

# Practical Worksheet 8

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## Set Up Python Environment

```
(venv) >_ cits5503/Labs $ pip install sagemaker pandas ipykernel
Defaulting to user installation because normal site-packages is not writeable
Collecting sagemaker
  Downloading sagemaker-2.110.0.tar.gz (576 kB)
    ━━━━━━━━━━━━━━━━ 576.0/576.0 kB 1.8 MB/s eta 0:00:00
  Preparing metadata (setup.py) ... done
Collecting pandas
  Downloading pandas-1.5.0-cp39-cp39-macosx_11_0_arm64.whl (10.9 MB)
    ━━━━━━━━━━━━━━ 10.9/10.9 kB 4.5 MB/s eta 0:00:00
Collecting ipykernel
  Downloading ipykernel-6.16.0-py3-none-any.whl (138 kB)
    ━━━━━━━━━━━━ 138.4/138.4 kB 3.8 MB/s eta 0:00:00
Collecting attrs<22,>=20.3.0
  Downloading attrs-21.4.0-py2.py3-none-any.whl (60 kB)
    ━━━━━━━━━━ 60.6/60.6 kB 1.7 MB/s eta 0:00:00
Requirement already satisfied: boto3<2.0,>=1.20.21 in /Users/kaiqiliang/Library/Python/3.9/lib/python/site-packages (from sagemaker) (1.24.75)
Collecting google-pasta
  Downloading google_pasta-0.2.0-py3-none-any.whl (57 kB)
    ━━━━━━━━ 57.5/57.5 kB 1.8 MB/s eta 0:00:00
Collecting numpy<2.0,>=1.9.0
  Using cached numpy-1.23.3-cp39-cp39-macosx_11_0_arm64.whl (13.4 MB)
Collecting protobuf<4.0,>=3.1
  Downloading protobuf-3.20.3-py2.py3-none-any.whl (162 kB)
    ━━━━━━━━ 162.1/162.1 kB 4.1 MB/s eta 0:00:00
Collecting protobuf3-to-dict<1.0,>=0.1.5
  Downloading protobuf3-to-dict-0.1.5.tar.gz (3.5 kB)
  Preparing metadata (setup.py) ... done
Collecting smdebug_rulesconfig==1.0.1
  Downloading smdebug_rulesconfig-1.0.1-py2.py3-none-any.whl (20 kB)
Collecting importlib-metadata<5.0,>=1.4.0
```

## Run Hyperparameter Tuning Jobs

Create an IAM role to get access to the **SageMaker** service for hyperparameter tuning.

Screenshot of the AWS IAM Role configuration page for "Role\_AWS\_SageMaker".

**Identity and Access Management (IAM)**

**Role\_AWS\_SageMaker**

Allows SageMaker notebook instances, training jobs, and models to access S3, ECR, and CloudWatch on your behalf.

**Summary**

**Permissions**

**Permissions policies (1)**

AmazonSageMakerFullAccess

**Feedback** Looking for language selection? Find it in the new Unified Settings [\[Z\]](#)

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Create a bucket to put the training data as well as the output from the training job.

Screenshot of the AWS S3 Buckets page for account 23344153.

**Buckets**

**23344153**

**Objects (1)**

sagemaker/

**Actions**

**Upload**

Name	Type	Last modified	Size	Storage class
sagemaker/	Folder	-	-	-

Change bucket name in the session preparation cell.

The screenshot shows a Jupyter Notebook interface with the following details:

- Title Bar:** LabAI.ipynb M
- Header:** lab8 > LabAI.ipynb > M+ Prepare SageMaker session
- Toolbar:** Code, Markdown, Run All, Clear Outputs of All Cells, Restart, Interrupt, Variables, Outline, venv (Python 3.8.9)
- Section Header:** Prepare SageMaker session
- Code Cell:** Contains Python code for setting up a SageMaker session. The code imports sagemaker, boto3, numpy, pandas, time, and os. It defines a region ('ap-southeast-2'), creates a smclient (boto3.Session().client("sagemaker")), gets the ARN of the SageMaker role from IAM, and sets student\_id, bucket, and prefix variables.
- Status Bar:** [3] ✓ 1.5s Python

Run the rest of the code cells then monitor the progress of the hyperparameter tuning job.

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▼ Training Algorithms Training jobs

Hyperparameter tuning jobs

Amazon SageMaker > Hyperparameter tuning jobs

Hyperparameter tuning jobs

Add/Edit tags Create hyperparameter tuning job

Search hyperparameter tuning jobs

Name	Status	Training completed/total	Creation time	Duration
23344153-xgboost-tuningjob-01	Completed	2 / 2	Sep 30, 2022 00:24 UTC	3 minutes

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Amazon SageMaker > Hyperparameter tuning jobs > 23344153-xgboost-tuningjob-01

## 23344153-xgboost-tuningjob-01

Stop tuning job

### Hyperparameter tuning job summary

Name 23344153-xgboost-tuningjob-01	Status Completed	Approx. total training duration 3 minute(s)
ARN arn:aws:sagemaker:ap-southeast-2:523265914192:hyper-parameter-tuning-job/23344153-xgboost-tuningjob-01	Creation time Sep 30, 2022 00:24 UTC	Last modified time Sep 30, 2022 00:27 UTC

Best training job Training jobs Training job definitions Tuning Job configuration Tags

### Training job status counter

Completed 2 In Progress 0 Stopped 0 Failed 0 (Retryable: 0, Non-retryable: 0)

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### Training job status counter

Completed 2 In Progress 0 Stopped 0 Failed 0 (Retryable: 0, Non-retryable: 0)

### Training jobs

Sorting by objective metric value will display only jobs that have metric values.

C View logs View instance metrics Stop Create model

Search training jobs

Name	Status	Objective metric value	Creation time	Training Duration
23344153-xgboost-tuningjob-01-002-2b5eb11c	Completed	0.6088539958000183	Sep 30, 2022 00:24 UTC	2 minute(s)
23344153-xgboost-tuningjob-01-001-6b7718aa	Completed	0.6432470083236694	Sep 30, 2022 00:24 UTC	2 minute(s)

These are the hyperparameters of the best training job.

The screenshot shows a table titled "Best training job hyperparameters" with the following data:

Name	Type	Value
_tuning_objective_metric	FreeText	validation:auc
alpha	Continuous	0.5290516757481565
eta	Continuous	0.46196256290661175
eval_metric	FreeText	auc
max_depth	Integer	4
min_child_weight	Continuous	2.1985605481225114
num_round	FreeText	1
objective	FreeText	binary:logistic
rate_drop	FreeText	0.3
tweedie_variance_power	FreeText	1.4

The output is stored in the same bucket by SageMaker.

The screenshot shows the AWS S3 console with the following details:

- Buckets:** sagemaker
- Objects:** 2
- Actions:** Copy S3 URI, Copy URL, Download, Open, Delete, Actions, Create folder, Upload
- Filter:** Find objects by prefix
- Table Headers:** Name, Type, Last modified, Size, Storage class
- Table Data:**

Name	Type	Last modified	Size	Storage class
23344153-xgboost-tuningjob-01-001-6b7718aa/	Folder	-	-	-
23344153-xgboost-tuningjob-01-002-2b5eb11c/	Folder	-	-	-