guide.

```
AWSPersonalizeConsoleAccess
```

You don't need to allow minimum console permissions for users that are making calls only to the AWS CLI or the AWS API. Instead, allow access to only the actions that match the API operation that you're trying to perform.

Allow Users to View Their Own Permissions

This example shows how you might create a policy that allows IAM users to view the inline and managed policies that are attached to their user identity. This policy includes permissions to complete this action on the console or programmatically using the AWS CLI or AWS API.

```
{
   "Version": "2012-10-17",
   "Statement": [
       {
           "Sid": "ViewOwnUserInfo",
           "Effect": "Allow",
           "Action": ["iam:GetUserPolicy",
                       "iam:ListGroupsForUser",
                       "iam:ListAttachedUserPolicies",
                       "iam:GetUser"],
           "Condition": {
               "StringLike": {
                   "aws:PrincipalId": ["A4E310C5A8900853527120D7B3C984A1"
]}},
```
Allowing Full Access to Amazon Personalize Resources

The following example gives an IAM user in your AWS account full access to all Amazon Personalize resources and actions.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": "personalize:*",
            "Resource": "*"
        }
    ]
}
```

Allowing Read-Only Access to Amazon Personalize Resources

In this example, you grant an IAM user in your AWS account read-only access to your Amazon Personalize resources, including Amazon Personalize datasets, dataset groups, solutions, and campaigns.

```
{
    "Version": "2012-10-17",
    "Statement": [
        {
            "Effect": "Allow",
            "Action": [
                "personalize:DescribeAlgorithm",
                "personalize:DescribeBatchInferenceJob",
                "personalize:DescribeCampaign",
                "personalize:DescribeDataset",
                "personalize:DescribeDatasetGroup",
                "personalize:DescribeDatasetImportJob",
                "personalize:DescribeDatasetImportJobRun",
                "personalize:DescribeEventTracker",
                "personalize:DescribeFeatureExportJob",
                "personalize:DescribeFeatureTransformation",
                "personalize:DescribeFeatureGroup",
                "personalize:DescribeFeatureSet",
                "personalize:DescribeInferenceChannel",
                "personalize:DescribeInferenceChannelGroup",
                "personalize:DescribeInferenceInstance",
                "personalize:DescribeInferenceInstanceGroup",
                "personalize:DescribeInferenceRequest",
                "personalize:DescribeInferenceSession",
                "personalize:DescribeInferenceSessionGroup",
                "personalize:DescribeKafkaChannel",
                "personalize:DescribeKafkaChannelGroup",
                "personalize:DescribeKafkaInstance",
                "personalize:DescribeKafkaInstanceGroup",
                "personalize:DescribeSolution",
                "personalize:DescribeSolutionVersion",
                "personalize:DescribeSolutionGroup",
                "personalize:DescribeSolutionGroupVersion",
                "personalize:DescribeSolutionVersionGroup",
                "personalize:DescribeStaticPredictor",
                "personalize:DescribeStaticPredictorGroup",
                "personalize:DescribeStationaryPredictor",
                "personalize:DescribeStationaryPredictorGroup",
                "personalize:DescribeStationaryPredictorVersion",
                "personalize:DescribeStationaryPredictorVersionGroup",
                "personalize:DescribeTrainSession",
                "personalize:DescribeTrainingJob",
                "personalize:DescribeTrainingJobGroup",
                "personalize:DescribeTrainingSession",
                "personalize:DescribeUserProfile",
                "personalize:DescribeUserProfilePermission",
                "personalize:DescribeUserSession",
                "personalize:DescribeUserSessionAttribute",
                "personalize:DescribeUserSessionPermission",
                "personalize:DescribeUserSessions",
                "personalize:ListAlgorithms",
                "personalize:ListBatchInferenceJobs",
                "personalize:ListCampaigns",
                "personalize:ListDatasetGroups",
                "personalize:ListDatasetImportJobs",
                "personalize:ListDatasetImportJobRuns",
                "personalize:ListEventTrackers",
                "personalize:ListFeatureExportJobs",
                "personalize:ListFeatureTransformations",
                "personalize:ListInferenceChannels",
                "personalize:ListInferenceChannelGroups",
                "personalize:ListInferenceInstances",
                "personalize:ListInferenceInstanceGroups",
                "personalize:ListInferenceRequests",
                "personalize:ListInferenceSessions",
                "personalize:ListInferenceSessionGroups",
                "personalize:ListKafkaChannels",
                "personalize:ListKafkaChannelGroups",
                "personalize:ListKafkaInstances",
                "personalize:ListKafkaInstanceGroups",
                "personalize:ListPredictors",
                "personalize:ListPredictorGroups",
                "personalize:ListPredictorVersionGroups",
                "personalize:ListPredictorVersions",
                "personalize:ListPredictorVersionsGroups",
                "personalize:ListPredictorWeights",
                "personalize:ListPredictorWeightsGroups",
                "personalize:ListProactivePredictions",
                "personalize:ListProactivePredictionsGroups",
                "personalize:ListProactivePredictionsSessions",
                "personalize:ListProactivePredictionsSessionGroups",
                "personalize:ListTrainingJobs",
                "personalize:ListTrainingJobGroups",
                "personalize:ListTrainingSessions",
                "personalize:ListUserSessions",
                "personalize:ListUserSessionFactorys",
                "personalize:ListUserSessionSignatures",
                "personalize:StartProactivePredictions",
                "personalize:CancelProactivePredictions",
                "personalize:DescribeProactivePredictions",
                "personalize:DescribeProactivePredictionsGroups",
                "personalize:DescribeProactivePredictionsSessions",
                "personalize:DescribeProactivePredictionsSessionGroups",
                "personalize:DescribeProactivePredictionsSessionSignatures",
                "personalize:DescribeProactivePredictionsSignatures",
                "personalize:DescribeProactivePredictionsTags",
                "personalize:DeleteProactivePredictions",
                "personalize:StopProactivePredictions",
                "personalize:ResumeProactivePredictions",
                "personalize:StartProactivePredictionsSession",
                "personalize:StopProactivePredictionsSession",
                "personalize:ResumeProactivePredictionsSession",
                "personalize:GetProactivePredictions",
                "personalize:GetProactivePredictionsGroups",
                "personalize:GetProactivePredictionsSessions",
                "personalize:GetProactivePredictionsSessionGroups",
                "personalize:GetProactivePredictionsSessionSignatures",
                "personalize:GetProactivePredictionsSignatures",
                "personalize:GetProactivePredictionsTags",
                "personalize:PutProactivePredictions",
                "personalize:TagProactivePredictions",
                "personalize:TagProactivePredictionsGroups",
                "personalize:TagProactivePredictionsSessions",
                "personalize:TagProactivePredictionsSessionGroups",
                "personalize:TagProactivePredictionsSessionSignatures",
                "personalize:TagProactivePredictionsSignatures",
                "personalize:TagProactivePredictionsTags"
            ],
            "Resource": "*"
        }
    ]
}
```
Troubleshooting Amazon Personalize Identity and Access

Use the following information to help you diagnose and fix common issues that you might encounter when working with Amazon Personalize and IAM.

Topics
- I Am Not Authorized to Perform an Action in Amazon Personalize (p. 93)
- I Am Not Authorized to Perform iam:PassRole (p. 93)
- I Want to View My Access Keys (p. 94)
- I'm an Administrator and Want to Allow Others to Access Amazon Personalize (p. 94)
- I Want to Allow People Outside of My AWS Account to Access My Amazon Personalize Resources (p. 94)

I Am Not Authorized to Perform an Action in Amazon Personalize

If the AWS Management Console tells you that you're not authorized to perform an action, then you must contact your administrator for assistance. Your administrator is the person that provided you with your user name and password.

The following example error occurs when the mateojackson IAM user tries to use the console to view details about a widget but does not have personalize:GetWidget permissions.

```
User: arn:aws:iam::123456789012:user/mateojackson is not authorized to perform: personalize:GetWidget on resource: my-example-widget
```

In this case, Mateo asks his administrator to update his policies to allow him to access the `my-example-widget` resource using the `personalize:GetWidget` action.

I Am Not Authorized to Perform iam:PassRole

If you receive an error that you're not authorized to perform the `iam:PassRole` action, then you must contact your administrator for assistance. Your administrator is the person that provided you with your
user name and password. Ask that person to update your policies to allow you to pass a role to Amazon Personalize.

Some AWS services allow you to pass an existing role to that service, instead of creating a new service role or service-linked role. To do this, you must have permissions to pass the role to the service.

The following example error occurs when an IAM user named marymajor tries to use the console to perform an action in Amazon Personalize. However, the action requires the service to have permissions granted by a service role. Mary does not have permissions to pass the role to the service.

```
User: arn:aws:iam::123456789012:user/marymajor is not authorized to perform: iam:PassRole
```

In this case, Mary asks her administrator to update her policies to allow her to perform the `iam:PassRole` action.

**I Want to View My Access Keys**

After you create your IAM user access keys, you can view your access key ID at any time. However, you can't view your secret access key again. If you lose your secret key, you must create a new access key pair.

Access keys consist of two parts: an access key ID (for example, AKIAIOSFODNN7EXAMPLE) and a secret access key (for example, wJalrXUtnFEMI/K7MDENG/bPxRfiCYEXAMPLEKEY). Like a user name and password, you must use both the access key ID and secret access key together to authenticate your requests. Manage your access keys as securely as you do your user name and password.

**Important**

Do not provide your access keys to a third party, even to help find your canonical user ID. By doing this, you might give someone permanent access to your account.

When you create an access key pair, you are prompted to save the access key ID and secret access key in a secure location. The secret access key is available only at the time you create it. If you lose your secret access key, you must add new access keys to your IAM user. You can have a maximum of two access keys. If you already have two, you must delete one key pair before creating a new one. To view instructions, see Managing Access Keys in the *IAM User Guide*.

**I'm an Administrator and Want to Allow Others to Access Amazon Personalize**

To allow others to access Amazon Personalize, you must create an IAM entity (user or role) for the person or application that needs access. They will use the credentials for that entity to access AWS. You must then attach a policy to the entity that grants them the correct permissions in Amazon Personalize.

To get started right away, see Creating Your First IAM Delegated User and Group in the *IAM User Guide*.

**I Want to Allow People Outside of My AWS Account to Access My Amazon Personalize Resources**

You can create a role that users in other accounts or people outside of your organization can use to access your resources. You can specify who is trusted to assume the role. For services that support resource-based policies or access control lists (ACLs), you can use those policies to grant people access to your resources.

To learn more, consult the following:

- To learn whether Amazon Personalize supports these features, see How Amazon Personalize Works with IAM (p. 88).
- To learn how to provide access to your resources across AWS accounts that you own, see Providing Access to an IAM User in Another AWS Account That You Own in the *IAM User Guide*. 
• To learn how to provide access to your resources to third-party AWS accounts, see Providing Access to AWS Accounts Owned by Third Parties in the IAM User Guide.

• To learn how to provide access through identity federation, see Providing Access to Externally Authenticated Users (Identity Federation) in the IAM User Guide.

• To learn the difference between using roles and resource-based policies for cross-account access, see How IAM Roles Differ from Resource-based Policies in the IAM User Guide.

Logging and Monitoring in Amazon Personalize

This section provides information about monitoring and logging Amazon Personalize with Amazon CloudWatch and AWS CloudTrail.

Topics
• Monitoring Amazon Personalize (p. 95)
• CloudWatch Metrics for Amazon Personalize (p. 97)
• Logging Amazon Personalize API Calls with AWS CloudTrail (p. 100)

Monitoring Amazon Personalize

With Amazon CloudWatch, you can get metrics associated with Amazon Personalize. You can set up alarms to notify you when one or more of these metrics fall outside a defined threshold. To see metrics, you can use Amazon CloudWatch, Amazon AWS Command Line Interface, or the CloudWatch API.

You can also see aggregated metrics, for a chosen period of time, by using the Amazon Personalize console.

Using CloudWatch Metrics for Amazon Personalize

To use metrics, you must specify the following information:

• The metric name.
• The metric dimension. A *dimension* is a name-value pair that helps you to uniquely identify a metric.

You can get monitoring data for Amazon Personalize using the AWS Management Console, the AWS CLI, or the CloudWatch API. You can also use the CloudWatch API through one of the Amazon AWS Software Development Kits (SDKs) or the CloudWatch API tools. The console displays a series of graphs based on the raw data from the CloudWatch API. Depending on your needs, you might prefer to use either the graphs displayed in the console or retrieved from the API.

The following list shows some common uses for the metrics. These are suggestions to get you started, not a comprehensive list.

<table>
<thead>
<tr>
<th>How Do I?</th>
<th>Relevant Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do I track the number of events that have been recorded?</td>
<td>Monitor the <strong>PutEventsRequests</strong> metric.</td>
</tr>
<tr>
<td>How can I monitor the DatasetImportJob errors?</td>
<td>Use the <strong>DatasetImportJobError</strong> metric.</td>
</tr>
<tr>
<td>How can I monitor the latency of GetRecommendations calls?</td>
<td>Use the <strong>GetRecommendationsLatency</strong> metric.</td>
</tr>
</tbody>
</table>
You must have the appropriate CloudWatch permissions to monitor Amazon Personalize with CloudWatch. For more information, see Authentication and Access Control for Amazon CloudWatch.

Access Amazon Personalize Metrics

The following examples show how to access Amazon Personalize metrics using the CloudWatch console, the AWS CLI, and the CloudWatch API.

To view metrics (console)

1. Sign in to the AWS Management Console and open the CloudWatch console at https://console.aws.amazon.com/cloudwatch/.
2. Choose Metrics, choose the All metrics tab, and then choose AWS/Personalize.
3. Choose the metric dimension.
4. Choose the desired metric from the list, and choose a time period for the graph.

To view metrics for events received over a period of time (CLI)

• Open the AWS CLI and enter the following command:

```
aws cloudwatch get-metric-statistics
--metric-name PutEventsRequests
--start-time 2019-03-15T00:00:20Z
--period 3600
--end-time 2019-03-16T00:00:00Z
--namespace AWS/Personalize
--dimensions Name=EventTrackerArn,Value=EventTrackerArn
--statistics Sum
```

This example shows the events received for the given event tracker ARN over a period of time. For more information, see get-metric-statistics.

To access metrics (CloudWatch API)

• Call GetMetricStatistics. For more information, see the Amazon CloudWatch API Reference.

Create an Alarm

You can create a CloudWatch alarm that sends an Amazon Simple Notification Service (Amazon SNS) message when the alarm changes state. An alarm watches a single metric over a time period you specify. The alarm performs one or more actions based on the value of the metric relative to a given threshold over a number of time periods. The action is a notification sent to an Amazon SNS topic or an AWS Auto Scaling policy.

Alarms invoke actions for sustained state changes only. CloudWatch alarms do not invoke actions simply because they are in a particular state. The state must have changed and been maintained for a specified number of time periods.

To set an alarm (console)

1. Sign in to the AWS Management Console and open the CloudWatch console at https://console.aws.amazon.com/cloudwatch/.
2. In the navigation pane, Choose Alarms, and then choose Create alarm. This launches the Create Alarm Wizard.
3. Choose Select metric.
4. In the All metrics tab, choose AWS/Personalize.
5. Choose EventTrackerArn, and then choose PutEventsRequests metrics.
6. Choose the Graphed metrics tab.
7. For Statistic choose Sum.
8. Choose Select metric.
9. Fill in the Name and Description. For Whenever, choose >, and then enter a maximum value of your choice.
10. If you want CloudWatch to send you email when the alarm state is reached, for Whenever this alarm, choose State is ALARM. To send alarms to an existing Amazon SNS topic, for Send notification to, choose an existing SNS topic. To set the name and email addresses for a new email subscription list, choose New list. CloudWatch saves the list and displays it in the field so you can use it to set future alarms.

   **Note**
   If you use New list to create a new Amazon SNS topic, the email addresses must be verified before the intended recipients receive notifications. Amazon SNS sends email only when the alarm enters an alarm state. If this alarm state change happens before the email addresses are verified, intended recipients do not receive a notification.

11. Choose Create alarm.

### To set an alarm (AWS CLI)

- Open the AWS CLI, and then enter the following command. Change the value of the alarm-actions parameter to reference an Amazon SNS topic that you previously created.

```
aws cloudwatch put-metric-alarm \
  --alarm-name PersonalizeCLI \
  --alarm-description "Alarm when more than 10 events occur" \
  --metric-name PutEventsRequests \
  --namespace AWS/Personalize \
  --statistic Sum \
  --period 300 \
  --threshold 10 \
  --comparison-operator GreaterThanThreshold \
  --evaluation-periods 1 \
  --unit Count \
  --dimensions Name=EventTrackerArn,Value=EventTrackerArn \
  --alarm-actions SNSTopicArn
```

This example shows how to create an alarm for when more than 10 events occur for the given event tracker ARN within 5 minutes. For more information, see put-metric-alarm.

### To set an alarm (CloudWatch API)

- Call PutMetricAlarm. For more information, see Amazon CloudWatch API Reference.

## CloudWatch Metrics for Amazon Personalize

This section contains information about the Amazon CloudWatch metrics available for Amazon Personalize. You can also see an aggregate view of Amazon Personalize metrics from the Amazon Personalize console. For more information, see Monitoring Amazon Personalize (p. 95).

The following table lists the Amazon Personalize metrics. All metrics support these statistics: Average, Minimum, Maximum, Sum.
<table>
<thead>
<tr>
<th>Metric</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DatasetImportJobRequests</td>
<td>The number of successful CreateDatasetImportJob API calls. Dimensions: DatasetGroupArn, DatasetArn, DatasetImportJobArn</td>
</tr>
<tr>
<td>DatasetImportJobError</td>
<td>The number of CreateDatasetImportJob API calls that resulted in an error. Dimensions: DatasetGroupArn, DatasetArn, DatasetImportJobArn</td>
</tr>
<tr>
<td>DatasetImportJobExecutionTime</td>
<td>The time between the CreateDatasetImportJob API call and the completion (or failure) of the operation. Dimensions: DatasetGroupArn, DatasetArn, DatasetImportJobArn Unit: Seconds</td>
</tr>
<tr>
<td>DatasetSize</td>
<td>The size of data imported by the dataset import job. Dimensions: DatasetGroupArn, DatasetArn, DatasetImportJobArn Unit: Bytes</td>
</tr>
<tr>
<td>SolutionTrainingJobRequests</td>
<td>The number of successful CreateSolutionVersion API calls. Dimensions: SolutionArn, SolutionVersionArn</td>
</tr>
<tr>
<td>SolutionTrainingJobError</td>
<td>The number of CreateSolutionVersion API calls that resulted in an error. Dimensions: SolutionArn, SolutionVersionArn</td>
</tr>
<tr>
<td>SolutionTrainingJobExecutionTime</td>
<td>The time between the CreateSolutionVersion API call and the completion (or failure) of the operation. Dimensions: SolutionArn, SolutionVersionArn Unit: Seconds</td>
</tr>
<tr>
<td>GetPersonalizedRankingRequests</td>
<td>The number of successful GetPersonalizedRanking API calls. Dimension: CampaignArn</td>
</tr>
<tr>
<td>GetPersonalizedRanking4xxErrors</td>
<td>The number of GetPersonalizedRanking API calls that returned a 4xx HTTP response code. Dimension: CampaignArn</td>
</tr>
<tr>
<td>GetPersonalizedRanking5xxErrors</td>
<td>The number of GetPersonalizedRanking API calls that returned a 5xx HTTP response code. Dimension: CampaignArn</td>
</tr>
<tr>
<td>Metric</td>
<td>Description</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>GetPersonalizedRankingLatency</td>
<td>The time between receiving the GetPersonalizedRanking API call and the sending of recommendations (excludes 4xx and 5xx errors).</td>
</tr>
<tr>
<td></td>
<td>Dimension: CampaignArn</td>
</tr>
<tr>
<td></td>
<td>Unit: Milliseconds</td>
</tr>
<tr>
<td>GetRecommendationsRequests</td>
<td>The number of successful GetRecommendations (p. 210) API calls.</td>
</tr>
<tr>
<td></td>
<td>Dimension: CampaignArn</td>
</tr>
<tr>
<td>GetRecommendations4xxErrors</td>
<td>The number of GetRecommendations API calls that returned a 4xx HTTP response code.</td>
</tr>
<tr>
<td></td>
<td>Dimension: CampaignArn</td>
</tr>
<tr>
<td>GetRecommendations5xxErrors</td>
<td>The number of GetRecommendations API calls that returned a 5xx HTTP response code.</td>
</tr>
<tr>
<td></td>
<td>Dimension: CampaignArn</td>
</tr>
<tr>
<td>GetRecommendationsLatency</td>
<td>The time between receiving the GetRecommendations API call and the sending of recommendations (excludes 4xx and 5xx errors).</td>
</tr>
<tr>
<td></td>
<td>Dimension: CampaignArn</td>
</tr>
<tr>
<td></td>
<td>Unit: Milliseconds</td>
</tr>
<tr>
<td>PutEventsRequests</td>
<td>The number of successful PutEvents (p. 205) API calls.</td>
</tr>
<tr>
<td></td>
<td>Dimension: EventTrackerArn</td>
</tr>
<tr>
<td>PutEvents4xxErrors</td>
<td>The number of PutEvents API calls that returned a 4xx HTTP response code.</td>
</tr>
<tr>
<td></td>
<td>Dimension: EventTrackerArn</td>
</tr>
<tr>
<td>PutEvents5xxErrors</td>
<td>The number of PutEvents API calls that returned a 5xx HTTP response code.</td>
</tr>
<tr>
<td></td>
<td>Dimension: EventTrackerArn</td>
</tr>
<tr>
<td>PutEventsLatency</td>
<td>The time taken for the completion of the PutEvents API call (excludes 4xx and 5xx errors).</td>
</tr>
<tr>
<td></td>
<td>Dimension: EventTrackerArn</td>
</tr>
<tr>
<td></td>
<td>Unit: Milliseconds</td>
</tr>
</tbody>
</table>
Logging Amazon Personalize API Calls with AWS CloudTrail

Amazon Personalize is integrated with AWS CloudTrail, a service that provides a record of actions taken by a user, role, or an AWS service in Amazon Personalize. CloudTrail captures a subset of API calls for Amazon Personalize as events, including calls from the Amazon Personalize console and from code calls to the Amazon Personalize APIs. If you create a trail, you can enable continuous delivery of CloudTrail events to an Amazon S3 bucket, including events for Amazon Personalize. If you don't configure a trail, you can still view the most recent events in the CloudTrail console in Event history. Using the information collected by CloudTrail, you can determine the request that was made to Amazon Personalize, the IP address from which the request was made, who made the request, when it was made, and additional details.

To learn more about CloudTrail, including how to configure and enable it, see the AWS CloudTrail User Guide.

Amazon Personalize Information in CloudTrail

CloudTrail is enabled on your AWS account when you create the account. When supported event activity occurs in Amazon Personalize, that activity is recorded in a CloudTrail event along with other AWS service events in Event history. You can view, search, and download recent events in your AWS account. For more information, see Viewing Events with CloudTrail Event History.

For an ongoing record of events in your AWS account, including events for Amazon Personalize, create a trail. A trail enables CloudTrail to deliver log files to an Amazon S3 bucket. By default, when you create a trail in the console, the trail applies to all regions. The trail logs events from all regions in the AWS partition and delivers the log files to the Amazon S3 bucket that you specify. Additionally, you can configure other AWS services to further analyze and act upon the event data collected in CloudTrail logs. For more information, see:

- Overview for Creating a Trail
- CloudTrail Supported Services and Integrations
- Configuring Amazon SNS Notifications for CloudTrail
- Receiving CloudTrail Log Files from Multiple Regions and Receiving CloudTrail Log Files from Multiple Accounts

Amazon Personalize supports logging every action (API operation) as an event in CloudTrail log files. For more information, see Actions (p. 105).

Every event or log entry contains information about who generated the request. The identity information helps you determine the following:

- Whether the request was made with root or IAM user credentials.
- Whether the request was made with temporary security credentials for a role or federated user.
- Whether the request was made by another AWS service.

For more information, see the CloudTrail userIdentity Element.

Example: Amazon Personalize Log File Entries

A trail is a configuration that enables delivery of events as log files to an Amazon S3 bucket that you specify. CloudTrail log files contain one or more log entries. An event represents a single request from any source and includes information about the requested action, the date and time of the action, request
parameters, and so on. CloudTrail log files are not an ordered stack trace of the public API calls, so they do not appear in any specific order.

The following example shows a CloudTrail log entry with actions for the ListDatasetGroups API operation:

```json
{
    "eventVersion": "1.05",
    "userIdentity": {
        "type": "IAMUser",
        "principalId": "principal-id",
        "arn": "arn:aws:iam::user-arn",
        "accountId": "account-id",
        "accessKeyId": "access-key",
        "userName": "user-name"
    },
    "eventTime": "2018-11-22T02:18:03Z",
    "eventSource": "personalize.amazonaws.com",
    "eventName": "ListDatasetGroups",
    "awsRegion": "us-west-2",
    "sourceIPAddress": "source-ip-address",
    "userAgent": "aws-cli/1.11.16 Python/2.7.11 Darwin/15.6.0 botocore/1.4.73",
    "requestParameters": null,
    "responseElements": {
        "datasetGroups": [
            {
                "name": "testdatasetgroup",
                "status": "ACTIVE",
                "creationDateTime": "Nov 5, 2018 6:06:01 AM"
            }
        ],
        "requestID": "request-id",
        "eventID": "event-id",
        "eventType": "AwsApiCall",
        "recipientAccountId": "recipient-account-id"
    }
}
```

## Compliance Validation for Amazon Personalize

Third-party auditors assess the security and compliance of Amazon Personalize as part of multiple AWS compliance programs. These include SOC, PCI, HIPAA, and others.

For a list of AWS services in scope of specific compliance programs, see [AWS Services in Scope by Compliance Program](#). For general information, see [AWS Compliance Programs](#).

You can download third-party audit reports using AWS Artifact. For more information, see [Downloading Reports in AWS Artifact](#).

Your compliance responsibility when using Amazon Personalize is determined by the sensitivity of your data, your company's compliance objectives, and applicable laws and regulations. AWS provides the following resources to help with compliance:

- **Security and Compliance Quick Start Guides** – These deployment guides discuss architectural considerations and provide steps for deploying security- and compliance-focused baseline environments on AWS.
- **Architecting for HIPAA Security and Compliance Whitepaper** – This whitepaper describes how companies can use AWS to create HIPAA-compliant applications.
• **AWS Compliance Resources** – This collection of workbooks and guides might apply to your industry and location.
• **Evaluating Resources with Rules** in the *AWS Config Developer Guide* – The AWS Config service assesses how well your resource configurations comply with internal practices, industry guidelines, and regulations.
• **AWS Security Hub** – This AWS service provides a comprehensive view of your security state within AWS that helps you check your compliance with security industry standards and best practices.

### Resilience in Amazon Personalize

The AWS global infrastructure is built around AWS Regions and Availability Zones. AWS Regions provide multiple physically separated and isolated Availability Zones, which are connected with low-latency, high-throughput, and highly redundant networking. With Availability Zones, you can design and operate applications and databases that automatically fail over between zones without interruption. Availability Zones are more highly available, fault tolerant, and scalable than traditional single or multiple data center infrastructures.

For more information about AWS Regions and Availability Zones, see [AWS Global Infrastructure](#).

### Infrastructure Security in Amazon Personalize

As a managed service, Amazon Personalize is protected by the AWS global network security procedures that are described in the *Amazon Web Services: Overview of Security Processes* whitepaper.

You use AWS published API calls to access Amazon Personalize through the network. Clients must support Transport Layer Security (TLS) 1.0 or later. We recommend TLS 1.2 or later. Clients must also support cipher suites with perfect forward secrecy (PFS) such as Ephemeral Diffie-Hellman (DHE) or Elliptic Curve Ephemeral Diffie-Hellman (ECDHE). Most modern systems such as Java 7 and later support these modes.

Additionally, requests must be signed by using an access key ID and a secret access key that is associated with an IAM principal. Or you can use the *AWS Security Token Service* (AWS STS) to generate temporary security credentials to sign requests.
Limits in Amazon Personalize

The following sections contain information about Amazon Personalize guidelines and limits.

Topics
• Supported AWS Regions (p. 103)
• Compliance (p. 103)
• Service Limits (p. 103)

Supported AWS Regions

For a list of AWS Regions that support Amazon Personalize, see AWS Regions and Endpoints in the Amazon Web Services General Reference.

Compliance

For more information about Amazon Personalize compliance programs, see AWS Compliance, AWS Compliance Programs, and AWS Services in Scope by Compliance Program.

Service Limits

Your AWS account has the following limits for Amazon Personalize.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum amount of data for an individual dataset (Users, Items, or Interactions) for HRNN, SIMS, Popularity-Count, and Personalized-Ranking recipes.</td>
<td>100 GB</td>
</tr>
<tr>
<td>Maximum amount of data for Interactions dataset for HRNN-metadata and HRNN-coldstart recipes.</td>
<td>100 GB</td>
</tr>
<tr>
<td>Maximum amount of combined data for Users and Items datasets for HRNN-metadata and HRNN-coldstart recipes.</td>
<td>5 GB</td>
</tr>
<tr>
<td>Minimum number of unique combined historical and event interactions (after filtering by eventType and eventValueThreshold, if provided) required to train a model (training a model means you create a solution version).</td>
<td>1000</td>
</tr>
<tr>
<td>Minimum number of unique users, with at least 2 interactions each, required to train a model (training a model means you create a solution version).</td>
<td>25</td>
</tr>
<tr>
<td>Maximum number of interactions that are considered by a model during training.</td>
<td>500 million</td>
</tr>
<tr>
<td>Maximum number of items that are considered by a model during training.</td>
<td>750 thousand</td>
</tr>
<tr>
<td>Maximum number of cold start items the HRNN-Coldstart recipe supports to train a model (training a model means you create a solution version).</td>
<td>80,000</td>
</tr>
</tbody>
</table>
### Service Limits

<table>
<thead>
<tr>
<th>Resource</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum number of cold start items the HRNN-Coldstart recipe requires to train a model (training a model means you create a solution version).</td>
<td>100</td>
</tr>
<tr>
<td>Maximum transaction rate (GetRecommendations and GetPersonalizedRanking requests).</td>
<td>2500/sec</td>
</tr>
<tr>
<td>Maximum number of GetRecommendations requests per second per campaign.</td>
<td>500/sec</td>
</tr>
<tr>
<td>Maximum number of GetPersonalizedRanking requests per second per campaign.</td>
<td>500/sec</td>
</tr>
<tr>
<td>Maximum number of PutEvents requests.</td>
<td>1000/sec</td>
</tr>
<tr>
<td>Maximum number of events in a PutEvents call.</td>
<td>10</td>
</tr>
<tr>
<td>Maximum size of an event.</td>
<td>10 KB</td>
</tr>
<tr>
<td>Maximum number of input files in a batch inference job.</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum size of batch inference job input.</td>
<td>1 GB</td>
</tr>
<tr>
<td>Maximum number of records per input file in a batch inference job.</td>
<td>50 million</td>
</tr>
</tbody>
</table>

Your AWS account has the following limits per region for Amazon Personalize.

<table>
<thead>
<tr>
<th>Resource</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of active schemas.</td>
<td>500</td>
</tr>
<tr>
<td>Total number of active datasets.</td>
<td>500</td>
</tr>
<tr>
<td>Total number of active dataset groups.</td>
<td>500</td>
</tr>
<tr>
<td>Total number of active event trackers.</td>
<td>500</td>
</tr>
<tr>
<td>Total number of active solutions.</td>
<td>500</td>
</tr>
<tr>
<td>Total number of active campaigns.</td>
<td>5</td>
</tr>
</tbody>
</table>
This section provides documentation for the Amazon Personalize API operations.

# Actions

The following actions are supported by Amazon Personalize:

- `CreateBatchInferenceJob (p. 108)`
- `CreateCampaign (p. 111)`
- `CreateDataset (p. 114)`
- `CreateDatasetGroup (p. 117)`
- `CreateDatasetImportJob (p. 120)`
- `CreateEventTracker (p. 123)`
- `CreateSchema (p. 126)`
- `CreateSolution (p. 128)`
- `CreateSolutionVersion (p. 133)`
- `DeleteCampaign (p. 136)`
- `DeleteDataset (p. 138)`
- `DeleteDatasetGroup (p. 140)`
- `DeleteEventTracker (p. 142)`
- `DeleteSchema (p. 144)`
- `DeleteSolution (p. 146)`
- `DescribeAlgorithm (p. 148)`
- `DescribeBatchInferenceJob (p. 150)`
- `DescribeCampaign (p. 152)`
- `DescribeDataset (p. 154)`
- `DescribeDatasetGroup (p. 156)`
- `DescribeDatasetImportJob (p. 158)`
- `DescribeEventTracker (p. 160)`
- `DescribeFeatureTransformation (p. 162)`
- `DescribeRecipe (p. 164)`
- `DescribeSchema (p. 166)`
- `DescribeSolution (p. 168)`
- `DescribeSolutionVersion (p. 171)`
- `GetSolutionMetrics (p. 174)`
- `ListBatchInferenceJobs (p. 176)`
- `ListCampaigns (p. 179)`
- `ListDatasetGroups (p. 182)`
- `ListDatasetImportJobs (p. 184)`
- `ListDatasets (p. 187)`
- `ListEventTrackers (p. 190)`
- `ListRecipes (p. 192)`
The following actions are supported by Amazon Personalize Events:

- **PutEvents** (p. 205)

The following actions are supported by Amazon Personalize Runtime:

- **GetPersonalizedRanking** (p. 207)
- **GetRecommendations** (p. 210)

# Amazon Personalize

The following actions are supported by Amazon Personalize:

- **CreateBatchInferenceJob** (p. 108)
- **CreateCampaign** (p. 111)
- **CreateDataset** (p. 114)
- **CreateDatasetGroup** (p. 117)
- **CreateDatasetImportJob** (p. 120)
- **CreateEventTracker** (p. 123)
- **CreateSchema** (p. 126)
- **CreateSolution** (p. 128)
- **CreateSolutionVersion** (p. 133)
- **DeleteCampaign** (p. 136)
- **DeleteDataset** (p. 138)
- **DeleteDatasetGroup** (p. 140)
- **DeleteEventTracker** (p. 142)
- **DeleteSchema** (p. 144)
- **DeleteSolution** (p. 146)
- **DescribeAlgorithm** (p. 148)
- **DescribeBatchInferenceJob** (p. 150)
- **DescribeCampaign** (p. 152)
- **DescribeDataset** (p. 154)
- **DescribeDatasetGroup** (p. 156)
- **DescribeDatasetImportJob** (p. 158)
- **DescribeEventTracker** (p. 160)
- **DescribeFeatureTransformation** (p. 162)
- **DescribeRecipe** (p. 164)
- **DescribeSchema** (p. 166)
- **DescribeSolution** (p. 168)
- **DescribeSolutionVersion** (p. 171)
- **GetSolutionMetrics** (p. 174)
- **ListBatchInferenceJobs** (p. 176)
- ListCampaigns (p. 179)
- ListDatasetGroups (p. 182)
- ListDatasetImportJobs (p. 184)
- ListDatasets (p. 187)
- ListEventTrackers (p. 190)
- ListRecipes (p. 192)
- ListSchemas (p. 194)
- ListSolutions (p. 196)
- ListSolutionVersions (p. 199)
- UpdateCampaign (p. 202)
CreateBatchInferenceJob
Service: Amazon Personalize

Creates a batch inference job. The operation can handle up to 50 million records and the input file must be in JSON format. For more information, see Getting Batch Recommendations (p. 79).

Request Syntax

```json
{
    "jobInput": {
        "s3DataSource": {
            "kmsKeyArn": "string",
            "path": "string"
        }
    },
    "jobName": "string",
    "jobOutput": {
        "s3DataDestination": {
            "kmsKeyArn": "string",
            "path": "string"
        }
    },
    "numResults": number,
    "roleArn": "string",
    "solutionVersionArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**jobInput (p. 108)**

The Amazon S3 path that leads to the input file to base your recommendations on. The input material must be in JSON format.

Type: BatchInferenceJobInput (p. 223) object

Required: Yes

**jobName (p. 108)**

The name of the batch inference job to create.

Type: String


Pattern: ^[a-zA-Z0-9][a-zA-Z0-9\-_.]*

Required: Yes

**jobOutput (p. 108)**

The path to the Amazon S3 bucket where the job's output will be stored.

Type: BatchInferenceJobOutput (p. 224) object

Required: Yes

**numResults (p. 108)**

The number of recommendations to retrieve.
Type: Integer
Required: No

**roleArn (p. 108)**

The ARN of the Amazon Identity and Access Management role that has permissions to read and write to your input and out Amazon S3 buckets respectively.

Type: String
Length Constraints: Maximum length of 256.

Pattern: \`arn:\([a-z\d-]+:iam::\d{12}:role/?[a-zA-Z0-9_+=,.@\-_\ ]+\`

Required: Yes

**solutionVersionArn (p. 108)**

The Amazon Resource Name (ARN) of the solution version that will be used to generate the batch inference recommendations.

Type: String
Length Constraints: Maximum length of 256.

Pattern: \`arn:\([a-z\d-]+:personalize:.+:.*\`

Required: Yes

**Response Syntax**

```json
{
   "batchInferenceJobArn": "string"
}
```

**Response Elements**

If the action is successful, the service sends back an HTTP 200 response.
The following data is returned in JSON format by the service.

**batchInferenceJobArn (p. 109)**

The ARN of the batch inference job.

Type: String
Length Constraints: Maximum length of 256.

Pattern: \`arn:\([a-z\d-]+:personalize:.+:.*\`

**Errors**

**InvalidInputException**

Provide a valid value for the field or parameter.

HTTP Status Code: 400
LimitExceededException

The limit on the number of requests per second has been exceeded.

HTTP Status Code: 400

ResourceAlreadyExistsException

The specified resource already exists.

HTTP Status Code: 400

ResourceInUseException

The specified resource is in use.

HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
CreateCampaign
Service: Amazon Personalize

Creates a campaign by deploying a solution version. When a client calls the GetRecommendations and GetPersonalizedRanking APIs, a campaign is specified in the request.

Minimum Provisioned TPS and Auto-Scaling

A transaction is a single GetRecommendations or GetPersonalizedRanking call. Transactions per second (TPS) is the throughput and unit of billing for Amazon Personalize. The minimum provisioned TPS (minProvisionedTPS) specifies the baseline throughput provisioned by Amazon Personalize, and thus, the minimum billing charge. If your TPS increases beyond minProvisionedTPS, Amazon Personalize auto-scales the provisioned capacity up and down, but never below minProvisionedTPS, to maintain a 70% utilization. There's a short time delay while the capacity is increased that might cause loss of transactions. It's recommended to start with a low minProvisionedTPS, track your usage using Amazon CloudWatch metrics, and then increase the minProvisionedTPS as necessary.

Status

A campaign can be in one of the following states:

- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING > DELETE IN_PROGRESS

To get the campaign status, call DescribeCampaign (p. 152).

Note
Wait until the status of the campaign is ACTIVE before asking the campaign for recommendations.

Related APIs

- ListCampaigns (p. 179)
- DescribeCampaign (p. 152)
- UpdateCampaign (p. 202)
- DeleteCampaign (p. 136)

Request Syntax

```
{
    "minProvisionedTPS": number,
    "name": "string",
    "solutionVersionArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

minProvisionedTPS (p. 111)

Specifies the requested minimum provisioned transactions (recommendations) per second that Amazon Personalize will support.

Type: Integer

Valid Range: Minimum value of 1.
**Required: Yes**

**name (p. 111)**

A name for the new campaign. The campaign name must be unique within your account.

Type: String


Pattern: `^[a-zA-Z0-9]-[a-zA-Z0-9\-_]*`

**solutionVersionArn (p. 111)**

The Amazon Resource Name (ARN) of the solution version to deploy.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):personalize:.+:.*:.*:`

**Response Syntax**

```
{
  "campaignArn": "string"
}
```

**Response Elements**

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

**campaignArn (p. 112)**

The Amazon Resource Name (ARN) of the campaign.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-zA-Z\d-]+):personalize:.+:.*:`

**Errors**

**InvalidInputException**

Provide a valid value for the field or parameter.

HTTP Status Code: 400

**LimitExceededException**

The limit on the number of requests per second has been exceeded.

HTTP Status Code: 400
ResourceAlreadyExistsException

The specified resource already exists.

HTTP Status Code: 400

ResourceInUseException

The specified resource is in use.

HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
CreateDataset
Service: Amazon Personalize

Creates an empty dataset and adds it to the specified dataset group. Use CreateDatasetImportJob (p. 120) to import your training data to a dataset.

There are three types of datasets:

- Interactions
- Items
- Users

Each dataset type has an associated schema with required field types. Only the Interactions dataset is required in order to train a model (also referred to as creating a solution).

A dataset can be in one of the following states:

- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING > DELETE IN_PROGRESS

To get the status of the dataset, call DescribeDataset (p. 154).

Related APIs

- CreateDatasetGroup (p. 117)
- ListDatasets (p. 187)
- DescribeDataset (p. 154)
- DeleteDataset (p. 138)

Request Syntax

```json
{
  "datasetGroupArn": "string",
  "datasetType": "string",
  "name": "string",
  "schemaArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**datasetGroupArn (p. 114)**

The Amazon Resource Name (ARN) of the dataset group to add the dataset to.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.*:.*:

Required: Yes
datasetType (p. 114)

The type of dataset.

One of the following (case insensitive) values:
- Interactions
- Items
- Users

Type: String

Length Constraints: Maximum length of 256.

Required: Yes

name (p. 114)

The name for the dataset.

Type: String


Pattern: ^[a-zA-Z0-9\-_]*

Required: Yes

schemaArn (p. 114)

The ARN of the schema to associate with the dataset. The schema defines the dataset fields.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:\([a-z\d-]+\):personalize::.*:.+

Required: Yes

Response Syntax

```json
{
  "datasetArn": "string"
}
```

Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

datasetArn (p. 115)

The ARN of the dataset.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:\([a-z\d-]+\):personalize::.*:.+.+
Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

LimitExceededException

The limit on the number of requests per second has been exceeded.

HTTP Status Code: 400

ResourceAlreadyExistsException

The specified resource already exists.

HTTP Status Code: 400

ResourceInUseException

The specified resource is in use.

HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
CreateDatasetGroup
Service: Amazon Personalize

Creates an empty dataset group. A dataset group contains related datasets that supply data for training a model. A dataset group can contain at most three datasets, one for each type of dataset:

- Interactions
- Items
- Users

To train a model (create a solution), a dataset group that contains an Interactions dataset is required. Call CreateDataset (p. 114) to add a dataset to the group.

A dataset group can be in one of the following states:

- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING

To get the status of the dataset group, call DescribeDatasetGroup (p. 156). If the status shows as CREATE FAILED, the response includes a failureReason key, which describes why the creation failed.

**Note**
You must wait until the status of the dataset group is ACTIVE before adding a dataset to the group.

You can specify an AWS Key Management Service (KMS) key to encrypt the datasets in the group. If you specify a KMS key, you must also include an AWS Identity and Access Management (IAM) role that has permission to access the key.

**APIs that require a dataset group ARN in the request**

- CreateDataset (p. 114)
- CreateEventTracker (p. 123)
- CreateSolution (p. 128)

**Related APIs**

- ListDatasetGroups (p. 182)
- DescribeDatasetGroup (p. 156)
- DeleteDatasetGroup (p. 140)

**Request Syntax**

```json
{
    "kmsKeyArn": "string",
    "name": "string",
    "roleArn": "string"
}
```

**Request Parameters**

The request accepts the following data in JSON format.
**kmsKeyArn (p. 117)**

The Amazon Resource Name (ARN) of a KMS key used to encrypt the datasets.

Type: String

Required: No

**name (p. 117)**

The name for the new dataset group.

Type: String


Pattern: ^[a-zA-Z0-9\-\_]*$

Required: Yes

**roleArn (p. 117)**

The ARN of the IAM role that has permissions to access the KMS key. Supplying an IAM role is only valid when also specifying a KMS key.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):iam::\d{12}:role/\?([a-zA-Z0-9-]+,\@\-/]+)

Required: No

**Response Syntax**

```json
{
    "datasetGroupArn": "string"
}
```

**Response Elements**

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

**datasetGroupArn (p. 118)**

The Amazon Resource Name (ARN) of the new dataset group.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize::.*:*:*:*:

**Errors**

**InvalidInputException**

Provide a valid value for the field or parameter.
HTTP Status Code: 400

LimitExceededException

The limit on the number of requests per second has been exceeded.

HTTP Status Code: 400

ResourceAlreadyExistsException

The specified resource already exists.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
CreateDatasetImportJob
Service: Amazon Personalize

Creates a job that imports training data from your data source (an Amazon S3 bucket) to an Amazon Personalize dataset. To allow Amazon Personalize to import the training data, you must specify an AWS Identity and Access Management (IAM) role that has permission to read from the data source.

**Important**
The dataset import job replaces any previous data in the dataset.

**Status**
A dataset import job can be in one of the following states:

- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED

To get the status of the import job, call DescribeDatasetImportJob (p. 158), providing the Amazon Resource Name (ARN) of the dataset import job. The dataset import is complete when the status shows as ACTIVE. If the status shows as CREATE FAILED, the response includes a failureReason key, which describes why the job failed.

**Note**
Importing takes time. You must wait until the status shows as ACTIVE before training a model using the dataset.

**Related APIs**
- ListDatasetImportJobs (p. 184)
- DescribeDatasetImportJob (p. 158)

**Request Syntax**

```json
{
    "datasetArn": "string",
    "dataSource": {
        "dataLocation": "string"
    },
    "jobName": "string",
    "roleArn": "string"
}
```

**Request Parameters**
The request accepts the following data in JSON format.

**datasetArn (p. 120)**
The ARN of the dataset that receives the imported data.

- Type: String
- Length Constraints: Maximum length of 256.
- Pattern: arn:([a-z\d-]+):personalize:.+:.*:+
- Required: Yes

**dataSource (p. 120)**
The Amazon S3 bucket that contains the training data to import.
Type: **DataSource** *(p. 250)* object

**jobName** *(p. 120)*

The name for the dataset import job.

Type: String


Pattern: `^[a-zA-Z0-9][a-zA-Z0-9\-_]*`

Required: Yes

**roleArn** *(p. 120)*

The ARN of the IAM role that has permissions to read from the Amazon S3 data source.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):iam::\d{12}:role/?([a-zA-Z0-9\-_@\d\+]+)`

Required: Yes

**Response Syntax**

```json
{
  "datasetImportJobArn": "string"
}
```

**Response Elements**

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

**datasetImportJobArn** *(p. 121)*

The ARN of the dataset import job.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):personalize:::*::*:*::*:.*`  

**Errors**

**InvalidInputException**

Provide a valid value for the field or parameter.

HTTP Status Code: 400

**LimitExceeded**

The limit on the number of requests per second has been exceeded.
HTTP Status Code: 400  
**ResourceAlreadyExistsException**  
The specified resource already exists.

HTTP Status Code: 400  
**ResourceInUseException**  
The specified resource is in use.

HTTP Status Code: 400  
**ResourceNotFoundException**  
Could not find the specified resource.

HTTP Status Code: 400

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
CreateEventTracker
Service: Amazon Personalize

Create an event tracker that you use when sending event data to the specified dataset group using the PutEvents API.

When Amazon Personalize creates an event tracker, it also creates an event-interactions dataset in the dataset group associated with the event tracker. The event-interactions dataset stores the event data from the PutEvents call. The contents of this dataset are not available to the user.

**Note**
Only one event tracker can be associated with a dataset group. You will get an error if you call CreateEventTracker using the same dataset group as an existing event tracker.

When you send event data you include your tracking ID. The tracking ID identifies the customer and authorizes the customer to send the data.

The event tracker can be in one of the following states:

- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING > DELETE IN_PROGRESS

To get the status of the event tracker, call DescribeEventTracker (p. 160).

**Note**
The event tracker must be in the ACTIVE state before using the tracking ID.

**Related APIs**
- ListEventTrackers (p. 190)
- DescribeEventTracker (p. 160)
- DeleteEventTracker (p. 142)

**Request Syntax**

```json
{
   "datasetGroupArn": "string",
   "name": "string"
}
```

**Request Parameters**
The request accepts the following data in JSON format.

**datasetGroupArn (p. 123)**
The Amazon Resource Name (ARN) of the dataset group that receives the event data.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.*:.*:.

Required: Yes

**name (p. 123)**
The name for the event tracker.
Type: String


Pattern: ^[a-zA-Z0-9\[\]_\-]*

Required: Yes

Response Syntax

```
{
  "eventTrackerArn": "string",
  "trackingId": "string"
}
```

Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

**eventTrackerArn (p. 124)**

The ARN of the event tracker.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+:.*:.*

**trackingId (p. 124)**

The ID of the event tracker. Include this ID in requests to the PutEvents API.

Type: String

Length Constraints: Maximum length of 256.

Errors

**InvalidInputException**

Provide a valid value for the field or parameter.

HTTP Status Code: 400

**LimitExceededException**

The limit on the number of requests per second has been exceeded.

HTTP Status Code: 400

**ResourceAlreadyExistsException**

The specified resource already exists.

HTTP Status Code: 400

**ResourceInUseException**

The specified resource is in use.
HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
CreateSchema
Service: Amazon Personalize

Creates an Amazon Personalize schema from the specified schema string. The schema you create must be in Avro JSON format.

Amazon Personalize recognizes three schema variants. Each schema is associated with a dataset type and has a set of required field and keywords. You specify a schema when you call CreateDataset (p. 114).

For more information on schemas, see Datasets and Schemas.

Related APIs
- ListSchemas (p. 194)
- DescribeSchema (p. 166)
- DeleteSchema (p. 144)

Request Syntax

```json
{
   "name": "string",
   "schema": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**name (p. 126)**

The name for the schema.

Type: String


Pattern: `^[a-zA-Z0-9][a-zA-Z0-9\-\_]*`

Required: Yes

**schema (p. 126)**

A schema in Avro JSON format.

Type: String

Length Constraints: Maximum length of 10000.

Required: Yes

Response Syntax

```json
{
   "schemaArn": "string"
}
```
Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

schemaArn (p. 126)

The Amazon Resource Name (ARN) of the created schema.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+:.+:.

Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

LimitExceededException

The limit on the number of requests per second has been exceeded.

HTTP Status Code: 400

ResourceAlreadyExistsException

The specified resource already exists.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
CreateSolution
Service: Amazon Personalize

Creates the configuration for training a model. A trained model is known as a solution. After the configuration is created, you train the model (create a solution) by calling the CreateSolutionVersion (p. 133) operation. Every time you call CreateSolutionVersion, a new version of the solution is created.

After creating a solution version, you check its accuracy by calling GetSolutionMetrics (p. 174). When you are satisfied with the version, you deploy it using CreateCampaign (p. 111). The campaign provides recommendations to a client through the GetRecommendations API.

To train a model, Amazon Personalize requires training data and a recipe. The training data comes from the dataset group that you provide in the request. A recipe specifies the training algorithm and a feature transformation. You can specify one of the predefined recipes provided by Amazon Personalize. Alternatively, you can specify performAutoML and Amazon Personalize will analyze your data and select the optimum USER_PERSONALIZATION recipe for you.

Status

A solution can be in one of the following states:

- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING > DELETE IN_PROGRESS

To get the status of the solution, call DescribeSolution (p. 168). Wait until the status shows as ACTIVE before calling CreateSolutionVersion.

Related APIs

- ListSolutions (p. 196)
- CreateSolutionVersion (p. 133)
- DescribeSolution (p. 168)
- DeleteSolution (p. 146)

- ListSolutionVersions (p. 199)
- DescribeSolutionVersion (p. 171)

Request Syntax

```json
{
    "datasetGroupArn": "string",
    "eventType": "string",
    "name": "string",
    "performAutoML": boolean,
    "performHPO": boolean,
    "recipeArn": "string",
    "solutionConfig": {
        "algorithmHyperParameters": {
            "string": "string"
        },
        "autoMLConfig": {
            "metricName": "string",
            "recipeList": [ "string" ]
        },
        "eventValueThreshold": "string",
```
"featureTransformationParameters": {
    "string": "string"
},
"hpoConfig": {
    "algorithmHyperParameterRanges": {
        "categoricalHyperParameterRanges": [
            {
                "name": "string",
                "values": ["string"]
            }
        ],
        "continuousHyperParameterRanges": [
            {
                "maxValue": number,
                "minValue": number,
                "name": "string"
            }
        ],
        "integerHyperParameterRanges": [
            {
                "maxValue": number,
                "minValue": number,
                "name": "string"
            }
        ]
    },
    "hpoObjective": {
        "metricName": "string",
        "metricRegex": "string",
        "type": "string"
    },
    "hpoResourceConfig": {
        "maxNumberOfTrainingJobs": "string",
        "maxParallelTrainingJobs": "string"
    }
},

Request Parameters

The request accepts the following data in JSON format.

datasetGroupArn (p. 128)

The Amazon Resource Name (ARN) of the dataset group that provides the training data.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+:.+:.

Required: Yes

eventType (p. 128)

When your have multiple event types (using an EVENT_TYPE schema field), this parameter specifies which event type (for example, 'click' or 'like') is used for training the model.

Type: String

Length Constraints: Maximum length of 256.

Required: No
**name (p. 128)**

The name for the solution.

Type: String


Pattern: ^[a-zA-Z0-9][a-zA-Z0-9-\_]*$

Required: Yes

**performAutoML (p. 128)**

Whether to perform automated machine learning (AutoML). The default is false. For this case, you must specify recipeArn.

When set to true, Amazon Personalize analyzes your training data and selects the optimal USER_PERSONALIZATION recipe and hyperparameters. In this case, you must omit recipeArn. Amazon Personalize determines the optimal recipe by running tests with different values for the hyperparameters. AutoML lengthens the training process as compared to selecting a specific recipe.

Type: Boolean

Required: No

**performHPO (p. 128)**

Whether to perform hyperparameter optimization (HPO) on the specified or selected recipe. The default is false.

When performing AutoML, this parameter is always true and you should not set it to false.

Type: Boolean

Required: No

**recipeArn (p. 128)**

The ARN of the recipe to use for model training. Only specified when performAutoML is false.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+:.*:*:*:*

Required: No

**solutionConfig (p. 128)**

The configuration to use with the solution. When performAutoML is set to true, Amazon Personalize only evaluates the autoMLConfig section of the solution configuration.

Type: SolutionConfig (p. 274) object

Required: No

**Response Syntax**

```json
{
    "solutionArn": "string"
}
```
Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

**solutionArn (p. 130)**

The ARN of the solution.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):personalize:.+:.*:.*`.

Errors

**InvalidInputException**

Provide a valid value for the field or parameter.

HTTP Status Code: 400

**LimitExceededException**

The limit on the number of requests per second has been exceeded.

HTTP Status Code: 400

**ResourceAlreadyExistsException**

The specified resource already exists.

HTTP Status Code: 400

**ResourceInUseException**

The specified resource is in use.

HTTP Status Code: 400

**ResourceNotFoundException**

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
CreateSolutionVersion
Service: Amazon Personalize

Trains or re trains an active solution. A solution is created using the CreateSolution (p. 128) operation and must be in the ACTIVE state before calling CreateSolutionVersion. A new version of the solution is created every time you call this operation.

Status

A solution version can be in one of the following states:

- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED

To get the status of the version, call DescribeSolutionVersion (p. 171). Wait until the status shows as ACTIVE before calling CreateCampaign.

If the status shows as CREATE FAILED, the response includes a failureReason key, which describes why the job failed.

Related APIs

- ListSolutionVersions (p. 199)
- DescribeSolutionVersion (p. 171)
- ListSolutions (p. 196)
- CreateSolution (p. 128)
- DescribeSolution (p. 168)
- DeleteSolution (p. 146)

Request Syntax

```json
{
  "solutionArn": "string",
  "trainingMode": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**solutionArn (p. 133)**

The Amazon Resource Name (ARN) of the solution containing the training configuration information.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+.

Required: Yes

**trainingMode (p. 133)**

The scope of training to be performed when creating the solution version. The FULL option trains the solution version based on the entirety of the input solution's training data, while the UPDATE
option processes only the data that has changed in comparison to the input solution. Choose `UPDATE` when you want to incrementally update your solution version instead of creating an entirely new one.

**Important**
The `UPDATE` option can only be used when you already have an active solution version created from the input solution using the `FULL` option and the input solution was trained with the HRNN-Coldstart Recipe (p. 59) recipe.

Type: String

Valid Values: FULL | UPDATE

Required: No

**Response Syntax**

```
{
    "solutionVersionArn": "string"
}
```

**Response Elements**

If the action is successful, the service sends back an HTTP 200 response. The following data is returned in JSON format by the service.

**solutionVersionArn (p. 134)**

The ARN of the new solution version.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:(\[a-z\d-]+):personalize:.+:\.:\.*

**Errors**

**InvalidInputException**

Provide a valid value for the field or parameter.

HTTP Status Code: 400

**ResourceInUseException**

The specified resource is in use.

HTTP Status Code: 400

**ResourceNotFoundException**

Could not find the specified resource.

HTTP Status Code: 400

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:
• AWS Command Line Interface
• AWS SDK for .NET
• AWS SDK for C++
• AWS SDK for Go
• AWS SDK for Java
• AWS SDK for JavaScript
• AWS SDK for PHP V3
• AWS SDK for Python
• AWS SDK for Ruby V3
DeleteCampaign
Service: Amazon Personalize

Removes a campaign by deleting the solution deployment. The solution that the campaign is based on is not deleted and can be redeployed when needed. A deleted campaign can no longer be specified in a GetRecommendations request. For more information on campaigns, see CreateCampaign (p. 111).

Request Syntax

```json
{
    "campaignArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

campaignArn (p. 136)

The Amazon Resource Name (ARN) of the campaign to delete.

Type: String
Length Constraints: Maximum length of 256.
Pattern: `arn:(\[a-z\d-]+):personalize:*:*:*`.
Required: Yes

Response Elements

If the action is successful, the service sends back an HTTP 200 response with an empty HTTP body.

Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

ResourceInUseException

The specified resource is in use.

HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DeleteDataset
Service: Amazon Personalize

Deletes a dataset. You can't delete a dataset if an associated DatasetImportJob or SolutionVersion is in the CREATE PENDING or IN PROGRESS state. For more information on datasets, see CreateDataset (p. 114).

Request Syntax

```
{
  "datasetArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

datasetArn (p. 138)

The Amazon Resource Name (ARN) of the dataset to delete.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([-a-z\d-]+):personalize:.*:.*:.+

Required: Yes

Response Elements

If the action is successful, the service sends back an HTTP 200 response with an empty HTTP body.

Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

ResourceInUseException

The specified resource is in use.

HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DeleteDatasetGroup
Service: Amazon Personalize

Deletes a dataset group. Before you delete a dataset group, you must delete the following:

- All associated event trackers.
- All associated solutions.
- All datasets in the dataset group.

Request Syntax

```json
{
  "datasetGroupArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

datasetGroupArn (p. 140)

  The ARN of the dataset group to delete.

  Type: String

  Length Constraints: Maximum length of 256.

  Pattern: arn:([a-z\d-]+):personalize:.*:.*:.*

  Required: Yes

Response Elements

If the action is successful, the service sends back an HTTP 200 response with an empty HTTP body.

Errors

InvalidInputException

  Provide a valid value for the field or parameter.

  HTTP Status Code: 400

ResourceInUseException

  The specified resource is in use.

  HTTP Status Code: 400

ResourceNotFoundException

  Could not find the specified resource.

  HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:
• AWS Command Line Interface
• AWS SDK for .NET
• AWS SDK for C++
• AWS SDK for Go
• AWS SDK for Java
• AWS SDK for JavaScript
• AWS SDK for PHP V3
• AWS SDK for Python
• AWS SDK for Ruby V3
DeleteEventTracker
Service: Amazon Personalize

Deletes the event tracker. Does not delete the event-interactions dataset from the associated dataset group. For more information on event trackers, see CreateEventTracker (p. 123).

Request Syntax

```json
{
   "eventTrackerArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**eventTrackerArn (p. 142)**

The Amazon Resource Name (ARN) of the event tracker to delete.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):personalize:.+:.*+`  

Required: Yes

Response Elements

If the action is successful, the service sends back an HTTP 200 response with an empty HTTP body.

Errors

**InvalidInputException**

Provide a valid value for the field or parameter.

HTTP Status Code: 400

**ResourceInUseException**

The specified resource is in use.

HTTP Status Code: 400

**ResourceNotFoundException**

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
• AWS SDK for C++
• AWS SDK for Go
• AWS SDK for Java
• AWS SDK for JavaScript
• AWS SDK for PHP V3
• AWS SDK for Python
• AWS SDK for Ruby V3
DeleteSchema

Service: Amazon Personalize

Deletes a schema. Before deleting a schema, you must delete all datasets referencing the schema. For more information on schemas, see CreateSchema (p. 126).

Request Syntax

```
{
  "schemaArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

schemaArn (p. 144)

The Amazon Resource Name (ARN) of the schema to delete.

- Type: String
- Length Constraints: Maximum length of 256.
- Pattern: arn:([a-z\d-]+):personalize:.+.*+:.+
- Required: Yes

Response Elements

If the action is successful, the service sends back an HTTP 200 response with an empty HTTP body.

Errors

- **InvalidInputException**
  - Provide a valid value for the field or parameter.
  - HTTP Status Code: 400
- **ResourceInUseException**
  - The specified resource is in use.
  - HTTP Status Code: 400
- **ResourceNotFoundException**
  - Could not find the specified resource.
  - HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DeleteSolution
Service: Amazon Personalize

Deletes all versions of a solution and the Solution object itself. Before deleting a solution, you must delete all campaigns based on the solution. To determine what campaigns are using the solution, call ListCampaigns (p. 179) and supply the Amazon Resource Name (ARN) of the solution. You can't delete a solution if an associated SolutionVersion is in the CREATE PENDING or IN PROGRESS state. For more information on solutions, see CreateSolution (p. 128).

Request Syntax

```json
{
  "solutionArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

solutionArn (p. 146)

  The ARN of the solution to delete.

  Type: String

  Length Constraints: Maximum length of 256.

  Pattern: arn:([a-z\d-]+):personalize:.+*:*.*

  Required: Yes

Response Elements

If the action is successful, the service sends back an HTTP 200 response with an empty HTTP body.

Errors

InvalidInputException

  Provide a valid value for the field or parameter.

  HTTP Status Code: 400

ResourceInUseException

  The specified resource is in use.

  HTTP Status Code: 400

ResourceNotFoundException

  Could not find the specified resource.

  HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:
- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DescribeAlgorithm
Service: Amazon Personalize

Describes the given algorithm.

Request Syntax

```json
{
  "algorithmArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

algorithmArn (p. 148)

The Amazon Resource Name (ARN) of the algorithm to describe.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+:*

Required: Yes

Response Syntax

```json
{
  "algorithm": {
    "algorithmArn": "string",
    "algorithmImage": {
      "dockerURI": "string",
      "name": "string"
    },
    "creationDateTime": number,
    "defaultHyperParameterRanges": {
      "categoricalHyperParameterRanges": [?
        {
          "isTunable": boolean,
          "name": "string",
          "values": [ "string" ]
        }?
      ],
      "continuousHyperParameterRanges": [?
        {
          "isTunable": boolean,
          "maxValue": number,
          "minValue": number,
          "name": "string"
        }?
      ],
      "integerHyperParameterRanges": [?
        {
          "isTunable": boolean,
          "maxValue": number,
          "minValue": number,
          "name": "string"
        }?
      ]
    }
  }
}
```
Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

**algorithm (p. 148)**

A listing of the properties of the algorithm.

Type: Algorithm (p. 215) object

**Errors**

**InvalidInputException**

Provide a valid value for the field or parameter.

HTTP Status Code: 400

**ResourceNotFoundException**

Could not find the specified resource.

HTTP Status Code: 400

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DescribeBatchInferenceJob
Service: Amazon Personalize

Gets the properties of a batch inference job including name, Amazon Resource Name (ARN), status, input and output configurations, and the ARN of the solution version used to generate the recommendations.

Request Syntax

```
{
    "batchInferenceJobArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**batchInferenceJobArn** *(p. 150)*

The ARN of the batch inference job to describe.

Type: String

Length Constraints: Maximum length of 256.


Required: Yes

Response Syntax

```
{
    "batchInferenceJob": {
        "batchInferenceJobArn": "string",
        "creationDateTime": number,
        "failureReason": "string",
        "jobInput": {
            "s3DataSource": {
                "kmsKeyArn": "string",
                "path": "string"
            }
        },
        "jobName": "string",
        "jobOutput": {
            "s3DataDestination": {
                "kmsKeyArn": "string",
                "path": "string"
            }
        },
        "lastUpdatedDateTime": number,
        "numResults": number,
        "roleArn": "string",
        "solutionVersionArn": "string",
        "status": "string"
    }
}
```

Response Elements

If the action is successful, the service sends back an HTTP 200 response.
The following data is returned in JSON format by the service.

**batchInferenceJob (p. 150)**

Information on the specified batch inference job.

Type: **BatchInferenceJob (p. 220)** object

**Errors**

**InvalidInputException**

Provide a valid value for the field or parameter.

HTTP Status Code: 400

**ResourceNotFoundException**

Could not find the specified resource.

HTTP Status Code: 400

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DescribeCampaign
Service: Amazon Personalize

Describes the given campaign, including its status.

A campaign can be in one of the following states:

- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING > DELETE IN_PROGRESS

When the status is CREATE FAILED, the response includes the failureReason key, which describes why.

For more information on campaigns, see CreateCampaign (p. 111).

Request Syntax

```
{
  "campaignArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

campaignArn (p. 152)

The Amazon Resource Name (ARN) of the campaign.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d\-]+):personalize:.*:.*:.+

Required: Yes

Response Syntax

```
{
  "campaign": {
    "campaignArn": "string",
    "creationDateTime": number,
    "failureReason": "string",
    "lastUpdatedDateTime": number,
    "latestCampaignUpdate": {
      "creationDateTime": number,
      "failureReason": "string",
      "lastUpdatedDateTime": number,
      "minProvisionedTPS": number,
      "solutionVersionArn": "string",
      "status": "string"
    },
    "minProvisionedTPS": number,
    "name": "string",
    "solutionVersionArn": "string",
    "status": "string"
  }
}
```
Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

campaign (p. 152)

The properties of the campaign.

Type: Campaign (p. 227) object

Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DescribeDataset
Service: Amazon Personalize

Describes the given dataset. For more information on datasets, see CreateDataset (p. 114).

Request Syntax

```
{
   "datasetArn": "string"
}
```

Request Parameters
The request accepts the following data in JSON format.

datasetArn (p. 154)
   The Amazon Resource Name (ARN) of the dataset to describe.
   Type: String
   Length Constraints: Maximum length of 256.
   Pattern: arn:([a-z\d-]+):personalize:.+:.*+:.
   Required: Yes

Response Syntax

```
{
   "dataset": {
      "creationDateTime": number,
      "datasetArn": "string",
      "datasetGroupArn": "string",
      "datasetType": "string",
      "lastUpdatedDateTime": number,
      "name": "string",
      "schemaArn": "string",
      "status": "string"
   }
}
```

Response Elements
If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

dataset (p. 154)
   A listing of the dataset's properties.
   Type: Dataset (p. 235) object

Errors

InvalidInputException
   Provide a valid value for the field or parameter.
HTTP Status Code: 400

**ResourceNotFoundException**

Could not find the specified resource.

HTTP Status Code: 400

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DescribeDatasetGroup
Service: Amazon Personalize

Describes the given dataset group. For more information on dataset groups, see CreateDatasetGroup (p. 117).

Request Syntax

```json
{
   "datasetGroupArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

datasetGroupArn (p. 156)

The Amazon Resource Name (ARN) of the dataset group to describe.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.*:.*:.*

Required: Yes

Response Syntax

```json
{
   "datasetGroup": {
       "creationDateTime": number,
       "datasetGroupArn": "string",
       "failureReason": "string",
       "kmsKeyArn": "string",
       "lastUpdatedDateTime": number,
       "name": "string",
       "roleArn": "string",
       "status": "string"
   }
}
```

Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

datasetGroup (p. 156)

A listing of the dataset group's properties.

Type: DatasetGroup (p. 237) object
Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DescribeDatasetImportJob
Service: Amazon Personalize

Describes the dataset import job created by CreateDatasetImportJob (p. 120), including the import job status.

Request Syntax

```json
{
  "datasetImportJobArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

datasetImportJobArn (p. 158)

The Amazon Resource Name (ARN) of the dataset import job to describe.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.*:.*:.+

Required: Yes

Response Syntax

```json
{
  "datasetImportJob": {
    "creationDateTime": number,
    "datasetArn": "string",
    "datasetImportJobArn": "string",
    "dataSource": {
      "dataLocation": "string"
    },
    "failureReason": "string",
    "jobName": "string",
    "lastUpdatedDateTime": number,
    "roleArn": "string",
    "status": "string"
  }
}
```

Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

datasetImportJob (p. 158)

Information about the dataset import job, including the status.

The status is one of the following values:

- CREATE PENDING
• CREATE_IN_PROGRESS
• ACTIVE
• CREATE_FAILED

Type: DatasetImportJob (p. 241) object

Errors

InvalidInputException

Provide a valid value for the field or parameter.
HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.
HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

• AWS Command Line Interface
• AWS SDK for .NET
• AWS SDK for C++
• AWS SDK for Go
• AWS SDK for Java
• AWS SDK for JavaScript
• AWS SDK for PHP V3
• AWS SDK for Python
• AWS SDK for Ruby V3
DescribeEventTracker
Service: Amazon Personalize

Describes an event tracker. The response includes the trackingId and status of the event tracker. For more information on event trackers, see CreateEventTracker (p. 123).

Request Syntax

```
{
  "eventTrackerArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**eventTrackerArn (p. 160)**

The Amazon Resource Name (ARN) of the event tracker to describe.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):personalize:.+:.*+:.*+`

Required: Yes

Response Syntax

```
{
  "eventTracker": {
    "accountId": "string",
    "creationDateTime": number,
    "datasetGroupArn": "string",
    "eventTrackerArn": "string",
    "lastUpdatedDateTime": number,
    "name": "string",
    "status": "string",
    "trackingId": "string"
  }
}
```

Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

**eventTracker (p. 160)**

An object that describes the event tracker.

Type: EventTracker (p. 255) object
Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DescribeFeatureTransformation
Service: Amazon Personalize

Describes the given feature transformation.

Request Syntax

```json
{
   "featureTransformationArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

featureTransformationArn (p. 162)

The Amazon Resource Name (ARN) of the feature transformation to describe.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.*:.*:.*

Required: Yes

Response Syntax

```json
{
   "featureTransformation": {
      "creationDateTime": number,
      "defaultParameters": {
         "string" : "string"
      },
      "featureTransformationArn": "string",
      "lastUpdatedDateTime": number,
      "name": "string",
      "status": "string"
   }
}
```

Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

featureTransformation (p. 162)

A listing of the FeatureTransformation properties.

Type: FeatureTransformation (p. 259) object

Errors

InvalidInputException

Provide a valid value for the field or parameter.
HTTP Status Code: 400

**ResourceNotFoundException**

Could not find the specified resource.

HTTP Status Code: 400

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DescribeRecipe
Service: Amazon Personalize

Describes a recipe.

A recipe contains three items:

- An algorithm that trains a model.
- Hyperparameters that govern the training.
- Feature transformation information for modifying the input data before training.

Amazon Personalize provides a set of predefined recipes. You specify a recipe when you create a solution with the CreateSolution (p. 128) API. CreateSolution trains a model by using the algorithm in the specified recipe and a training dataset. The solution, when deployed as a campaign, can provide recommendations using the GetRecommendations API.

Request Syntax

```
{
  "recipeArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**recipeArn (p. 164)**

The Amazon Resource Name (ARN) of the recipe to describe.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+:.*:+

Required: Yes

Response Syntax

```
{
  "recipe": {
    "algorithmArn": "string",
    "creationDateTime": number,
    "description": "string",
    "featureTransformationArn": "string",
    "lastUpdatedDateTime": number,
    "name": "string",
    "recipeArn": "string",
    "recipeType": "string",
    "status": "string"
  }
}
```

Response Elements

If the action is successful, the service sends back an HTTP 200 response.
The following data is returned in JSON format by the service.

**recipe (p. 164)**

An object that describes the recipe.

Type: Recipe (p. 266) object

**Errors**

**InvalidInputException**

Provide a valid value for the field or parameter.

HTTP Status Code: 400

**ResourceNotFoundException**

Could not find the specified resource.

HTTP Status Code: 400

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DescribeSchema
Service: Amazon Personalize

Describes a schema. For more information on schemas, see CreateSchema (p. 126).

Request Syntax

```json
{
   "schemaArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**schemaArn (p. 166)**

The Amazon Resource Name (ARN) of the schema to retrieve.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):personalize:.+:.*:+`

Required: Yes

Response Syntax

```json
{
   "schema": {
      "creationDateTime": number,
      "lastUpdatedDateTime": number,
      "name": "string",
      "schema": "string",
      "schemaArn": "string"
   }
}
```

Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

**schema (p. 166)**

The requested schema.

Type: DatasetSchema (p. 245) object

Errors

**InvalidInputException**

Provide a valid value for the field or parameter.
HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DescribeSolution
Service: Amazon Personalize

Describes a solution. For more information on solutions, see CreateSolution (p. 128).

Request Syntax

```
{
  "solutionArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**solutionArn (p. 168)**

The Amazon Resource Name (ARN) of the solution to describe.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+:.*+:.

Required: Yes

Response Syntax

```
{
  "solution": {
    "autoMLResult": {
      "bestRecipeArn": "string"
    },
    "creationDateTime": number,
    "datasetGroupArn": "string",
    "eventType": "string",
    "lastUpdatedDateTime": number,
    "latestSolutionVersion": {
      "creationDateTime": number,
      "failureReason": "string",
      "lastUpdatedDateTime": number,
      "solutionVersionArn": "string",
      "status": "string"
    },
    "name": "string",
    "performAutoML": boolean,
    "performHPO": boolean,
    "recipeArn": "string",
    "solutionArn": "string",
    "solutionConfig": {
      "algorithmHyperParameters": {
        "string": "string"
      },
      "autoMLConfig": {
        "metricName": "string",
        "recipeList": [ "string" ]
      },
      "eventValueThreshold": "string",
      "featureTransformationParameters": {
      };
```
"string" : "string"
},
"hpoConfig": {
"algorithmHyperParameterRanges": {
"categoricalHyperParameterRanges": [
{
"name": "string",
"values": [ "string" ]
}
],
"continuousHyperParameterRanges": [
{
"maxValue": number,
"minValue": number,
"name": "string"
}
],
"integerHyperParameterRanges": [
{
"maxValue": number,
"minValue": number,
"name": "string"
}
]
},
"hpoObjective": {
"metricName": "string",
"metricRegex": "string",
"type": "string"
},
"hpoResourceConfig": {
"maxNumberOfTrainingJobs": "string",
"maxParallelTrainingJobs": "string"
}
},
"status": "string"
}

Response Elements
If the action is successful, the service sends back an HTTP 200 response.
The following data is returned in JSON format by the service.

solution (p. 168)

An object that describes the solution.

Type: Solution (p. 271) object

Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.
HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
DescribeSolutionVersion

Service: Amazon Personalize

Describes a specific version of a solution. For more information on solutions, see CreateSolution (p. 128).

Request Syntax

```json
{
    "solutionVersionArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

solutionVersionArn (p. 171)

The Amazon Resource Name (ARN) of the solution version.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+.*.+

Required: Yes

Response Syntax

```json
{
    "solutionVersion": {
        "creationDateTime": number,
        "datasetGroupArn": "string",
        "eventType": "string",
        "failureReason": "string",
        "lastUpdatedDateTime": number,
        "performAutoML": boolean,
        "performHPO": boolean,
        "recipeArn": "string",
        "solutionArn": "string",
        "solutionConfig": {
            "algorithmHyperParameters": {
                "string": "string"
            },
            "autoMLConfig": {
                "metricName": "string",
                "recipeList": ["string"]
            },
            "eventValueThreshold": "string",
            "featureTransformationParameters": {
                "string": "string"
            },
            "hpoConfig": {
                "algorithmHyperParameterRanges": {
                    "categoricalHyperParameterRanges": [
                        {
                            "name": "string",
                            "values": ["string"]
                        }
                    ]
                }
            }
        }
    }
}
```
"continuousHyperParameterRanges": [
  {
    "maxValue": number,
    "minValue": number,
    "name": "string"
  }
],
"integerHyperParameterRanges": [
  {
    "maxValue": number,
    "minValue": number,
    "name": "string"
  }
],
"hpoObjective": {
  "metricName": "string",
  "metricRegex": "string",
  "type": "string"
},
"hpoResourceConfig": {
  "maxNumberOfTrainingJobs": "string",
  "maxParallelTrainingJobs": "string"
},
"solutionVersionArn": "string",
"status": "string",
"trainingHours": number,
"trainingMode": "string",
"tunedHPOParams": {
  "algorithmHyperParameters": {
    "string": "string"
  }
}
}

**Response Elements**

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

**solutionVersion (p. 171)**

The solution version.

Type: SolutionVersion (p. 278) object

**Errors**

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.

HTTP Status Code: 400
See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
GetSolutionMetrics
Service: Amazon Personalize

Gets the metrics for the specified solution version.

Request Syntax

```json
{
   "solutionVersionArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

solutionVersionArn (p. 174)

The Amazon Resource Name (ARN) of the solution version for which to get metrics.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):personalize:.+:*:.*:`

Required: Yes

Response Syntax

```json
{
   "metrics": {
      "string": number,
      "solutionVersionArn": "string"
   }
}
```

Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

metrics (p. 174)

The metrics for the solution version.

Type: String to double map

Key Length Constraints: Maximum length of 256.

solutionVersionArn (p. 174)

The same solution version ARN as specified in the request.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):personalize:.+:*:.*:`
Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

ResourceInUseException

The specified resource is in use.

HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
ListBatchInferenceJobs
Service: Amazon Personalize

Gets a list of the batch inference jobs that have been performed off of a solution version.

Request Syntax

```plaintext
{
    "maxResults": number,
    "nextToken": "string",
    "solutionVersionArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

maxResults (p. 176)

The maximum number of batch inference job results to return in each page. The default value is 100.

Type: Integer

Valid Range: Minimum value of 1. Maximum value of 100.

Required: No

nextToken (p. 176)

The token to request the next page of results.

Type: String

Length Constraints: Maximum length of 1300.

Required: No

solutionVersionArn (p. 176)

The Amazon Resource Name (ARN) of the solution version from which the batch inference jobs were created.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([^a-z\d-]+):personalize:.+:.+:.

Required: No

Response Syntax

```plaintext`

```
Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

batchInferenceJobs (p. 176)
A list containing information on each job that is returned.
Type: Array of BatchInferenceJobSummary (p. 225) objects
Array Members: Maximum number of 100 items.

nextToken (p. 176)
The token to use to retrieve the next page of results. The value is null when there are no more results to return.
Type: String
Length Constraints: Maximum length of 1300.

Errors

InvalidInputException
Provide a valid value for the field or parameter.
HTTP Status Code: 400

InvalidNextTokenException
The token is not valid.
HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
ListCampaigns
Service: Amazon Personalize

Returns a list of campaigns that use the given solution. When a solution is not specified, all the campaigns associated with the account are listed. The response provides the properties for each campaign, including the Amazon Resource Name (ARN). For more information on campaigns, see CreateCampaign (p. 111).

Request Syntax

```json
{
  "maxResults": number,
  "nextToken": "string",
  "solutionArn": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**maxResults (p. 179)**

The maximum number of campaigns to return.

Type: Integer

Valid Range: Minimum value of 1. Maximum value of 100.

Required: No

**nextToken (p. 179)**

A token returned from the previous call to ListCampaigns for getting the next set of campaigns (if they exist).

Type: String

Length Constraints: Maximum length of 1300.

Required: No

**solutionArn (p. 179)**

The Amazon Resource Name (ARN) of the solution to list the campaigns for. When a solution is not specified, all the campaigns associated with the account are listed.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+.*:.*

Required: No

Response Syntax

```json
{
  "campaigns": [ 
    {
      "campaignArn": "string",
    },
  ]
}
```
Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

campaigns (p. 179)

A list of the campaigns.

Type: Array of CampaignSummary (p. 229) objects

Array Members: Maximum number of 100 items.

nextToken (p. 179)

A token for getting the next set of campaigns (if they exist).

Type: String

Length Constraints: Maximum length of 1300.

Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

InvalidNextTokenException

The token is not valid.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
• AWS SDK for Ruby V3
ListDatasetGroups
Service: Amazon Personalize

Returns a list of dataset groups. The response provides the properties for each dataset group, including the Amazon Resource Name (ARN). For more information on dataset groups, see CreateDatasetGroup (p. 117).

Request Syntax

```
{
    "maxResults": number,
    "nextToken": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**maxResults** (p. 182)

The maximum number of dataset groups to return.

Type: Integer

Valid Range: Minimum value of 1. Maximum value of 100.

Required: No

**nextToken** (p. 182)

A token returned from the previous call to ListDatasetGroups for getting the next set of dataset groups (if they exist).

Type: String

Length Constraints: Maximum length of 1300.

Required: No

Response Syntax

```
{
    "datasetGroups": [
        {
            "creationDateTime": number,
            "datasetGroupArn": "string",
            "failureReason": "string",
            "lastUpdatedDateTime": number,
            "name": "string",
            "status": "string"
        }
    ],
    "nextToken": "string"
}
```

Response Elements

If the action is successful, the service sends back an HTTP 200 response.
The following data is returned in JSON format by the service.

**datasetGroups (p. 182)**

The list of your dataset groups.

Type: Array of DatasetGroupSummary (p. 239) objects

Array Members: Maximum number of 100 items.

**nextToken (p. 182)**

A token for getting the next set of dataset groups (if they exist).

Type: String

Length Constraints: Maximum length of 1300.

**Errors**

**InvalidNextTokenException**

The token is not valid.

HTTP Status Code: 400

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
**ListDatasetImportJobs**  
Service: Amazon Personalize

Returns a list of dataset import jobs that use the given dataset. When a dataset is not specified, all the dataset import jobs associated with the account are listed. The response provides the properties for each dataset import job, including the Amazon Resource Name (ARN). For more information on dataset import jobs, see *CreateDatasetImportJob* (p. 120). For more information on datasets, see *CreateDataset* (p. 114).

**Request Syntax**

```json
{
    "datasetArn": "string",
    "maxResults": number,
    "nextToken": "string"
}
```

**Request Parameters**

The request accepts the following data in JSON format.

**datasetArn (p. 184)**

The Amazon Resource Name (ARN) of the dataset to list the dataset import jobs for.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):personalize:.*:.*:.*`  

Required: No

**maxResults (p. 184)**

The maximum number of dataset import jobs to return.

Type: Integer

Valid Range: Minimum value of 1. Maximum value of 100.

Required: No

**nextToken (p. 184)**

A token returned from the previous call to *ListDatasetImportJobs* for getting the next set of dataset import jobs (if they exist).

Type: String

Length Constraints: Maximum length of 1300.

Required: No

**Response Syntax**

```json
{
    "datasetImportJobs": [  
        {  
            "creationDateTime": number,
            ...
        }
    ]
}
```
"datasetImportJobArn": "string",
"failureReason": "string",
"jobName": "string",
"lastUpdatedDateTime": number,
"status": "string"
}

"nextToken": "string"
}

Response Elements

If the action is successful, the service sends back an HTTP 200 response. The following data is returned in JSON format by the service.

datasetImportJobs (p. 184)

The list of dataset import jobs.

Type: Array of DatasetImportJobSummary (p. 243) objects

Array Members: Maximum number of 100 items.

nextToken (p. 184)

A token for getting the next set of dataset import jobs (if they exist).

Type: String

Length Constraints: Maximum length of 1300.

Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

InvalidNextTokenException

The token is not valid.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
• AWS SDK for Ruby V3
ListDatasets
Service: Amazon Personalize

Returns the list of datasets contained in the given dataset group. The response provides the properties for each dataset, including the Amazon Resource Name (ARN). For more information on datasets, see CreateDataset (p. 114).

Request Syntax

```json
{
    "datasetGroupArn": "string",
    "maxResults": number,
    "nextToken": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

datasetGroupArn (p. 187)

- The Amazon Resource Name (ARN) of the dataset group that contains the datasets to list.
- Type: String
- Length Constraints: Maximum length of 256.
- Pattern: arn:([a-zA-Z\d-]+):personalize:.+:.*+.
- Required: No

maxResults (p. 187)

- The maximum number of datasets to return.
- Type: Integer
- Valid Range: Minimum value of 1. Maximum value of 100.
- Required: No

nextToken (p. 187)

- A token returned from the previous call to ListDatasetImportJobs for getting the next set of dataset import jobs (if they exist).
- Type: String
- Length Constraints: Maximum length of 1300.
- Required: No

Response Syntax

```json
{
    "datasets": [
        {
            "creationDateTime": number,
            "datasetArn": "string",
            "datasetType": "string"
        }
    ]
}
```
Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

datasets (p. 187)

An array of Dataset objects. Each object provides metadata information.

Type: Array of DatasetSummary (p. 248) objects

Array Members: Maximum number of 100 items.

nextToken (p. 187)

A token for getting the next set of datasets (if they exist).

Type: String

Length Constraints: Maximum length of 1300.

Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

InvalidNextTokenException

The token is not valid.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
**ListEventTrackers**

Service: Amazon Personalize

Returns the list of event trackers associated with the account. The response provides the properties for each event tracker, including the Amazon Resource Name (ARN) and tracking ID. For more information on event trackers, see CreateEventTracker (p. 123).

**Request Syntax**

```json
{
   "datasetGroupArn": "string",
   "maxResults": number,
   "nextToken": "string"
}
```

**Request Parameters**

The request accepts the following data in JSON format.

**datasetGroupArn (p. 190)**

The ARN of a dataset group used to filter the response.

- Type: String
- Length Constraints: Maximum length of 256.
- Pattern: `arn:([a-z\d-]+):personalize:.*:.*:.+`
- Required: No

**maxResults (p. 190)**

The maximum number of event trackers to return.

- Type: Integer
- Valid Range: Minimum value of 1. Maximum value of 100.
- Required: No

**nextToken (p. 190)**

A token returned from the previous call to ListEventTrackers for getting the next set of event trackers (if they exist).

- Type: String
- Length Constraints: Maximum length of 1300.
- Required: No

**Response Syntax**

```json
{
   "eventTrackers": [
   {
      "creationDateTime": number,
      "eventTrackerArn": "string",
      "lastUpdatedDateTime": number,
```

190
Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

eventTrackers (p. 190)

A list of event trackers.

Type: Array of EventTrackerSummary (p. 257) objects

Array Members: Maximum number of 100 items.

nextToken (p. 190)

A token for getting the next set of event trackers (if they exist).

Type: String

Length Constraints: Maximum length of 1300.

Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

InvalidNextTokenException

The token is not valid.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
ListRecipes
Service: Amazon Personalize

Returns a list of available recipes. The response provides the properties for each recipe, including the recipe's Amazon Resource Name (ARN).

Request Syntax

```json
{
    "maxResults": number,
    "nextToken": "string",
    "recipeProvider": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**maxResults (p. 192)**

- The maximum number of recipes to return.
- Type: Integer
- Valid Range: Minimum value of 1. Maximum value of 100.
- Required: No

**nextToken (p. 192)**

- A token returned from the previous call to ListRecipes for getting the next set of recipes (if they exist).
- Type: String
- Length Constraints: Maximum length of 1300.
- Required: No

**recipeProvider (p. 192)**

- The default is SERVICE.
- Type: String
- Valid Values: SERVICE
- Required: No

Response Syntax

```json
{
    "nextToken": "string",
    "recipes": [
    {
        "creationDateTime": number,
        "lastUpdatedDateTime": number,
        "name": "string",
        "recipeArn": "string",
        "status": "string"
    }
    ]
}
```
Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

nextToken (p. 192)

A token for getting the next set of recipes.

Type: String

Length Constraints: Maximum length of 1300.

recipes (p. 192)

The list of available recipes.

Type: Array of RecipeSummary (p. 268) objects

Array Members: Maximum number of 100 items.

Errors

InvalidNextTokenException

The token is not valid.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
ListSchemas
Service: Amazon Personalize

Returns the list of schemas associated with the account. The response provides the properties for each schema, including the Amazon Resource Name (ARN). For more information on schemas, see CreateSchema (p. 126).

Request Syntax

```json
{
    "maxResults": number,
    "nextToken": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

**maxResults (p. 194)**

The maximum number of schemas to return.

Type: Integer

Valid Range: Minimum value of 1. Maximum value of 100.

Required: No

**nextToken (p. 194)**

A token returned from the previous call to ListSchemas for getting the next set of schemas (if they exist).

Type: String

Length Constraints: Maximum length of 1300.

Required: No

Response Syntax

```json
{
    "nextToken": "string",
    "schemas": [
        {
            "creationDateTime": number,
            "lastUpdatedDateTime": number,
            "name": "string",
            "schemaArn": "string"
        }
    ]
}
```

Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.
nextToken (p. 194)
A token used to get the next set of schemas (if they exist).
Type: String
Length Constraints: Maximum length of 1300.
schemas (p. 194)
A list of schemas.
Type: Array of DatasetSchemaSummary (p. 247) objects
Array Members: Maximum number of 100 items.

Errors
InvalidNextTokenException
The token is not valid.
HTTP Status Code: 400

See Also
For more information about using this API in one of the language-specific AWS SDKs, see the following:
- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
ListSolutions
Service: Amazon Personalize

Returns a list of solutions that use the given dataset group. When a dataset group is not specified, all the solutions associated with the account are listed. The response provides the properties for each solution, including the Amazon Resource Name (ARN). For more information on solutions, see CreateSolution (p. 128).

Request Syntax

```json
{
    "datasetGroupArn": "string",
    "maxResults": number,
    "nextToken": "string"
}
```

Request Parameters

The request accepts the following data in JSON format.

datasetGroupArn (p. 196)

The Amazon Resource Name (ARN) of the dataset group.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-zA-Z0-9-]+):personalize:.+\:\.*\:\.*\:\.*

Required: No

maxResults (p. 196)

The maximum number of solutions to return.

Type: Integer

Valid Range: Minimum value of 1. Maximum value of 100.

Required: No

nextToken (p. 196)

A token returned from the previous call to ListSolutions for getting the next set of solutions (if they exist).

Type: String

Length Constraints: Maximum length of 1300.

Required: No

Response Syntax

```json
{
    "nextToken": "string",
    "solutions": [
    
    ]
}
```
Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

nextToken (p. 196)

A token for getting the next set of solutions (if they exist).

Type: String

Length Constraints: Maximum length of 1300.

solutions (p. 196)

A list of the current solutions.

Type: Array of SolutionSummary (p. 276) objects

Array Members: Maximum number of 100 items.

Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

InvalidNextTokenException

The token is not valid.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
**ListSolutionVersions**  
Service: Amazon Personalize

Returns a list of solution versions for the given solution. When a solution is not specified, all the solution versions associated with the account are listed. The response provides the properties for each solution version, including the Amazon Resource Name (ARN). For more information on solutions, see [CreateSolution](p. 128).

**Request Syntax**

```
{
    "maxResults": number,
    "nextToken": "string",
    "solutionArn": "string"
}
```

**Request Parameters**

The request accepts the following data in JSON format.

- **maxResults (p. 199)**
  
  The maximum number of solution versions to return.
  
  Type: Integer
  
  Valid Range: Minimum value of 1. Maximum value of 100.
  
  Required: No

- **nextToken (p. 199)**
  
  A token returned from the previous call to `ListSolutionVersions` for getting the next set of solution versions (if they exist).
  
  Type: String
  
  Length Constraints: Maximum length of 1300.
  
  Required: No

- **solutionArn (p. 199)**
  
  The Amazon Resource Name (ARN) of the solution.
  
  Type: String
  
  Length Constraints: Maximum length of 256.
  
  Pattern: `arn:(\[a-z\d-]+):personalize:.+:.*:.*`  

  Required: No

**Response Syntax**

```
{
    "nextToken": "string",
    "solutionVersions": [
        
    ]
```

"creationDateTime": number,
Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

nextToken (p. 199)

A token for getting the next set of solution versions (if they exist).

Type: String

Length Constraints: Maximum length of 1300.

solutionVersions (p. 199)

A list of solution versions describing the version properties.

Type: Array of SolutionVersionSummary (p. 281) objects

Array Members: Maximum number of 100 items.

Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

InvalidNextTokenException

The token is not valid.

HTTP Status Code: 400

ResourceNotFoundException

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
• AWS SDK for PHP V3
• AWS SDK for Python
• AWS SDK for Ruby V3
**UpdateCampaign**  
Service: Amazon Personalize

Updates a campaign by either deploying a new solution or changing the value of the campaign's minProvisionedTPS parameter.

To update a campaign, the campaign status must be ACTIVE or CREATE FAILED. Check the campaign status using the DescribeCampaign (p. 152) API.

**Note**
You must wait until the status of the updated campaign is ACTIVE before asking the campaign for recommendations.

For more information on campaigns, see CreateCampaign (p. 111).

**Request Syntax**

```
{
    "campaignArn": "string",
    "minProvisionedTPS": number,
    "solutionVersionArn": "string"
}
```

**Request Parameters**

The request accepts the following data in JSON format.

- **campaignArn (p. 202)**
  The Amazon Resource Name (ARN) of the campaign.
  
  Type: String
  
  Length Constraints: Maximum length of 256.
  
  Pattern: arn:([a-z\d-]+):personalize:.+:.*:*.*
  
  Required: Yes

- **minProvisionedTPS (p. 202)**
  Specifies the requested minimum provisioned transactions (recommendations) per second that Amazon Personalize will support.
  
  Type: Integer
  
  Valid Range: Minimum value of 1.
  
  Required: No

- **solutionVersionArn (p. 202)**
  The ARN of a new solution version to deploy.
  
  Type: String
  
  Length Constraints: Maximum length of 256.
  
  Pattern: arn:([a-z\d-]+):personalize:.+:.*:*.*
  
  Required: No
Response Syntax

```
{
  "campaignArn": "string"
}
```

Response Elements

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

**campaignArn (p. 203)**

The same campaign ARN as given in the request.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):personalize:.+:.*:+`

Errors

**InvalidInputException**

Provide a valid value for the field or parameter.

HTTP Status Code: 400

**ResourceInUseException**

The specified resource is in use.

HTTP Status Code: 400

**ResourceNotFoundException**

Could not find the specified resource.

HTTP Status Code: 400

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
Amazon Personalize Events

The following actions are supported by Amazon Personalize Events:

- PutEvents (p. 205)
**PutEvents**  
Service: Amazon Personalize Events  
Records user interaction event data.

**Request Syntax**

```
POST /events HTTP/1.1
Content-type: application/json

{
    "eventList": [
        {
            "eventId": "string",
            "eventType": "string",
            "properties": "string",
            "sentAt": number
        }
    ],
    "sessionId": "string",
    "trackingId": "string",
    "userId": "string"
}
```

**URI Request Parameters**

The request does not use any URI parameters.

**Request Body**

The request accepts the following data in JSON format.

**eventList (p. 205)**

A list of event data from the session.

Type: Array of Event (p. 284) objects

Array Members: Minimum number of 1 item. Maximum number of 10 items.

Required: Yes

**sessionId (p. 205)**

The session ID associated with the user’s visit.

Type: String

Length Constraints: Minimum length of 1. Maximum length of 256.

Required: Yes

**trackingId (p. 205)**

The tracking ID for the event. The ID is generated by a call to the CreateEventTracker API.

Type: String

Length Constraints: Minimum length of 1. Maximum length of 256.

Required: Yes
**userid (p. 205)**

The user associated with the event.

Type: String

Length Constraints: Minimum length of 1. Maximum length of 256.

Required: No

### Response Syntax

```
HTTP/1.1 200
```

### Response Elements

If the action is successful, the service sends back an HTTP 200 response with an empty HTTP body.

### Errors

**InvalidInputException**

Provide a valid value for the field or parameter.

HTTP Status Code: 400

### See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3

### Amazon Personalize Runtime

The following actions are supported by Amazon Personalize Runtime:

- GetPersonalizedRanking (p. 207)
- GetRecommendations (p. 210)
GetPersonalizedRanking
Service: Amazon Personalize Runtime

Re-ranks a list of recommended items for the given user. The first item in the list is deemed the most likely item to be of interest to the user.

**Note**
The solution backing the campaign must have been created using a recipe of type PERSONALIZED_RANKING.

**Request Syntax**

```plaintext
POST /personalize-ranking HTTP/1.1
Content-type: application/json
{
  "campaignArn": "string",
  "context": {
    "String": "string"
  },
  "inputList": [ "string" ],
  "userId": "string"
}
```

**URI Request Parameters**
The request does not use any URI parameters.

**Request Body**
The request accepts the following data in JSON format.

- **campaignArn (p. 207)**
  - The Amazon Resource Name (ARN) of the campaign to use for generating the personalized ranking.
  - Type: String
  - Length Constraints: Maximum length of 256.
  - Pattern: `arn:(\[a-z\d-]+):personalize:.+:.*+.+
  - Required: Yes

- **context (p. 207)**
  - The contextual metadata to use when getting recommendations. Contextual metadata includes any interaction information that might be relevant when getting a user's recommendations, such as the user's current location or device type.
  - Type: String to string map
  - Key Length Constraints: Maximum length of 150.
  - Key Pattern: `[A-Za-z\d_]`
  - Value Length Constraints: Maximum length of 1000.
  - Required: No
**inputList (p. 207)**

A list of items (itemId's) to rank. If an item was not included in the training dataset, the item is appended to the end of the reranked list. The maximum is 500.

Type: Array of strings

Length Constraints: Maximum length of 256.

Required: Yes

**userId (p. 207)**

The user for which you want the campaign to provide a personalized ranking.

Type: String

Length Constraints: Maximum length of 256.

Required: Yes

**Response Syntax**

HTTP/1.1 200
Content-type: application/json

```json
{
   "personalizedRanking": [
      {
         "itemId": "string",
         "score": number
      }
   ]
}
```

**Response Elements**

If the action is successful, the service sends back an HTTP 200 response.

The following data is returned in JSON format by the service.

**personalizedRanking (p. 208)**

A list of items in order of most likely interest to the user. The maximum is 500.

Type: Array of PredictedItem (p. 286) objects

**Errors**

**InvalidInputException**

Provide a valid value for the field or parameter.

HTTP Status Code: 400

**ResourceNotFoundException**

The specified resource does not exist.

HTTP Status Code: 404
See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3
GetRecommendations
Service: Amazon Personalize Runtime

Returns a list of recommended items. The required input depends on the recipe type used to create the solution backing the campaign, as follows:

- RELATED_ITEMS - itemId required, userId not used
- USER_PERSONALIZATION - itemId optional, userId required

Note
Campaigns that are backed by a solution created using a recipe of type PERSONALIZED_RANKING use the GetPersonalizedRanking (p. 207) API.

Request Syntax

```
POST /recommendations HTTP/1.1
Content-type: application/json

{
  "campaignArn": "string",
  "context": {
    "string": "string"
  },
  "itemId": "string",
  "numResults": number,
  "userId": "string"
}
```

URI Request Parameters

The request does not use any URI parameters.

Request Body

The request accepts the following data in JSON format.

campaignArn (p. 210)

The Amazon Resource Name (ARN) of the campaign to use for getting recommendations.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+:.*.*+.

Required: Yes
c

context (p. 210)

The contextual metadata to use when getting recommendations. Contextual metadata includes any interaction information that might be relevant when getting a user's recommendations, such as the user's current location or device type.

Type: String to string map

Key Length Constraints: Maximum length of 150.

Key Pattern: [A-Za-z\d_.]+$
Value Length Constraints: Maximum length of 1000.
Required: No

**itemId (p. 210)**

The item ID to provide recommendations for.
Required for RELATED_ITEMS recipe type.
Type: String
Length Constraints: Maximum length of 256.
Required: No

**numResults (p. 210)**

The number of results to return. The default is 25. The maximum is 500.
Type: Integer
Valid Range: Minimum value of 0.
Required: No

**userId (p. 210)**

The user ID to provide recommendations for.
Required for USER_PERSONALIZATION recipe type.
Type: String
Length Constraints: Maximum length of 256.
Required: No

**Response Syntax**

```
HTTP/1.1 200
Content-type: application/json

{
   "itemList": [
      {
         "itemId": "string",
         "score": number
      }
   ]
}
```

**Response Elements**

If the action is successful, the service sends back an HTTP 200 response.
The following data is returned in JSON format by the service.

**itemList (p. 211)**

A list of recommendations sorted in ascending order by prediction score. There can be a maximum of 500 items in the list.
Data Types

Type: Array of PredictedItem (p. 286) objects

Errors

InvalidInputException

Provide a valid value for the field or parameter.

HTTP Status Code: 400

ResourceNotFoundException

The specified resource does not exist.

HTTP Status Code: 404

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS Command Line Interface
- AWS SDK for .NET
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for JavaScript
- AWS SDK for PHP V3
- AWS SDK for Python
- AWS SDK for Ruby V3

Data Types

The following data types are supported by Amazon Personalize:

- Algorithm (p. 215)
- AlgorithmImage (p. 217)
- AutoMLConfig (p. 218)
- AutoMLResult (p. 219)
- BatchInferenceJob (p. 220)
- BatchInferenceJobInput (p. 223)
- BatchInferenceJobOutput (p. 224)
- BatchInferenceJobSummary (p. 225)
- Campaign (p. 227)
- CampaignSummary (p. 229)
- CampaignUpdateSummary (p. 231)
- CategoricalHyperParameterRange (p. 233)
- ContinuousHyperParameterRange (p. 234)
- Dataset (p. 235)
- DatasetGroup (p. 237)
- DatasetGroupSummary (p. 239)
The following data types are supported by Amazon Personalize Events:

- **Event** (p. 284)

The following data types are supported by Amazon Personalize Runtime:

- **PredictedItem** (p. 286)

**Amazon Personalize**

The following data types are supported by Amazon Personalize:

- **Algorithm** (p. 215)
- **AlgorithmImage** (p. 217)
- **AutoMLConfig** (p. 218)
- **AutoMLResult** (p. 219)
- **BatchInferenceJob** (p. 220)
- **BatchInferenceJobInput** (p. 223)
- **BatchInferenceJobOutput** (p. 224)
• BatchInferenceJobSummary (p. 225)
• Campaign (p. 227)
• CampaignSummary (p. 229)
• CampaignUpdateSummary (p. 231)
• CategoricalHyperParameterRange (p. 233)
• ContinuousHyperParameterRange (p. 234)
• Dataset (p. 235)
• DatasetGroup (p. 237)
• DatasetGroupSummary (p. 239)
• DatasetImportJob (p. 241)
• DatasetImportJobSummary (p. 243)
• DatasetSchema (p. 245)
• DatasetSchemaSummary (p. 247)
• DatasetSummary (p. 248)
• DataSource (p. 250)
• DefaultCategoricalHyperParameterRange (p. 251)
• DefaultContinuousHyperParameterRange (p. 252)
• DefaultHyperParameterRanges (p. 253)
• DefaultIntegerHyperParameterRange (p. 254)
• EventTracker (p. 255)
• EventTrackerSummary (p. 257)
• FeatureTransformation (p. 259)
• HPOConfig (p. 261)
• HPOObjective (p. 262)
• HPOResourceConfig (p. 263)
• HyperParameterRanges (p. 264)
• IntegerHyperParameterRange (p. 265)
• Recipe (p. 266)
• RecipeSummary (p. 268)
• S3DataConfig (p. 270)
• Solution (p. 271)
• SolutionConfig (p. 274)
• SolutionSummary (p. 276)
• SolutionVersion (p. 278)
• SolutionVersionSummary (p. 281)
• TunedHPOParams (p. 283)
Algorithm
Service: Amazon Personalize

Describes a custom algorithm.

Contents

algorithmArn
The Amazon Resource Name (ARN) of the algorithm.
Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-z\d-]+):personalize:.+.
Required: No

algorithmImage
The URI of the Docker container for the algorithm image.
Type: AlgorithmImage (p. 217) object
Required: No

creationDateTime
The date and time (in Unix time) that the algorithm was created.
Type: Timestamp
Required: No

defaultHyperParameterRanges
Specifies the default hyperparameters, their ranges, and whether they are tunable. A tunable hyperparameter can have its value determined during hyperparameter optimization (HPO).
Type: DefaultHyperParameterRanges (p. 253) object
Required: No

defaultHyperParameters
Specifies the default hyperparameters.
Type: String to string map
Key Length Constraints: Maximum length of 256.
Value Length Constraints: Maximum length of 1000.
Required: No

defaultResourceConfig
Specifies the default maximum number of training jobs and parallel training jobs.
Type: String to string map
Key Length Constraints: Maximum length of 256.
Value Length Constraints: Maximum length of 1000.
Required: No

lastUpdatedDateTime

The date and time (in Unix time) that the algorithm was last updated.

Type: Timestamp

Required: No

name

The name of the algorithm.

Type: String


Pattern: ^[a-zA-Z0-9][a-zA-Z0-9-\_]*$

Required: No

roleArn

The Amazon Resource Name (ARN) of the role.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+:.*:*:.*

Required: No

trainingInputMode

The training input mode.

Type: String

Length Constraints: Maximum length of 256.

Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
AlgorithmImage
Service: Amazon Personalize

Describes an algorithm image.

Contents

dockerURI

The URI of the Docker container for the algorithm image.

Type: String
Length Constraints: Maximum length of 256.
Required: Yes

name

The name of the algorithm image.

Type: String
Pattern: ^[a-zA-Z0-9-]a-zA-Z0-9-]*
Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
AutoMLConfig
Service: Amazon Personalize

When the solution performs AutoML (performAutoML is true in CreateSolution (p. 128)), Amazon Personalize determines which recipe, from the specified list, optimizes the given metric. Amazon Personalize then uses that recipe for the solution.

Contents

metricName
The metric to optimize.
Type: String
Length Constraints: Maximum length of 256.
Required: No

recipeList
The list of candidate recipes.
Type: Array of strings
Array Members: Maximum number of 100 items.
Length Constraints: Maximum length of 256.
Pattern: arn:([\-a-z\d]+):personalize:.+.*.*
Required: No

See Also
For more information about using this API in one of the language-specific AWS SDKs, see the following:
- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
AutoMLResult
Service: Amazon Personalize

When the solution performs AutoML (performAutoML is true in CreateSolution (p. 128)), specifies the recipe that best optimized the specified metric.

Contents

bestRecipeArn

The Amazon Resource Name (ARN) of the best recipe.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-zA-Z0-9\-]+):personalize:.+.*.*.*

Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
BatchInferenceJob
Service: Amazon Personalize

Contains information on a batch inference job.

Contents

batchInferenceJobArn
  The Amazon Resource Name (ARN) of the batch inference job.
  Type: String
  Length Constraints: Maximum length of 256.
  Pattern: arn:([a-z\d-]+):personalize:.+::
  Required: No

creationDateTime
  The time at which the batch inference job was created.
  Type: Timestamp
  Required: No

failureReason
  If the batch inference job failed, the reason for the failure.
  Type: String
  Required: No

jobInput
  The Amazon S3 path that leads to the input data used to generate the batch inference job.
  Type: BatchInferenceJobInput (p. 223) object
  Required: No

jobName
  The name of the batch inference job.
  Type: String
  Pattern: ^[a-zA-Z0-9-][a-zA-Z0-9-\.\_]*
  Required: No

jobOutput
  The Amazon S3 bucket that contains the output data generated by the batch inference job.
  Type: BatchInferenceJobOutput (p. 224) object
  Required: No

lastUpdatedDateTime
  The time at which the batch inference job was last updated.
Type: Timestamp
Required: No

numResults
The number of recommendations generated by the batch inference job. This number includes the error messages generated for failed input records.
Type: Integer
Required: No

roleArn
The ARN of the Amazon Identity and Access Management (IAM) role that requested the batch inference job.
Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-z\d-]+):iam::\d{12}:role/?[a-zA-Z_0-9+=,.@\-_/]+
Required: No

solutionVersionArn
The Amazon Resource Name (ARN) of the solution version from which the batch inference job was created.
Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-z\d-]+):personalize:.+:.*:.*
Required: No

status
The status of the batch inference job. The status is one of the following values:
• PENDING
• IN PROGRESS
• ACTIVE
• CREATE FAILED
Type: String
Length Constraints: Maximum length of 256.
Required: No

See Also
For more information about using this API in one of the language-specific AWS SDKs, see the following:
• AWS SDK for C++
• AWS SDK for Go
• AWS SDK for Java
• AWS SDK for Ruby V3
BatchInferenceJobInput
Service: Amazon Personalize

The input configuration of a batch inference job.

Contents

s3DataSource

The URI of the Amazon S3 location that contains your input data. The Amazon S3 bucket must be in the same region as the API endpoint you are calling.

Type: S3DataConfig (p. 270) object

Required: Yes

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
**BatchInferenceJobOutput**  
Service: Amazon Personalize  

The output configuration parameters of a batch inference job.

**Contents**

**s3DataDestination**

Information on the Amazon S3 bucket in which the batch inference job's output is stored.

Type: S3DataConfig (p. 270) object

Required: Yes

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
**BatchInferenceJobSummary**

Service: Amazon Personalize

A truncated version of the `BatchInferenceJob` (p. 220) datatype. The `ListBatchInferenceJobs` (p. 176) operation returns a list of batch inference job summaries.

**Contents**

- **batchInferenceJobArn**
  - The Amazon Resource Name (ARN) of the batch inference job.
  - Type: String
  - Length Constraints: Maximum length of 256.
  - Pattern: `arn:(\[a-z\d-\]+):personalize:.*:.*:.+`
  - Required: No

- **creationDateTime**
  - The time at which the batch inference job was created.
  - Type: Timestamp
  - Required: No

- **failureReason**
  - If the batch inference job failed, the reason for the failure.
  - Type: String
  - Required: No

- **jobName**
  - The name of the batch inference job.
  - Type: String
  - Pattern: `^[a-zА-Я-ё-0-9][a-zA-Z0-9\-_.]*`*
  - Required: No

- **lastUpdatedDateTime**
  - The time at which the batch inference job was last updated.
  - Type: Timestamp
  - Required: No

- **solutionVersionArn**
  - The ARN of the solution version used by the batch inference job.
  - Type: String
  - Length Constraints: Maximum length of 256.
  - Pattern: `arn:\([a-z\d-]+\):personalize:.*:.*:.+`
Required: No

**status**

The status of the batch inference job. The status is one of the following values:

- PENDING
- IN PROGRESS
- ACTIVE
- CREATE FAILED

Type: String

Length Constraints: Maximum length of 256.

Required: No

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
Campaign
Service: Amazon Personalize

Describes a deployed solution version, otherwise known as a campaign. For more information on campaigns, see CreateCampaign (p. 111).

Contents

campaignArn
   The Amazon Resource Name (ARN) of the campaign.
   Type: String
   Length Constraints: Maximum length of 256.
   Pattern: arn:([a-z\d-]+):personalize:.+:.*
   Required: No

creationDateTime
   The date and time (in Unix format) that the campaign was created.
   Type: Timestamp
   Required: No

failureReason
   If a campaign fails, the reason behind the failure.
   Type: String
   Required: No

lastUpdatedDateTime
   The date and time (in Unix format) that the campaign was last updated.
   Type: Timestamp
   Required: No

latestCampaignUpdate
   Provides a summary of the properties of a campaign update. For a complete listing, call the DescribeCampaign (p. 152) API.
   Type: CampaignUpdateSummary (p. 231) object
   Required: No

minProvisionedTPS
   Specifies the requested minimum provisioned transactions (recommendations) per second.
   Type: Integer
   Valid Range: Minimum value of 1.
   Required: No

name
   The name of the campaign.
Type: String
Pattern: ^[a-zA-Z0-9][a-zA-Z0-9\-_]*$
Required: No

**solutionVersionArn**

The Amazon Resource Name (ARN) of a specific version of the solution.

Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([^a-z\d-]+):personalize:.+:.

Required: No

**status**

The status of the campaign.

A campaign can be in one of the following states:
- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING > DELETE IN_PROGRESS

Type: String
Length Constraints: Maximum length of 256.

Required: No

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
CampaignSummary
Service: Amazon Personalize

Provides a summary of the properties of a campaign. For a complete listing, call the DescribeCampaign (p. 152) API.

Contents

campaignArn
The Amazon Resource Name (ARN) of the campaign.
Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-z\d-]+):personalize:.+:.*:+
Required: No

creationDateTime
The date and time (in Unix time) that the campaign was created.
Type: Timestamp
Required: No

failureReason
If a campaign fails, the reason behind the failure.
Type: String
Required: No

lastUpdatedDateTime
The date and time (in Unix time) that the campaign was last updated.
Type: Timestamp
Required: No

name
The name of the campaign.
Type: String
Pattern: ^[a-zA-Z0-9][a-zA-Z0-9\-_.]*
Required: No

status
The status of the campaign.

A campaign can be in one of the following states:
- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING > DELETE IN_PROGRESS
Type: String

Length Constraints: Maximum length of 256.

Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
**CampaignUpdateSummary**  
Service: Amazon Personalize

Provides a summary of the properties of a campaign update. For a complete listing, call the DescribeCampaign (p. 152) API.

**Contents**

`creationDateTime`

The date and time (in Unix time) that the campaign update was created.

Type: Timestamp

Required: No

`failureReason`

If a campaign update fails, the reason behind the failure.

Type: String

Required: No

`lastUpdatedDateTime`

The date and time (in Unix time) that the campaign update was last updated.

Type: Timestamp

Required: No

`minProvisionedTPS`

Specifies the requested minimum provisioned transactions (recommendations) per second that Amazon Personalize will support.

Type: Integer

Valid Range: Minimum value of 1.

Required: No

`solutionVersionArn`

The Amazon Resource Name (ARN) of the deployed solution version.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):personalize:.+:.*+`  

Required: No

`status`

The status of the campaign update.

A campaign update can be in one of the following states:

- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING > DELETE IN_PROGRESS

Type: String
Length Constraints: Maximum length of 256.

Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
CategoricalHyperParameterRange
Service: Amazon Personalize

Provides the name and range of a categorical hyperparameter.

Contents

name

The name of the hyperparameter.
Type: String
Length Constraints: Maximum length of 256.
Required: No

values

A list of the categories for the hyperparameter.
Type: Array of strings
Array Members: Maximum number of 100 items.
Length Constraints: Maximum length of 1000.
Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
ContinuousHyperParameterRange
Service: Amazon Personalize

Provides the name and range of a continuous hyperparameter.

Contents

**maxValue**

The maximum allowable value for the hyperparameter.

Type: Double

Valid Range: Minimum value of -1000000.

Required: No

**minValue**

The minimum allowable value for the hyperparameter.

Type: Double

Valid Range: Minimum value of -1000000.

Required: No

**name**

The name of the hyperparameter.

Type: String

Length Constraints: Maximum length of 256.

Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
Dataset
Service: Amazon Personalize

Provides metadata for a dataset.

Contents

creationDateTime
The creation date and time (in Unix time) of the dataset.
Type: Timestamp
Required: No

datasetArn
The Amazon Resource Name (ARN) of the dataset that you want metadata for.
Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-z\d-]+):personalize:.+:..+
Required: No

datasetGroupArn
The Amazon Resource Name (ARN) of the dataset group.
Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-z\d-]+):personalize:.+:..+
Required: No

datasetType
One of the following values:
• Interactions
• Items
• Users
Type: String
Length Constraints: Maximum length of 256.
Required: No

lastUpdatedDateTime
A time stamp that shows when the dataset was updated.
Type: Timestamp
Required: No

name
The name of the dataset.
Type: String


Pattern: ^[a-zA-Z0-9][a-zA-Z0-9\-_]*

Required: No

schemaArn

The ARN of the associated schema.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:\[[a-z\d-]+:personalize:.+:.*:+

Required: No

status

The status of the dataset.

A dataset can be in one of the following states:
- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING > DELETE IN_PROGRESS

Type: String

Length Constraints: Maximum length of 256.

Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
DatasetGroup
Service: Amazon Personalize

A dataset group is a collection of related datasets (Interactions, User, and Item). You create a dataset

group by calling CreateDatasetGroup (p. 117). You then create a dataset and add it to a dataset group

by calling CreateDataset (p. 114). The dataset group is used to create and train a solution by calling

CreateSolution (p. 128). A dataset group can contain only one of each type of dataset.

You can specify an AWS Key Management Service (KMS) key to encrypt the datasets in the group.

Contents

creationDateTime
    The creation date and time (in Unix time) of the dataset group.
    Type: Timestamp
    Required: No

datasetGroupArn
    The Amazon Resource Name (ARN) of the dataset group.
    Type: String
    Length Constraints: Maximum length of 256.
    Pattern: arn:\[[a-z\d-]+\]:personalize:.+:.*
    Required: No

failureReason
    If creating a dataset group fails, provides the reason why.
    Type: String
    Required: No

kmsKeyArn
    The Amazon Resource Name (ARN) of the KMS key used to encrypt the datasets.
    Type: String
    Required: No

lastUpdatedDateTime
    The last update date and time (in Unix time) of the dataset group.
    Type: Timestamp
    Required: No

name
    The name of the dataset group.
    Type: String
    Pattern: ^[a-zA-Z0-9\-\_]\[a-zA-Z0-9\-\_]\*$
Required: No

roleArn

The ARN of the IAM role that has permissions to create the dataset group.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):iam::\d{12}:role/?[a-zA-Z_0-9+=,.@\-_/]+

Required: No

status

The current status of the dataset group.

A dataset group can be in one of the following states:

- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING

Type: String

Length Constraints: Maximum length of 256.

Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
DatasetGroupSummary
Service: Amazon Personalize

Provides a summary of the properties of a dataset group. For a complete listing, call the DescribeDatasetGroup (p. 156) API.

Contents

creationDateTime
The date and time (in Unix time) that the dataset group was created.
Type: Timestamp
Required: No
datasetGroupArn
The Amazon Resource Name (ARN) of the dataset group.
Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-z\d-]+):personalize:.*:.*
Required: No
failureReason
If creating a dataset group fails, the reason behind the failure.
Type: String
Required: No
lastUpdatedDateTime
The date and time (in Unix time) that the dataset group was last updated.
Type: Timestamp
Required: No
name
The name of the dataset group.
Type: String
Pattern: ^[a-zA-Z0-9][-_.]^[a-zA-Z0-9\-\_]*$
Required: No
status
The status of the dataset group.

A dataset group can be in one of the following states:
- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING
Type: String
Length Constraints: Maximum length of 256.
Required: No

See Also
For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
DatasetImportJob
Service: Amazon Personalize

Describes a job that imports training data from a data source (Amazon S3 bucket) to an Amazon Personalize dataset. For more information, see CreateDatasetImportJob (p. 120).

A dataset import job can be in one of the following states:

- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED

Contents

creationDateTime

The creation date and time (in Unix time) of the dataset import job.

Type: Timestamp

Required: No
datasetArn

The Amazon Resource Name (ARN) of the dataset that receives the imported data.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:(\[a-z\d\-]+):personalize:.+:.*+:.*

Required: No
datasetImportJobArn

The ARN of the dataset import job.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:(\[a-z\d\-]+):personalize:.+:.*+:.*

Required: No
dataSource

The Amazon S3 bucket that contains the training data to import.

Type: DataSource (p. 250) object

Required: No
failureReason

If a dataset import job fails, provides the reason why.

Type: String

Required: No
jobName

The name of the import job.
Type: String
Pattern: ^[a-zA-Z0-9][a-zA-Z0-9\-_]*
Required: No

**lastUpdatedDateTime**

The date and time (in Unix time) the dataset was last updated.

Type: Timestamp
Required: No

**roleArn**

The ARN of the AWS Identity and Access Management (IAM) role that has permissions to read from the Amazon S3 data source.

Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-z\d-]+):personalize:.+:*.*:*.*
Required: No

**status**

The status of the dataset import job.

A dataset import job can be in one of the following states:
- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED

Type: String
Length Constraints: Maximum length of 256.
Required: No

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
DatasetImportJobSummary
Service: Amazon Personalize

Provides a summary of the properties of a dataset import job. For a complete listing, call the DescribeDatasetImportJob (p. 158) API.

Contents

creationDateTime
The date and time (in Unix time) that the dataset import job was created.

Type: Timestamp
Required: No

datasetImportJobArn
The Amazon Resource Name (ARN) of the dataset import job.

Type: String
Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+:.*:.*

Required: No

failureReason
If a dataset import job fails, the reason behind the failure.

Type: String
Required: No

jobName
The name of the dataset import job.

Type: String

Pattern: ^[a-zA-Z0-9-\_]*[a-zA-Z0-9-\_]*

Required: No

lastUpdatedDateTime
The date and time (in Unix time) that the dataset was last updated.

Type: Timestamp
Required: No

status
The status of the dataset import job.

A dataset import job can be in one of the following states:
• CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED

Type: String
Length Constraints: Maximum length of 256.
Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
**DatasetSchema**  
Service: Amazon Personalize

Describes the schema for a dataset. For more information on schemas, see CreateSchema (p. 126).

**Contents**

- **creationDateTime**
  The date and time (in Unix time) that the schema was created.
  
  Type: Timestamp
  
  Required: No

- **lastUpdatedDateTime**
  The date and time (in Unix time) that the schema was last updated.
  
  Type: Timestamp
  
  Required: No

- **name**
  The name of the schema.
  
  Type: String
  
  
  Pattern: `^[a-zA-Z0-9][a-zA-Z0-9\-_]*`
  
  Required: No

- **schema**
  The schema.
  
  Type: String
  
  Length Constraints: Maximum length of 10000.
  
  Required: No

- **schemaArn**
  The Amazon Resource Name (ARN) of the schema.
  
  Type: String
  
  Length Constraints: Maximum length of 256.
  
  Pattern: `arn:\([a-z\d-]+:personalize:.\:*\:.+`  
  
  Required: No

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
• AWS SDK for Go
• AWS SDK for Java
• AWS SDK for Ruby V3
DatasetSchemaSummary
Service: Amazon Personalize

Provides a summary of the properties of a dataset schema. For a complete listing, call the DescribeSchema (p. 166) API.

Contents

creationDateTime
The date and time (in Unix time) that the schema was created.
Type: Timestamp
Required: No

lastUpdatedDateTime
The date and time (in Unix time) that the schema was last updated.
Type: Timestamp
Required: No

name
The name of the schema.
Type: String
Pattern: ^[a-zA-Z0-9-\_]*$ Required: No

schemaArn
The Amazon Resource Name (ARN) of the schema.
Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-z\d-]+):personalize:.+:.*:*:*:* Required: No

See Also
For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
DatasetSummary
Service: Amazon Personalize

Provides a summary of the properties of a dataset. For a complete listing, call the DescribeDataset (p. 154) API.

Contents

creationDateTime

The date and time (in Unix time) that the dataset was created.

Type: Timestamp

Required: No

datasetArn

The Amazon Resource Name (ARN) of the dataset.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+:.*:*:*:*+

Required: No

datasetType

The dataset type. One of the following values:
• Interactions
• Items
• Users
• Event-Interactions

Type: String

Length Constraints: Maximum length of 256.

Required: No

lastUpdatedDateTime

The date and time (in Unix time) that the dataset was last updated.

Type: Timestamp

Required: No

name

The name of the dataset.

Type: String


Pattern: ^[a-zA-Z0-9][a-zA-Z0-9\-_.]*$
status

The status of the dataset.

A dataset can be in one of the following states:
- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING > DELETE IN_PROGRESS

Type: String

Length Constraints: Maximum length of 256.

Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
Amazon Personalize Developer Guide
Amazon Personalize

**DataSource**
Service: Amazon Personalize

Describes the data source that contains the data to upload to a dataset.

**Contents**

**dataLocation**

The path to the Amazon S3 bucket where the data that you want to upload to your dataset is stored. For example:

`s3://bucket-name/training-data.csv`

Type: String

Length Constraints: Maximum length of 256.

Required: No

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
DefaultCategoricalHyperParameterRange
Service: Amazon Personalize

Provides the name and default range of a categorical hyperparameter and whether the hyperparameter is tunable. A tunable hyperparameter can have its value determined during hyperparameter optimization (HPO).

Contents

isTunable

Whether the hyperparameter is tunable.
Type: Boolean
Required: No

name

The name of the hyperparameter.
Type: String
Length Constraints: Maximum length of 256.
Required: No

values

A list of the categories for the hyperparameter.
Type: Array of strings
Array Members: Maximum number of 100 items.
Length Constraints: Maximum length of 1000.
Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
DefaultContinuousHyperParameterRange
Service: Amazon Personalize

Provides the name and default range of a continuous hyperparameter and whether the hyperparameter is tunable. A tunable hyperparameter can have its value determined during hyperparameter optimization (HPO).

Contents

isTunable

Whether the hyperparameter is tunable.
Type: Boolean
Required: No

maxValue

The maximum allowable value for the hyperparameter.
Type: Double
Valid Range: Minimum value of -1000000.
Required: No

minValue

The minimum allowable value for the hyperparameter.
Type: Double
Valid Range: Minimum value of -1000000.
Required: No

name

The name of the hyperparameter.
Type: String
Length Constraints: Maximum length of 256.
Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
DefaultHyperParameterRanges
Service: Amazon Personalize

Specifies the hyperparameters and their default ranges. Hyperparameters can be categorical, continuous, or integer-valued.

Contents

categoricalHyperParameterRanges
The categorical hyperparameters and their default ranges.
Type: Array of DefaultCategoricalHyperParameterRange (p. 251) objects
Array Members: Maximum number of 100 items.
Required: No

continuousHyperParameterRanges
The continuous hyperparameters and their default ranges.
Type: Array of DefaultContinuousHyperParameterRange (p. 252) objects
Array Members: Maximum number of 100 items.
Required: No

integerHyperParameterRanges
The integer-valued hyperparameters and their default ranges.
Type: Array of DefaultIntegerHyperParameterRange (p. 254) objects
Array Members: Maximum number of 100 items.
Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
DefaultIntegerHyperParameterRange
Service: Amazon Personalize

Provides the name and default range of a integer-valued hyperparameter and whether the hyperparameter is tunable. A tunable hyperparameter can have its value determined during hyperparameter optimization (HPO).

Contents

isTunable
Indicates whether the hyperparameter is tunable.
Type: Boolean
Required: No

maxValue
The maximum allowable value for the hyperparameter.
Type: Integer
Valid Range: Maximum value of 1000000.
Required: No

minValue
The minimum allowable value for the hyperparameter.
Type: Integer
Valid Range: Minimum value of -1000000.
Required: No

name
The name of the hyperparameter.
Type: String
Length Constraints: Maximum length of 256.
Required: No

See Also
For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
**EventTracker**
Service: Amazon Personalize

Provides information about an event tracker.

**Contents**

**accountId**

The Amazon AWS account that owns the event tracker.

Type: String

Length Constraints: Maximum length of 256.

Required: No

**creationDateTime**

The date and time (in Unix format) that the event tracker was created.

Type: Timestamp

Required: No

**datasetGroupArn**

The Amazon Resource Name (ARN) of the dataset group that receives the event data.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):personalize:.+:.*+.+

Required: No

**eventTrackerArn**

The ARN of the event tracker.

Type: String

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-z\d-]+):personalize:.+:.*+.+

Required: No

**lastUpdatedDateTime**

The date and time (in Unix time) that the event tracker was last updated.

Type: Timestamp

Required: No

**name**

The name of the event tracker.

Type: String

Pattern: ^[a-zA-Z0-9][a-zA-Z0-9\-_]*$

Required: No

**status**

The status of the event tracker.

An event tracker can be in one of the following states:
- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING > DELETE IN_PROGRESS

Type: String

Length Constraints: Maximum length of 256.

Required: No

**trackingId**

The ID of the event tracker. Include this ID in requests to the PutEvents API.

Type: String

Length Constraints: Maximum length of 256.

Required: No

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
EventTrackerSummary
Service: Amazon Personalize

Provides a summary of the properties of an event tracker. For a complete listing, call the DescribeEventTracker (p. 160) API.

Contents

creationDateTime
The date and time (in Unix time) that the event tracker was created.
Type: Timestamp
Required: No

eventTrackerArn
The Amazon Resource Name (ARN) of the event tracker.
Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-z\d-]+):personalize:.+:.*:+
Required: No

lastUpdatedDateTime
The date and time (in Unix time) that the event tracker was last updated.
Type: Timestamp
Required: No

name
The name of the event tracker.
Type: String
Pattern: ^[a-zA-Z0-9][a-zA-Z0-9\-_]*
Required: No

status
The status of the event tracker.
An event tracker can be in one of the following states:
• CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
• DELETE PENDING > DELETE IN_PROGRESS
Type: String
Length Constraints: Maximum length of 256.
Required: No
See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
FeatureTransformation

Service: Amazon Personalize

Provides feature transformation information. Feature transformation is the process of modifying raw input data into a form more suitable for model training.

Contents

creationDateTime

The creation date and time (in Unix time) of the feature transformation.

Type: Timestamp  
Required: No

defaultParameters

Provides the default parameters for feature transformation.

Type: String to string map  
Key Length Constraints: Maximum length of 256.  
Value Length Constraints: Maximum length of 1000.  
Required: No

featureTransformationArn

The Amazon Resource Name (ARN) of the FeatureTransformation object.

Type: String  
Length Constraints: Maximum length of 256.  
Pattern: arn:([a-z\d-]+):personalize:.*:.*:.+  
Required: No

lastUpdatedDateTime

The last update date and time (in Unix time) of the feature transformation.

Type: Timestamp  
Required: No

name

The name of the feature transformation.

Type: String  
Pattern: ^[a-zA-Z0-9-\_]*$  
Required: No

status

The status of the feature transformation.

A feature transformation can be in one of the following states:
• CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED

Type: String

Length Constraints: Maximum length of 256.

Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

• AWS SDK for C++
• AWS SDK for Go
• AWS SDK for Java
• AWS SDK for Ruby V3
**HPOConfig**

Service: Amazon Personalize

Describes the properties for hyperparameter optimization (HPO). For use with the bring-your-own-recipe feature. Do not use for Amazon Personalize native recipes.

**Contents**

*algorithmHyperParameterRanges*

The hyperparameters and their allowable ranges.

Type: `HyperParameterRanges (p. 264)` object

Required: No

*hpoObjective*

The metric to optimize during HPO.

Type: `HPOObjective (p. 262)` object

Required: No

*hpoResourceConfig*

Describes the resource configuration for HPO.

Type: `HPOResourceConfig (p. 263)` object

Required: No

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
HPOObjective
Service: Amazon Personalize

The metric to optimize during hyperparameter optimization (HPO).

Contents

metricName

The name of the metric.
Type: String
Length Constraints: Maximum length of 256.
Required: No

metricRegex

A regular expression for finding the metric in the training job logs.
Type: String
Length Constraints: Maximum length of 256.
Required: No

type

The type of the metric. Valid values are Maximize and Minimize.
Type: String
Length Constraints: Maximum length of 256.
Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
**HPOResourceConfig**
Service: Amazon Personalize

Describes the resource configuration for hyperparameter optimization (HPO).

**Contents**

**maxNumberOfTrainingJobs**

The maximum number of training jobs when you create a solution version. The maximum value for maxNumberOfTrainingJobs is 40.

Type: String

Length Constraints: Maximum length of 256.

Required: No

**maxParallelTrainingJobs**

The maximum number of parallel training jobs when you create a solution version. The maximum value for maxParallelTrainingJobs is 10.

Type: String

Length Constraints: Maximum length of 256.

Required: No

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
HyperParameterRanges

Service: Amazon Personalize

Specifies the hyperparameters and their ranges. Hyperparameters can be categorical, continuous, or integer-valued.

Contents

categoricalHyperParameterRanges

The categorical hyperparameters and their ranges.

Type: Array of CategoricalHyperParameterRange (p. 233) objects

Array Members: Maximum number of 100 items.

Required: No

continuousHyperParameterRanges

The continuous hyperparameters and their ranges.

Type: Array of ContinuousHyperParameterRange (p. 234) objects

Array Members: Maximum number of 100 items.

Required: No

integerHyperParameterRanges

The integer-valued hyperparameters and their ranges.

Type: Array of IntegerHyperParameterRange (p. 265) objects

Array Members: Maximum number of 100 items.

Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
**IntegerHyperParameterRange**

Service: Amazon Personalize

Provides the name and range of an integer-valued hyperparameter.

**Contents**

**maxValue**

The maximum allowable value for the hyperparameter.

Type: Integer

Valid Range: Maximum value of 1000000.

Required: No

**minValue**

The minimum allowable value for the hyperparameter.

Type: Integer

Valid Range: Minimum value of -1000000.

Required: No

**name**

The name of the hyperparameter.

Type: String

Length Constraints: Maximum length of 256.

Required: No

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
Recipe
Service: Amazon Personalize

Provides information about a recipe. Each recipe provides an algorithm that Amazon Personalize uses in model training when you use the CreateSolution (p. 128) operation.

Contents

algorithmArn

The Amazon Resource Name (ARN) of the algorithm that Amazon Personalize uses to train the model.

Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([-a-z\d-]+):personalize:.+.
Required: No

creationDateTime

The date and time (in Unix format) that the recipe was created.

Type: Timestamp
Required: No

description

The description of the recipe.

Type: String
Required: No

featureTransformationArn

The ARN of the FeatureTransformation object.

Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([-a-z\d-]+):personalize:.+.
Required: No

lastUpdatedDateTime

The date and time (in Unix format) that the recipe was last updated.

Type: Timestamp
Required: No

name

The name of the recipe.

Type: String
Pattern: ^[a-zA-Z0-9][a-zA-Z0-9\-_]*

Required: No

**recipeArn**

The Amazon Resource Name (ARN) of the recipe.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:[\(a-z\d\-]+:personalize:.+:.*:+

Required: No

**recipeType**

One of the following values:

- PERSONALIZED_RANKING
- RELATED_ITEMS
- USER_PERSONALIZATION

Type: String

Length Constraints: Maximum length of 256.

Required: No

**status**

The status of the recipe.

Type: String

Length Constraints: Maximum length of 256.

Required: No

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
RecipeSummary
Service: Amazon Personalize

Provides a summary of the properties of a recipe. For a complete listing, call the DescribeRecipe (p. 164) API.

Contents

creationDateTime
The date and time (in Unix time) that the recipe was created.
Type: Timestamp
Required: No

lastUpdatedDateTime
The date and time (in Unix time) that the recipe was last updated.
Type: Timestamp
Required: No

name
The name of the recipe.
Type: String
Pattern: ^[a-zA-Z0-9\-_]*
Required: No

recipeArn
The Amazon Resource Name (ARN) of the recipe.
Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-z\d-]+):personalize:.+:.*:+
Required: No

status
The status of the recipe.
Type: String
Length Constraints: Maximum length of 256.
Required: No

See Also
For more information about using this API in one of the language-specific AWS SDKs, see the following:

• AWS SDK for C++
• AWS SDK for Go
• AWS SDK for Java
• AWS SDK for Ruby V3
**S3DataConfig**

Service: Amazon Personalize

The configuration details of an Amazon S3 input or output bucket.

**Contents**

**kmsKeyArn**

The Amazon Resource Name (ARN) of the Amazon Key Management Service (KMS) key that Amazon Personalize uses to encrypt or decrypt the input and output files of a batch inference job.

Type: String

Required: No

**path**

The file path of the Amazon S3 bucket.

Type: String

Length Constraints: Maximum length of 256.

Required: Yes

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
Solution
Service: Amazon Personalize

An object that provides information about a solution. A solution is a trained model that can be deployed as a campaign.

Contents

autoMLResult
When `performAutoML` is true, specifies the best recipe found.

Type: `AutoMLResult` (p. 219) object

Required: No

creationDateTime
The creation date and time (in Unix time) of the solution.

Type: `Timestamp`

Required: No

datasetGroupArn
The Amazon Resource Name (ARN) of the dataset group that provides the training data.

Type: `String`

Length Constraints: Maximum length of 256.

Pattern: `arn:([a-zA-Z0-9-]+):personalize:.+:.*:.*`

Required: No

eventType
The event type (for example, 'click' or 'like') that is used for training the model.

Type: `String`

Length Constraints: Maximum length of 256.

Required: No

lastUpdatedDateTime
The date and time (in Unix time) that the solution was last updated.

Type: `Timestamp`

Required: No

latestSolutionVersion
Describes the latest version of the solution, including the status and the ARN.

Type: `SolutionVersionSummary` (p. 281) object

Required: No

name
The name of the solution.
Type: String
Pattern: ^[a-zA-Z0-9][a-zA-Z0-9\-\_]*
Required: No

performAutoML

When true, Amazon Personalize performs a search for the best USER_PERSONALIZATION recipe from the list specified in the solution configuration (recipeArn must not be specified). When false (the default), Amazon Personalize uses recipeArn for training.

Type: Boolean
Required: No

performHPO

Whether to perform hyperparameter optimization (HPO) on the chosen recipe. The default is false.

Type: Boolean
Required: No

recipeArn

The ARN of the recipe used to create the solution.

Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-zA-Z0-9\d-]+):personalize:.+:.*:*:*:+
Required: No

solutionArn

The ARN of the solution.

Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-zA-Z0-9\d-]+):personalize:.+:.*:*:*:+
Required: No

solutionConfig

Describes the configuration properties for the solution.

Type: SolutionConfig (p. 274) object
Required: No

status

The status of the solution.

A solution can be in one of the following states:
- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING > DELETE IN_PROGRESS
Type: String
Length Constraints: Maximum length of 256.
Required: No

See Also
For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
SolutionConfig
Service: Amazon Personalize

Describes the configuration properties for the solution.

Contents

algorithmHyperParameters
- Lists the hyperparameter names and ranges.
  
  Type: String to string map
  
  Key Length Constraints: Maximum length of 256.
  
  Value Length Constraints: Maximum length of 1000.
  
  Required: No

customAutoMLConfig
- The AutoMLConfig (p. 218) object containing a list of recipes to search when AutoML is performed.
  
  Type: AutoMLConfig (p. 218) object
  
  Required: No

eventValueThreshold
- Only events with a value greater than or equal to this threshold are used for training a model.
  
  Type: String
  
  Length Constraints: Maximum length of 256.
  
  Required: No

featureTransformationParameters
- Lists the feature transformation parameters.
  
  Type: String to string map
  
  Key Length Constraints: Maximum length of 256.
  
  Value Length Constraints: Maximum length of 1000.
  
  Required: No

hpoConfig
- Describes the properties for hyperparameter optimization (HPO).
  
  Type: HPOConfig (p. 261) object
  
  Required: No

See Also
- For more information about using this API in one of the language-specific AWS SDKs, see the following:
  
  - AWS SDK for C++
• AWS SDK for Go
• AWS SDK for Java
• AWS SDK for Ruby V3
SolutionSummary
Service: Amazon Personalize

Provides a summary of the properties of a solution. For a complete listing, call the DescribeSolution (p. 168) API.

Contents

creationDateTime

The date and time (in Unix time) that the solution was created.

Type: Timestamp

Required: No

lastUpdatedDateTime

The date and time (in Unix time) that the solution was last updated.

Type: Timestamp

Required: No

name

The name of the solution.

Type: String


Pattern: ^[a-zA-Z0-9\-\_]*

Required: No

solutionArn

The Amazon Resource Name (ARN) of the solution.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.*:.*:*

Required: No

status

The status of the solution.

A solution can be in one of the following states:
- CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
- DELETE PENDING > DELETE IN_PROGRESS

Type: String

Length Constraints: Maximum length of 256.

Required: No
See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
SolutionVersion

Service: Amazon Personalize

An object that provides information about a specific version of a Solution (p. 271).

Contents

creationDateTime

The date and time (in Unix time) that this version of the solution was created.

Type: Timestamp

Required: No

datasetGroupArn

The Amazon Resource Name (ARN) of the dataset group providing the training data.

Type: String

Length Constraints: Maximum length of 256.

Pattern: arn:([a-z\d-]+):personalize:.+:.+:.+

Required: No

eventType

The event type (for example, 'click' or 'like') that is used for training the model.

Type: String

Length Constraints: Maximum length of 256.

Required: No

failureReason

If training a solution version fails, the reason for the failure.

Type: String

Required: No

lastUpdatedDateTime

The date and time (in Unix time) that the solution was last updated.

Type: Timestamp

Required: No

performAutoML

When true, Amazon Personalize searches for the most optimal recipe according to the solution configuration. When false (the default), Amazon Personalize uses recipeArn.

Type: Boolean

Required: No

performHPO

Whether to perform hyperparameter optimization (HPO) on the chosen recipe. The default is false.
Type: Boolean  
Required: No

**recipeArn**

The ARN of the recipe used in the solution.

Type: String  
Length Constraints: Maximum length of 256.  
Pattern: arn:([a-z\d-]+):personalize:.+:.*

Required: No

**solutionArn**

The ARN of the solution.

Type: String  
Length Constraints: Maximum length of 256.  
Pattern: arn:([a-z\d-]+):personalize:.+:.*

Required: No

**solutionConfig**

Describes the configuration properties for the solution.

Type: [SolutionConfig](p. 274) object  
Required: No

**solutionVersionArn**

The ARN of the solution version.

Type: String  
Length Constraints: Maximum length of 256.  
Pattern: arn:([a-z\d-]+):personalize:.+:.*

Required: No

**status**

The status of the solution version.

A solution version can be in one of the following states:
- CREATE PENDING
- CREATE IN_PROGRESS
- ACTIVE
- CREATE FAILED

Type: String  
Length Constraints: Maximum length of 256.  
Required: No
trainingHours

The time used to train the model. You are billed for the time it takes to train a model. This field is visible only after Amazon Personalize successfully trains a model.

Type: Double

Valid Range: Minimum value of 0.

Required: No

trainingMode

The scope of training used to create the solution version. The FULL option trains the solution version based on the entirety of the input solution's training data, while the UPDATE option processes only the training data that has changed since the creation of the last solution version. Choose UPDATE when you want to start recommending items added to the dataset without retraining the model.

Important

The UPDATE option can only be used after you've created a solution version with the FULL option and the training solution uses the HRNN-Coldstart Recipe (p. 59).

Type: String

Valid Values: FULL | UPDATE

Required: No

tunedHPOParams

If hyperparameter optimization was performed, contains the hyperparameter values of the best performing model.

Type: TunedHPOParams (p. 283) object

Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
SolutionVersionSummary
Service: Amazon Personalize

Provides a summary of the properties of a solution version. For a complete listing, call the DescribeSolutionVersion (p. 171) API.

Contents

creationDateTime
The date and time (in Unix time) that this version of a solution was created.
Type: Timestamp
Required: No

failureReason
If a solution version fails, the reason behind the failure.
Type: String
Required: No

lastUpdatedDateTime
The date and time (in Unix time) that the solution version was last updated.
Type: Timestamp
Required: No

solutionVersionArn
The Amazon Resource Name (ARN) of the solution version.
Type: String
Length Constraints: Maximum length of 256.
Pattern: arn:([a-z\d-]+):personalize:.+:
Required: No

status
The status of the solution version.
A solution version can be in one of the following states:
• CREATE PENDING > CREATE IN_PROGRESS > ACTIVE -or- CREATE FAILED
Type: String
Length Constraints: Maximum length of 256.
Required: No

See Also
For more information about using this API in one of the language-specific AWS SDKs, see the following:
• AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3
TunedHPOParams
Service: Amazon Personalize

If hyperparameter optimization (HPO) was performed, contains the hyperparameter values of the best performing model.

Contents

algorithmHyperParameters

A list of the hyperparameter values of the best performing model.

Type: String to string map

Key Length Constraints: Maximum length of 256.

Value Length Constraints: Maximum length of 1000.

Required: No

See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3

Amazon Personalize Events

The following data types are supported by Amazon Personalize Events:

- Event (p. 284)
Event
Service: Amazon Personalize Events

Represents user interaction event information sent using the PutEvents API.

Contents

eventId
An ID associated with the event. If an event ID is not provided, Amazon Personalize generates a unique ID for the event. An event ID is not used as an input to the model. Amazon Personalize uses the event ID to distinguish unique events. Any subsequent events after the first with the same event ID are not used in model training.

Type: String
Length Constraints: Minimum length of 1. Maximum length of 256.
Required: No

eventType
The type of event. This property corresponds to the EVENT_TYPE field of the Interactions schema.

Type: String
Length Constraints: Minimum length of 1. Maximum length of 256.
Required: Yes

properties
A string map of event-specific data that you might choose to record. For example, if a user rates a movie on your site, you might send the movie ID and rating, and the number of movie ratings made by the user.

Each item in the map consists of a key-value pair. For example,

{"itemId": "movie1"}
{"itemId": "movie2", "eventValue": "4.5"}
{"itemId": "movie3", "eventValue": "3", "numberOfRatings": "12"}

The keys use camel case names that match the fields in the Interactions schema. The itemId and eventValue keys correspond to the ITEM_ID and EVENT_VALUE fields. In the above example, the eventType might be 'MovieRating' with eventValue being the rating. The numberOfRatings would match the 'NUMBER_OF_RATINGS' field defined in the Interactions schema.

Type: String
Required: No

sentAt
The timestamp on the client side when the event occurred.

Type: Timestamp
Required: Yes
See Also

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3

Amazon Personalize Runtime

The following data types are supported by Amazon Personalize Runtime:

- PredictedItem (p. 286)
**PredictedItem**  
Service: Amazon Personalize Runtime

An object that identifies an item.

The GetRecommendations (p. 210) and GetPersonalizedRanking (p. 207) APIs return a list of PredictedItems.

**Contents**

**itemId**

The recommended item ID.

Type: String

Length Constraints: Maximum length of 256.

Required: No

**score**

A numeric representation of the model's certainty that the item will be the next user selection. For more information on scoring logic, see How Recommendation Scoring Works (p. 76).

Type: Double

Required: No

**See Also**

For more information about using this API in one of the language-specific AWS SDKs, see the following:

- AWS SDK for C++
- AWS SDK for Go
- AWS SDK for Java
- AWS SDK for Ruby V3

**Common Errors**

This section lists the errors common to the API actions of all AWS services. For errors specific to an API action for this service, see the topic for that API action.

**AccessDeniedException**

You do not have sufficient access to perform this action.

HTTP Status Code: 400

**IncompleteSignature**

The request signature does not conform to AWS standards.

HTTP Status Code: 400

**InternalFailure**

The request processing has failed because of an unknown error, exception or failure.
HTTP Status Code: 500

**InvalidAction**

The action or operation requested is invalid. Verify that the action is typed correctly.

HTTP Status Code: 400

**InvalidClientTokenId**

The X.509 certificate or AWS access key ID provided does not exist in our records.

HTTP Status Code: 403

**InvalidParameterCombination**

Parameters that must not be used together were used together.

HTTP Status Code: 400

**InvalidParameterValue**

An invalid or out-of-range value was supplied for the input parameter.

HTTP Status Code: 400

**InvalidQueryParameter**

The AWS query string is malformed or does not adhere to AWS standards.

HTTP Status Code: 400

**MalformedQueryString**

The query string contains a syntax error.

HTTP Status Code: 404

**MissingAction**

The request is missing an action or a required parameter.

HTTP Status Code: 400

**MissingAuthenticationToken**

The request must contain either a valid (registered) AWS access key ID or X.509 certificate.

HTTP Status Code: 403

**MissingParameter**

A required parameter for the specified action is not supplied.

HTTP Status Code: 400

**OptInRequired**

The AWS access key ID needs a subscription for the service.

HTTP Status Code: 403

**RequestExpired**

The request reached the service more than 15 minutes after the date stamp on the request or more than 15 minutes after the request expiration date (such as for pre-signed URLs), or the date stamp on the request is more than 15 minutes in the future.

HTTP Status Code: 400
Common Parameters

The following list contains the parameters that all actions use for signing Signature Version 4 requests with a query string. Any action-specific parameters are listed in the topic for that action. For more information about Signature Version 4, see Signature Version 4 Signing Process in the Amazon Web Services General Reference.

**Action**

The action to be performed.

Type: string

Required: Yes

**Version**

The API version that the request is written for, expressed in the format YYYY-MM-DD.

Type: string

Required: Yes

**X-Amz-Algorithm**

The hash algorithm that you used to create the request signature.

Condition: Specify this parameter when you include authentication information in a query string instead of in the HTTP authorization header.

Type: string

Valid Values: AWS4-HMAC-SHA256

Required: Conditional

**X-Amz-Credential**

The credential scope value, which is a string that includes your access key, the date, the region you are targeting, the service you are requesting, and a termination string ("aws4_request"). The value is expressed in the following format: access_key/YYYYMMDD/region/service/aws4_request.

For more information, see Task 2: Create a String to Sign for Signature Version 4 in the Amazon Web Services General Reference.
Condition: Specify this parameter when you include authentication information in a query string instead of in the HTTP authorization header.

Type: string

Required: Conditional

**X-Amz-Date**

The date that is used to create the signature. The format must be ISO 8601 basic format (YYYYMMDD'T'HHMMSS'Z'). For example, the following date time is a valid X-Amz-Date value: 20120325T120000Z.

Condition: X-Amz-Date is optional for all requests; it can be used to override the date used for signing requests. If the Date header is specified in the ISO 8601 basic format, X-Amz-Date is not required. When X-Amz-Date is used, it always overrides the value of the Date header. For more information, see Handling Dates in Signature Version 4 in the Amazon Web Services General Reference.

Type: string

Required: Conditional

**X-Amz-Security-Token**

The temporary security token that was obtained through a call to AWS Security Token Service (AWS STS). For a list of services that support temporary security credentials from AWS Security Token Service, go to AWS Services That Work with IAM in the IAM User Guide.

Condition: If you're using temporary security credentials from the AWS Security Token Service, you must include the security token.

Type: string

Required: Conditional

**X-Amz-Signature**

Specifies the hex-encoded signature that was calculated from the string to sign and the derived signing key.

Condition: Specify this parameter when you include authentication information in a query string instead of in the HTTP authorization header.

Type: string

Required: Conditional

**X-Amz-SignedHeaders**

Specifies all the HTTP headers that were included as part of the canonical request. For more information about specifying signed headers, see Task 1: Create a Canonical Request For Signature Version 4 in the Amazon Web Services General Reference.

Condition: Specify this parameter when you include authentication information in a query string instead of in the HTTP authorization header.

Type: string

Required: Conditional
Document History for Amazon Personalize

The following table describes important changes in each release of the Amazon Personalize Developer Guide. For notification about updates to this documentation, you can subscribe to an RSS feed.

- **Latest documentation update:** April 3, 2020

<table>
<thead>
<tr>
<th>update-history-change</th>
<th>update-history-description</th>
<th>update-history-date</th>
</tr>
</thead>
<tbody>
<tr>
<td>New feature (p. 290)</td>
<td>Amazon Personalize now exposes scores for recommended items. Scores represent the Amazon Personalize model's certainty that a user will next choose a certain item. For more information, see Getting Recommendations.</td>
<td>April 3, 2020</td>
</tr>
<tr>
<td>New Region (p. 290)</td>
<td>Amazon Personalize adds support for the Asia Pacific (Seoul) Region. For a complete list of the AWS Regions supported by Amazon Personalize, see the AWS Region Table or AWS Regions and Endpoints in the Amazon Web Services General Reference.</td>
<td>January 21, 2020</td>
</tr>
<tr>
<td>New feature (p. 290)</td>
<td>Amazon Personalize can now get recommendations based on contextual metadata. For more information, see Getting Recommendations.</td>
<td>December 19, 2019</td>
</tr>
<tr>
<td>New Regions (p. 290)</td>
<td>Amazon Personalize adds support for the Asia Pacific (Mumbai), Asia Pacific (Sydney), and Canada (Central) Regions. For a complete list of the AWS Regions supported by Amazon Personalize, see the AWS Region Table or AWS Regions and Endpoints in the Amazon Web Services General Reference.</td>
<td>December 18, 2019</td>
</tr>
<tr>
<td>New feature (p. 290)</td>
<td>Amazon Personalize now supports batch recommendation workflows. For more information, see Get Batch Recommendations.</td>
<td>November 14, 2019</td>
</tr>
<tr>
<td>Amazon Personalize general availability (p. 290)</td>
<td>Amazon Personalize is now available for general use.</td>
<td>June 10, 2019</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Amazon Personalize preview release (p. 290)</td>
<td>This is the first preview release of the documentation for Amazon Personalize.</td>
<td>November 28, 2018</td>
</tr>
</tbody>
</table>
AWS Glossary

For the latest AWS terminology, see the AWS Glossary in the AWS General Reference.