

# Third Project

By I.T Club President Justin Cortez

## Framework

- Set of pre-written code that provides structure for developing software applications
- Requires the developer to build functionalities
- Provide the necessary tools and features that devs can extend and build on
- Ex: URL routing | Reading multiple protocols

## Examples of Libraries

Java.util is a part of a Java Library for utilities methods

Java.text is a part of a Java Library for text modification methods

Scapy is a Python packet manipulation Library which is a tool for computer networks

Pandas is a Python Library for data analysis and manipulation tool

Numpy is a Python Library used for working arrays

Scikit-learn is a Python Library for Machine Learning; classification, regression, clustering, and dimensionality reduction.

# Library

- A collection of pre-written code that can be used to perform specific tasks
- A developer can call methods from the library whenever
- Ex: calling “Scanner” in java lets the program save user-inputted information for future use

## Examples of Frameworks

PyTorch is an Open-Source Deep Learning Framework, quick production deployment, useful for neural networks, accelerated processing via GPU, and integrates rapidly within the Python's ecosystem

Theano is Dynamic Machine Learning Framework used for manipulating and evaluating mathematical expressions

MXNet is a Deep Learning Framework for neural network development, offering faster context switching and optimized computation for different functions

# What is Customer Churning and why is it important for business

- Customer churn, or customer attrition, means a customer has the tendency to leave and stop paying for a service.
- It is one of the primary metrics companies use as a health indicator for the business and get a sense of their customer satisfaction.
- In today's project we will formulate the churn prediction as a classification problem

Pt2

companies want to track to get a sense of their customer satisfaction, especially for a subscription-based business model. The company can track churn rate (defined as the percentage of customers churned during a period) as a health indicator for the business, but we would love to identify the at-risk customers before they churn and offer appropriate treatment to keep them with the business, and this is where machine learning comes into play.

## Beginning questions

- Will this customer churn (cancel the plan, cancel the subscription)?
- Will this customer downgrade a pricing plan?
- For a subscription business model, will a customer renew his/her subscription?

## How we'll tackle this

We will aggregate from event-level to user-level, calculate user listening behavior metrics, and add time factor to the user behavior metrics

### An Example:

advertisement listened by the user in 30 days, 60 days, and 180 days

For each user, we will determine if and when they cancel their subscription and we will use this for our target. We will train a XGBoost model on whether they cancel or not, giving inputs (i.e. features) of their aggregated user behavior.

## XGBoost

A althogrim used for structured or tabular data.

its ability to handle missing data and large datasets efficiently. It also has a number of hyperparameters that can be tuned to improve model performance, including the learning rate, depth of the trees, and regularization parameters.

Login into your personal AWS Account

Navigate To AWS Console And Click on Machine Learning

Scroll Till you find Amazon SageMaker

Click Getting Started on the top left

Click Configure Domain

Click Standard Setup

# Select Standard Setup

er for your organization.

## Standard setup (10 min)

Control all aspects of account configuration, including permissions, integrations, and encryption.

- Advanced network security, and data encryption
- SageMaker Studio, and RStudio integration
- SageMaker Studio Projects, and Jumpstart configurable
- SageMaker Canvas, and Amazon services integrations
- IAM, or IAM Identity Center (successor to AWS SSO)

*Better for admins with large user groups, but you can always update your account configuration settings later if you want to do a quick setup now.*

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# The name is your choice, select (IAM)

## General settings

Configurations that are shared across the entire SageMaker Domain.

### Domain name

#### Name

Domain name should be unique across the AWS account.

whatever

### Authentication

The authentication method you choose determines how you can access the SageMaker domain. To use AWS IAM Identity Center (successor to AWS SSO), you must have an IAM Identity Center account in an AWS Region supported by the domain.

AWS IAM Identity Center

Access the domain with a bookmarked URL.

AWS Identity and Access Management (IAM)

Access the domain with the Amazon SageMaker console.

# Create a new role for both

## Permission

### Default execution role

SageMaker Domain requires permissions for its users to access other AWS services, such as Amazon SageMaker and Amazon S3. For a broad range of capabilities, you may attach the [AmazonSageMakerFullAccess](#) policy to the execution role. If you don't have a role with this policy, we can create one for you.

AmazonSageMaker-ExecutionRole-20230311T182800 ▾

### Space default execution role

SageMaker Domain requires permissions for its users to access other AWS services, such as Amazon SageMaker and Amazon S3. For a broad range of capabilities, you may attach the [AmazonSageMakerFullAccess](#) policy to the execution role. If you don't have a role with this policy, we can create one for you.

Please choose an execution role ▾

Create a new role

Enter a custom IAM role ARN

Use existing role

AmazonSageMaker-ExecutionRole-20230311T182800

AmazonSageMaker-ExecutionRole-20230311T182831

AmazonSageMakerServiceCatalogProductsExecutionRole

AmazonSageMakerServiceCatalogProductsUserRole

## VPC

To enable internet access, make sure that your VPC has a NAT gateway and your security group allows outbound connections.

# Click Any S3 Bucket and then create role

AmazonSageMaker-ExecutionRole-20230311T182800

Space default execution role  
SageMaker Domain requires permissions for its users to access other AWS services, such as Amazon SageMaker and Amazon S3. For a broad range of permissions, choose the [AmazonSageMakerFullAccess](#) IAM policy.

### Create an IAM role

Passing an IAM role gives Amazon SageMaker permission to perform actions in other AWS services on your behalf. Creating a role here will grant permissions described by the [AmazonSageMakerFullAccess](#) IAM policy to the role you create.

The IAM role you create will provide access to:

S3 buckets you specify - optional

Any S3 bucket  
Allow users that have access to your notebook instance access to any bucket and its contents in your account.

Specific S3 buckets  
*Example: bucket-name-1, bucke*  
Comma delimited. ARNs, "\*" and "/" are not supported.

None

Any S3 bucket with "sagemaker" in the name

Any S3 object with "sagemaker" in the name

Any S3 object with the tag "sagemaker" and value "true"  
See Object tagging [↗](#)

S3 bucket with a Bucket Policy allowing access to SageMaker  
See S3 bucket policies [↗](#)

[Cancel](#) [Create role](#)

# These are the defaults

## Default Jupyter Lab version

The Jupyter Server runs with the selected version by default for all users in the Domain. Permissions to run Jupyter Lab versions are determined by the [IAM policy](#). You must restart the Jupyter Server app to make the version changes effective.

Jupyter Lab 3.0

## ▼ Notebook Sharing Configuration

Recommended defaults have been selected for you

### Shareable notebook resources

Notebook resources include artifacts such as cell output and Git Repositories [Learn more](#)

Enable notebook resource sharing

### S3 location for shareable notebook resources

Use the S3 default location or pick one

s3://sagemaker-studio-026471298429-5qzc6zyqjjs/sharing

To find a path, [go to Amazon S3](#)

### Encryption key - optional

Encrypt your data. Choose an existing KMS key or enter a key's ARN.

No Custom Encryption

### Notebook cell output sharing preference

When sharing notebooks, users can also share the output of cells.

Allow users to share cell output

Disable cell output sharing

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# These are defaults, click next

## SageMaker Projects and JumpStart

- optional

### SageMaker Projects and JumpStart New

Enable access and provisioning of AWS Service Catalog Portfolio of products in Amazon SageMaker Studio for Amazon SageMaker Projects and JumpStart. [Learn more](#)

- Enable Amazon SageMaker project templates and Amazon SageMaker JumpStart for this account

If enabled, the administrator can view the Amazon SageMaker built-in project templates and Amazon SageMaker JumpStart solutions published in AWS Service Catalog. A launch constraint role and a project use role are automatically generated in IAM for your account.

- Enable Amazon SageMaker project templates and Amazon SageMaker JumpStart for Studio users

If enabled, this setting allows users who are currently using the domain execution role to create projects using templates and JumpStart solutions published by Amazon SageMaker in AWS Service Catalog. If there are individual users using custom execution roles in your organization, you need to enable them on the user profile page.

Cancel

Back

Next

Click next

## General settings

Configurations that are shared across the entire SageMaker Domain.

### RStudio Workbench - optional

#### License

A saved license from AWS License Manager will be automatically detected once a license has been added. If a license is not detected, you must add one to AWS License Manager to activate, and use RStudio Workbench, and other RStudio tools.

 RStudio Workbench license not detected.

Cancel

Back

Next

# This is defaults

## ▼ Canvas base permissions configuration

### Enable Canvas base permissions

If you enable Canvas base permissions, your users will have the necessary permissions to build models in Canvas. If you disable Canvas base permissions, your users won't have the necessary permissions to use Canvas, and you must manually configure IAM permissions for full Canvas functionality.

The [AmazonSageMakerCanvasFullAccess](#) policy will be attached to the default Sagemaker execution role that you specified in General settings.

## ▼ Time series forecasting configuration

### Enable time series forecasting

Enable time series forecasting to allow users to use time series forecasting in Canvas.

#### Amazon Forecast role

Canvas needs permission to connect to Amazon Forecast on your behalf to enable time series forecasting in Canvas.

- Create and use a new execution role
- Use an existing execution role

#### New IAM role suffix

Your role will be prefixed with "AmazonSagemakerCanvasForecastRole-" and includes the policy named

[AmazonSagemakerCanvasForecastRolePolicy](#)

20230311T200457

The name can have up to 63 characters. Valid characters: A-Z, a-z, 0-9, and - (hyphen)

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# Click submit, the Domain take time to setup, hit refresh

Local file upload configuration

Enable local file upload

Enable local file upload to allow users to upload local files in Canvas. This will override any custom CORS configuration.

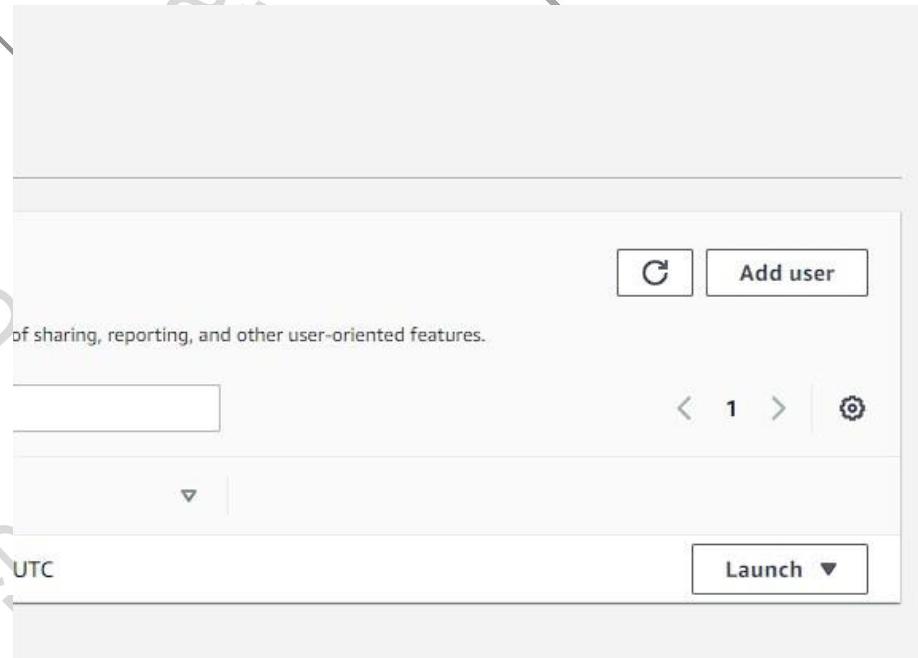
The following Cross-origins resource sharing (CORS) configuration will be attached, enabling users to upload local files.

```
[  
  {  
    AllowedHeaders: [  
      *  
    ],  
    AllowedMethods: [  
      POST  
    ],  
    AllowedOrigins: [  
      *  
    ],  
    ExposeHeaders: []  
  }  
]
```

Cancel Back Submit

Every few minutes

Click Add user



This is default, click next

User profile

Name

The name can have up to 63 characters. Valid characters: A-Z, a-z, 0-9, and - (hyphen)

Execution role

The default execution role for both users and spaces in the domain. The execution role must have the [AmazonSageMakerFullAccess](#) policy attached.

▼

[Create role using the role creation wizard](#)

Tags - optional

Add tag

You can attach up to 50 tags

Cancel **Next**

# Click submit, you can now access the SageMaker Studios

Enable Canvas base permissions

If you enable Canvas base permissions, your users will have the necessary permissions to build models in Canvas. If you disable Canvas base permissions, your users won't have the necessary permissions to use Canvas, and you must manually configure IAM permissions for full Canvas functionality.

The [AmazonSageMakerCanvasFullAccess](#) policy will be attached to the default Sagemaker execution role that you specified in General settings.

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Enable time series forecasting

Enable time series forecasting to allow users to use time series forecasting in Canvas.

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Create and use a new execution role

Use an existing execution role

**New IAM role suffix**

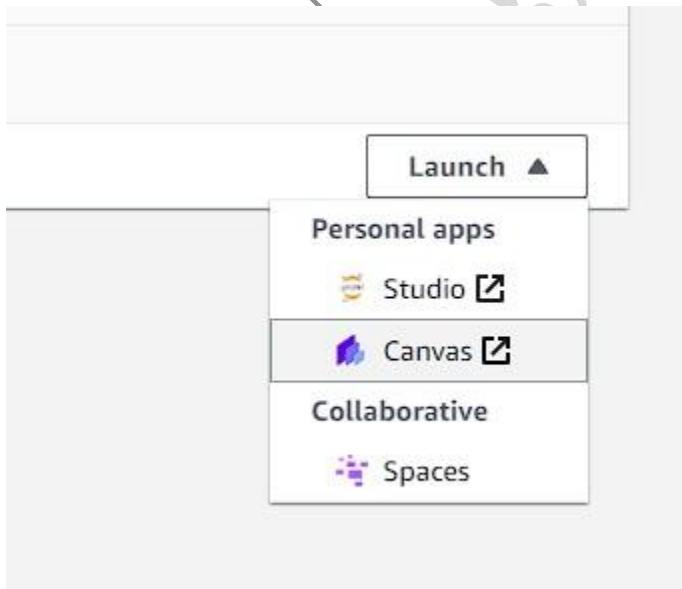
Your role will be prefixed with "AmazonSagemakerCanvasForecastRole-" and includes the policy named [AmazonSagemakerCanvasForecastRolePolicy](#)

20230311T200683

The name can have up to 63 characters. Valid characters: A-Z, a-z, 0-9, and - (hyphen)

[Cancel](#) [Back](#) [Submit](#)

Click Studio



# Get Ready for next steps

The screenshot shows the AWS SageMaker Home interface. On the left is a navigation sidebar with the following items:

- Home
- Data
- AutoML
- Experiments
- Notebook jobs
- Pipelines
- Models
- Deployments
- SageMaker JumpStart
- Learning resources

The main content area is titled "Home". It features a "Quick actions" section with four cards:

- Open Launcher**: Create notebooks and other resources.
- Import & prepare data visually**
- Open the Getting Started guide**
- Read documentation**

Below this is a section titled "Prebuilt and automated solutions" with two cards:

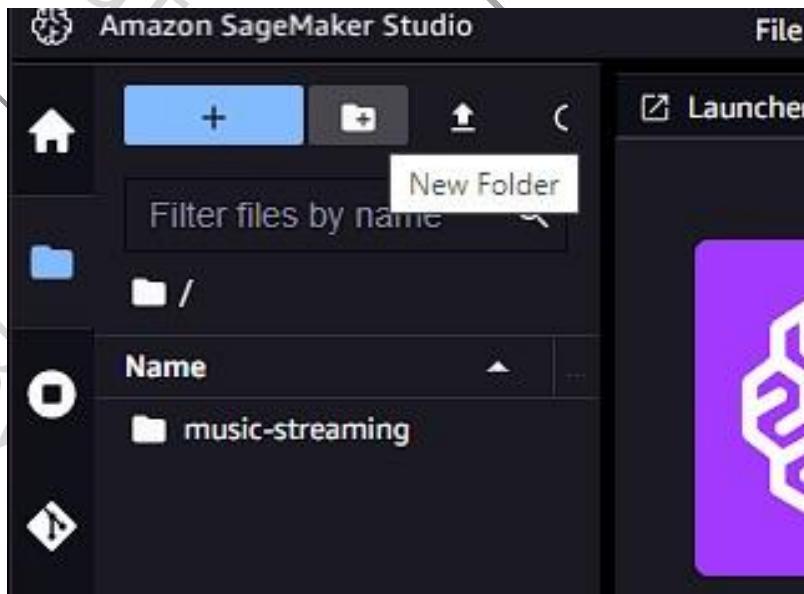
- JumpStart**: Pretrained models, notebooks, and prebuilt solutions.
- AutoML**: Automatically build, train, and tune the best machine learning model.

At the bottom is a section titled "Workflows and tasks" with three columns:

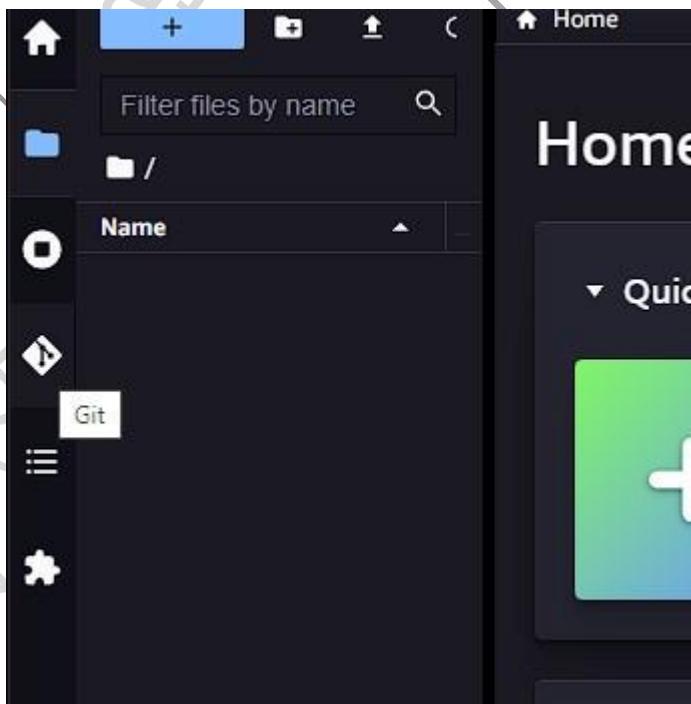
- Prepare data**
  - Connect to data sources
  - Transform, analyze, and export data
  - Store, manage, and retrieve features
  - Manage EMR clusters
- Build, train, tune model**
  - View all experiments
  - Create AutoML experiment
  - Get pretrained models
  - Catalog models with model registry
  - Compile model
- Deploy model**
  - Get endpoint recommendations
  - Manage endpoints and inference requests

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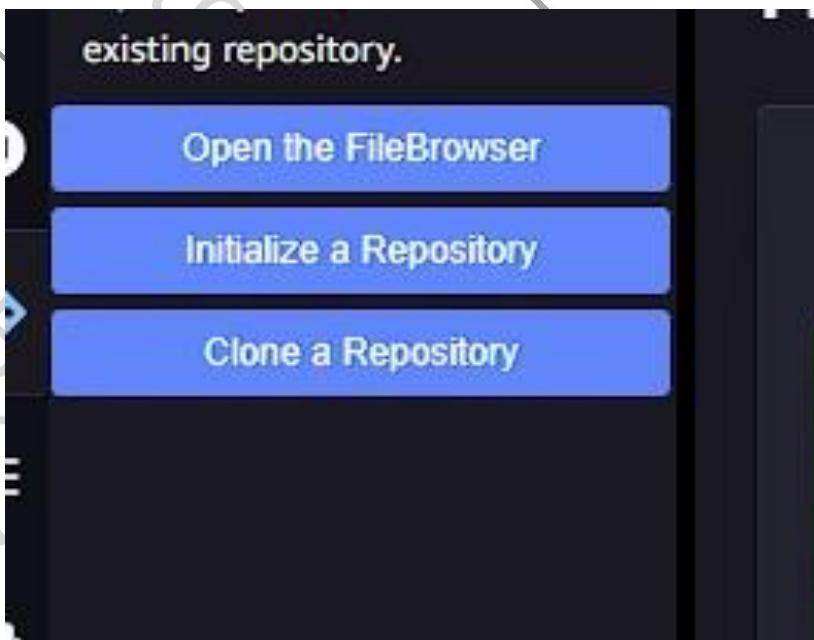
On the top left create a new folder



Once you created your folder, click on Git



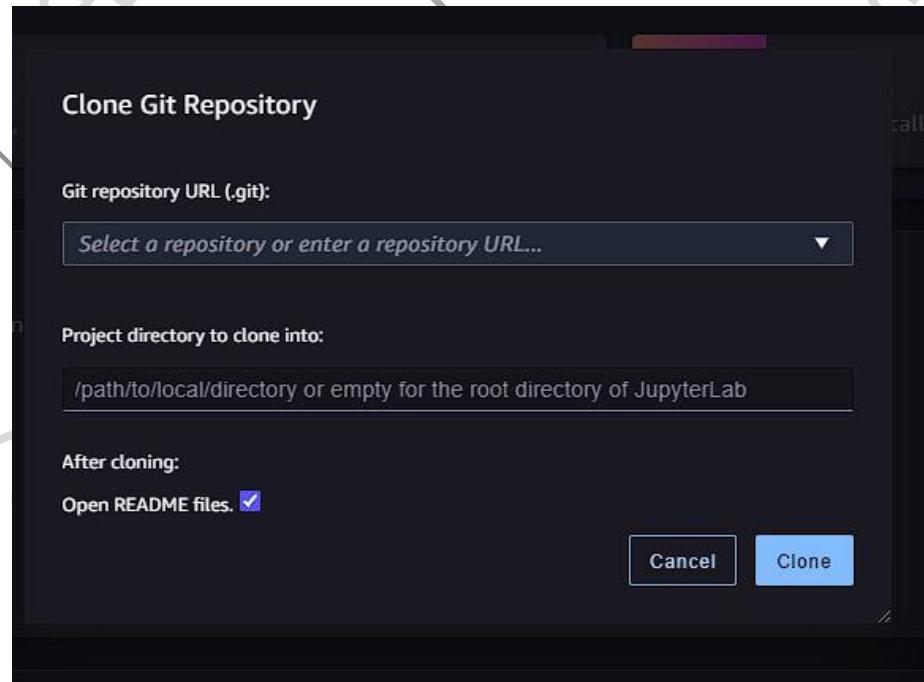
Click Clone a Repository



Copy and paste into “Git repository URL”

<https://github.com/aws/amazon-sagemaker-examples.git>

It should automatically have your folder in “Project directory to clone into”

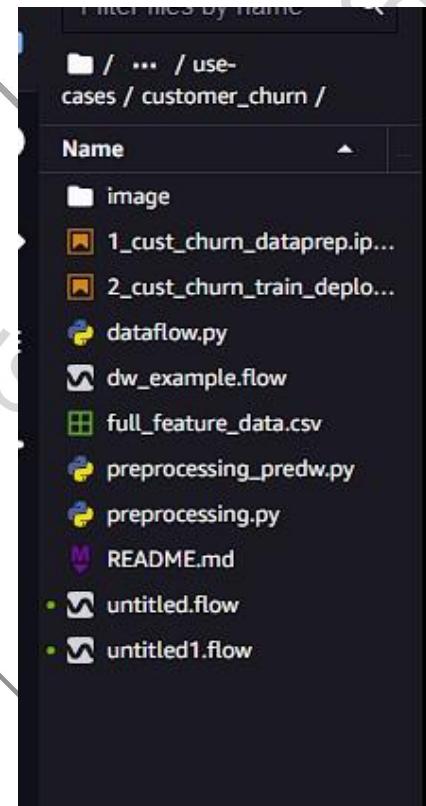


To get here first click your folder name,

Then amazon-sage  
Maker-examples

Then scroll down to  
Use-cases

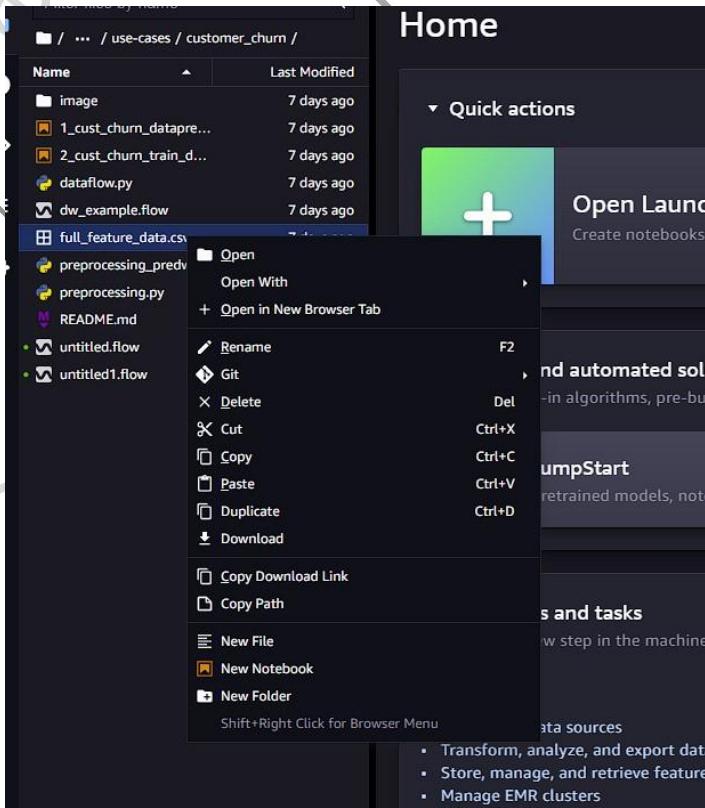
Then customer-churn



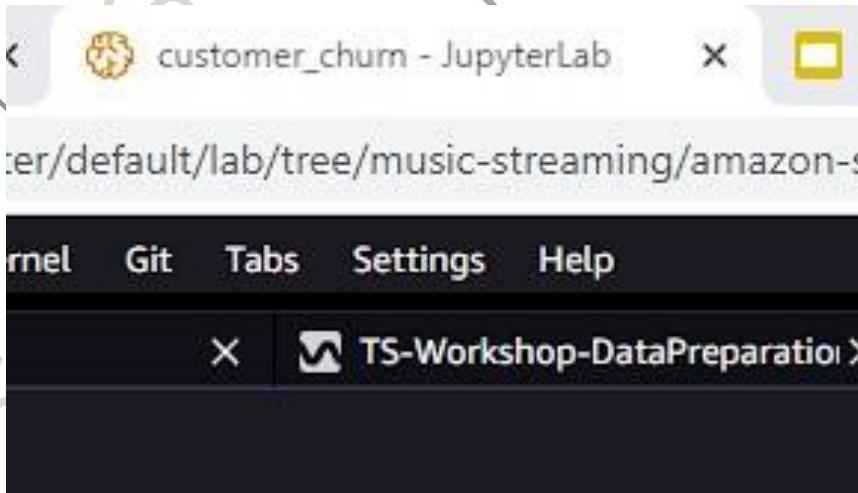
Full\_feature\_data.csv

Download the csv file either from github or from Sagemaker, you'll right click the csv file then press download then upload it to your bucket then it should be available for you to use in the later steps

# An example of how to download the csv file

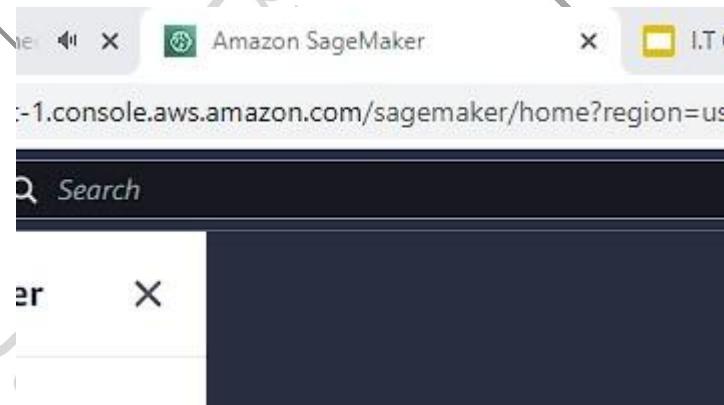


Keep your SageMaker Studio tab open



Then click on your AWS Sagemaker tab

Click search and type S3. Click create new bucket



# The bucket name is up to you

## General configuration

Bucket name

Bucket name must be globally unique and must not contain spaces or uppercase letters. See rules for bucket naming [↗](#)

AWS Region

▼

Copy settings from existing bucket - *optional*

Only the bucket settings in the following configuration are copied.

[Choose bucket](#)

# Copy these settings

## Object Ownership Info

Control ownership of objects written to this bucket from other AWS accounts and the use of access control lists (ACLs). Object ownership determines who can specify access to objects.

### ACLs disabled (recommended)

All objects in this bucket are owned by this account. Access to this bucket and its objects is specified using only policies.

### ACLs enabled

Objects in this bucket can be owned by other AWS accounts. Access to this bucket and its objects can be specified using ACLs.

## Object Ownership

### Bucket owner preferred

If new objects written to this bucket specify the bucket-owner-full-control canned ACL, they are owned by the bucket owner. Otherwise, they are owned by the object writer.

### Object writer

The object writer remains the object owner.



### Upcoming permission changes to enable ACLs

Starting in April 2023, to enable ACLs when creating buckets by using the S3 console, you must have the s3:PutBucketOwnershipControls permission. Learn more [↗](#)

# And these

## Block Public Access settings for this bucket

Public access is granted to buckets and objects through access control lists (ACLs), bucket policies, access point policies, or all. In order to ensure that public access to this bucket and its objects is blocked, turn on Block all public access. These settings apply only to this bucket and its access points. AWS recommends that you turn on Block all public access, but before applying any of these settings, ensure that your applications will work correctly without public access. If you require some level of public access to this bucket or objects within, you can customize the individual settings below to suit your specific storage use cases. Learn more [\[2\]](#)

### Block all public access

Turning this setting on is the same as turning on all four settings below. Each of the following settings are independent of one another.

#### Block public access to buckets and objects granted through **new** access control lists (ACLs)

S3 will block public access permissions applied to newly added buckets or objects, and prevent the creation of new public access ACLs for existing buckets and objects. This setting doesn't change any existing permissions that allow public access to S3 resources using ACLs.

#### Block public access to buckets and objects granted through **any** access control lists (ACLs)

S3 will ignore all ACLs that grant public access to buckets and objects.

#### Block public access to buckets and objects granted through **new** public bucket or access point policies

S3 will block new bucket and access point policies that grant public access to buckets and objects. This setting doesn't change any existing policies that allow public access to S3 resources.

#### Block public and cross-account access to buckets and objects through **any** public bucket or access point policies

S3 will ignore public and cross-account access for buckets or access points with policies that grant public access to buckets and objects.



### ⚠ Turning off block all public access might result in this bucket and the objects within becoming public

AWS recommends that you turn on block all public access, unless public access is required for specific and verified use cases such as static website hosting.

- I acknowledge that the current settings might result in this bucket and the objects within becoming public.



### ℹ Upcoming permission changes to disable any Block Public Access setting

Starting in April 2023, to disable any Block Public Access setting when creating buckets by using the S3 console, you must have the s3:PutBucketPublicAccessBlock permission. Learn more [\[2\]](#)

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# This is default

**Bucket Versioning**

Versioning is a means of keeping multiple variants of an object in the same bucket. You can use versioning to preserve, retrieve, and restore every version of every object stored in your Amazon S3 bucket. With versioning, you can easily recover from both unintended user actions and application failures. Learn more [↗](#)

**Bucket Versioning**

Disable  
 Enable

**Tags (0) - optional**

You can use bucket tags to track storage costs and organize buckets. Learn more [↗](#)

No tags associated with this bucket.

[Add tag](#)

**Default encryption** [Info](#)

Server-side encryption is automatically applied to new objects stored in this bucket.

**Encryption key type** [Info](#)

Amazon S3 managed keys (SSE-S3)  
 AWS Key Management Service key (SSE-KMS)

**Bucket Key**

When KMS encryption is used to encrypt new objects in this bucket, the bucket key reduces encryption costs by lowering calls to AWS KMS. Learn more [↗](#)

Disable  
 Enable

[▶ Advanced settings](#)

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Justin Cortez

Once the bucket is created, click on the bucket, upload the  
Full\_feature\_data file into the bucket.

Then once done, click on your sagemaker studio and follow the next slides  
instructions

**Click home then click data**

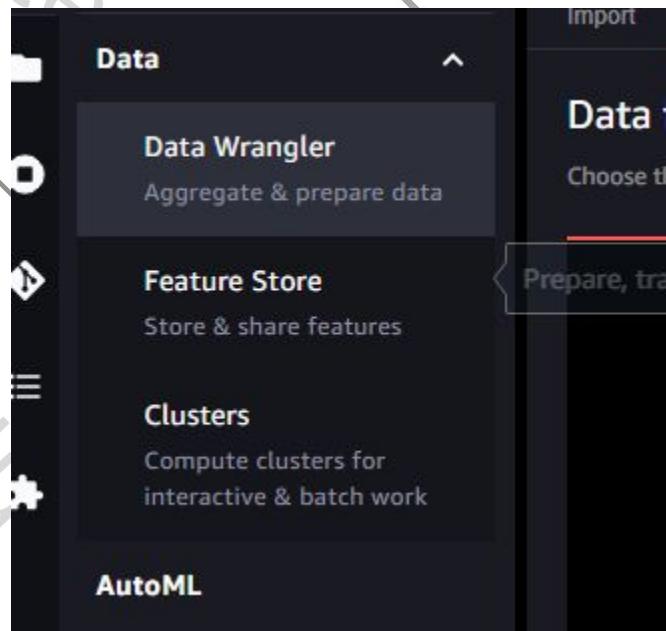
Data wrangler , Amazon S3

Click on TS-workshop-Dataprepartion

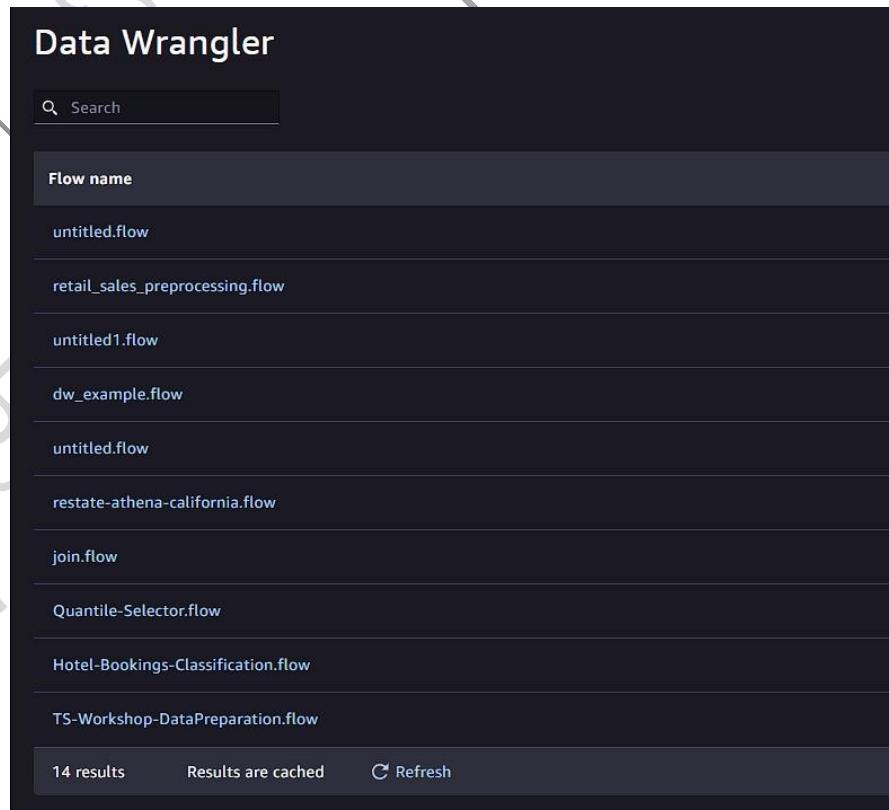
Find Source and click on the plus, click edit dataset and click on  
sagemaker-us-east1

Then click on your csv then press import

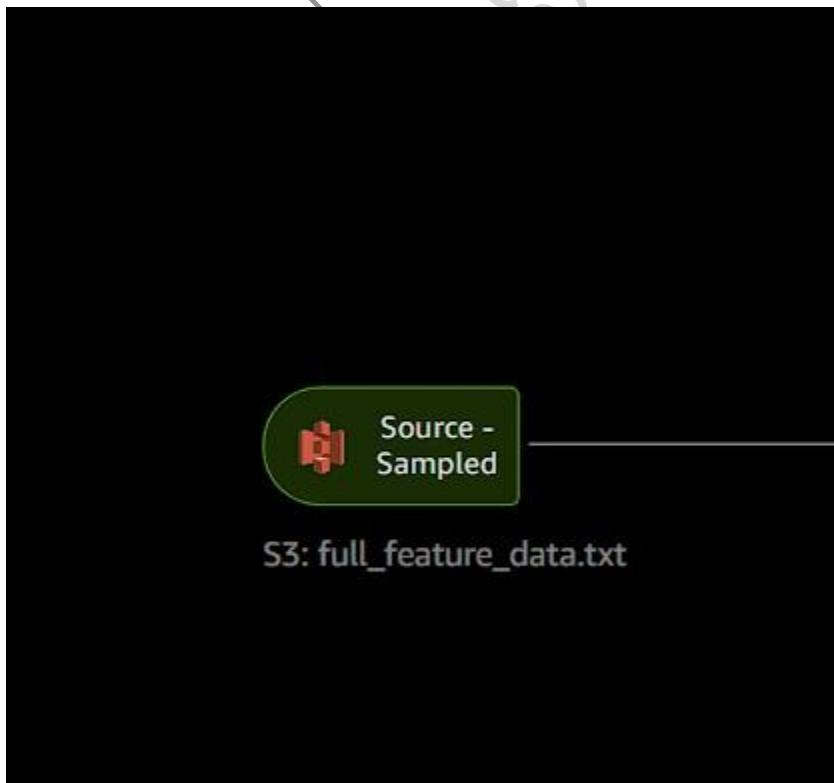
Go home and click on data then data wrangler



Click on TS-workshop-Dataprepartition

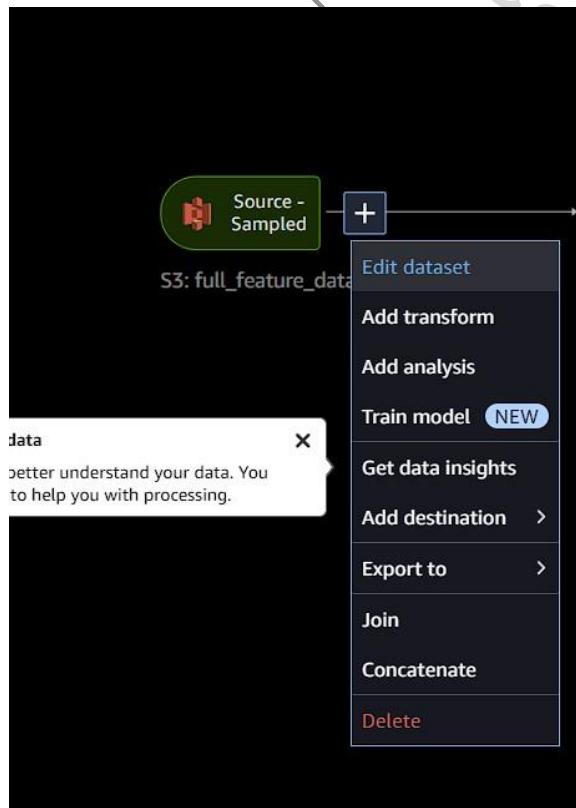


Drag and click your mouse to the left till you find “Source”

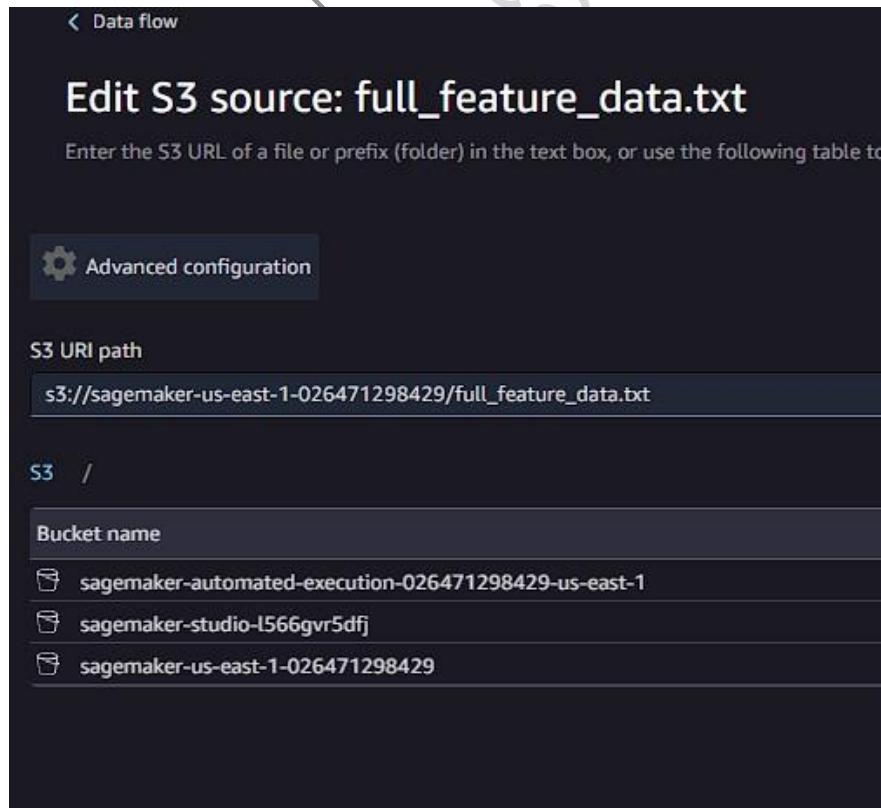


Yours will say  
TS-workshop-Dataprepartion

Click on the plus, then click edit dataset



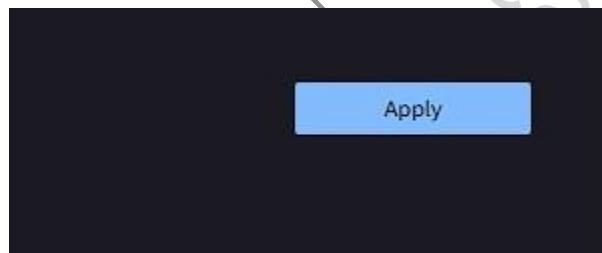
Click on your bucket, in this example my bucket is



Sagemaker-us-east-1-02

Click on full\_feature\_data.csv

Click apply



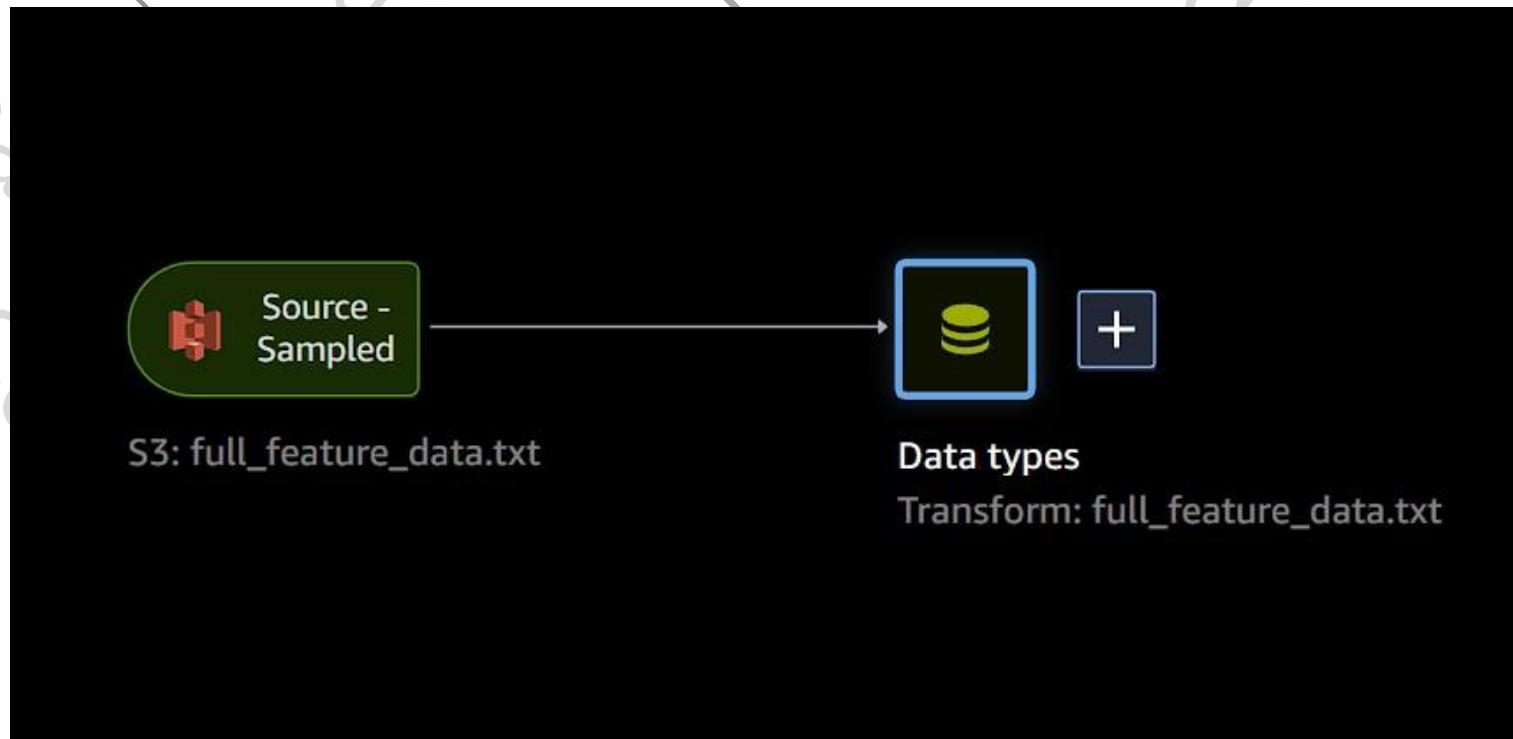
Apply

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You've imported the dataset and now will begin editing the Model

Created By Justin Cortez

Delete the other the transformations till you have your Lab setup like this



**Click Create Job and follow the instructions provided**

Click on AutoML

Create new AutoML Experiment

Click the S3 bucket you saved the data flow to

# Click on user\_churned

**Target**  
Select the Target for the model to predict.

**Target** ⓘ  
Select your target column

- userId
- user\_churned**
- average\_events\_weekend
- average\_events\_weekday
- num\_songs\_played\_7d
- num\_ads\_7d
- num\_error\_7d
- num\_songs\_played\_30d
- num\_songs\_played\_90d

num\_songs\_played\_7d    Auto

# Click HPO

## Training method and algorithms

Select the training method for solving your machine learning problems.

Auto

Let Autopilot automatically decide the training method based on your dataset size.

Ensembling

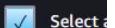
Autopilot uses an AutoML algorithm that trains a multi-layer stack ensemble model to predict on regression and classification datasets directly from your data.

Hyperparameter optimization (HPO)

Autopilot finds the best version of a model by tuning hyperparameters and running training jobs on your data set.

Select the algorithms to improve model prediction accuracies.

3/3 algorithms selected



Linear Models

A framework that uses a linear equation to model the relationship between two variables target variable and feature variable in observed data.



XGBoost

A supervised learning algorithm that attempts to accurately predict a target variable by combining an ensemble of estimates from a set of simpler and weaker models.



MLP

A multilayer perceptron (MLP) and feedforward artificial neural network. This algorithm can handle data that is not linearly separable.



# Copy these settings and click create

**Advanced settings (optional)**

**Machine learning problem type**

Specify the type of machine learning problem for Autopilot to solve.

Select the machine learning problem type ⓘ

Binary classification ▾

**Objective metric ⓘ**

Accuracy ▾

Choose how to run your experiment

Runtime

Access

Encryption

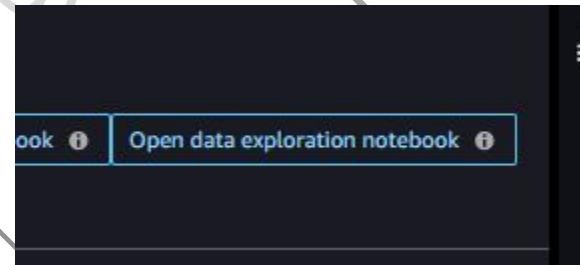
Security

Project

Tags

The screenshot shows the 'Create' interface for a machine learning experiment in the Azure Machine Learning studio. On the left, a sidebar lists optional settings: 'Machine learning problem type', 'Choose how to run your experiment', 'Runtime', 'Access', 'Encryption', 'Security', 'Project', and 'Tags'. The 'Machine learning problem type' section is expanded, showing 'Binary classification' selected as the objective metric. The background features a large watermark reading 'Create By Justin NZ'.

Click open data exploration notebook to view your experiment



# **DELETE YOUR DOMAIN**

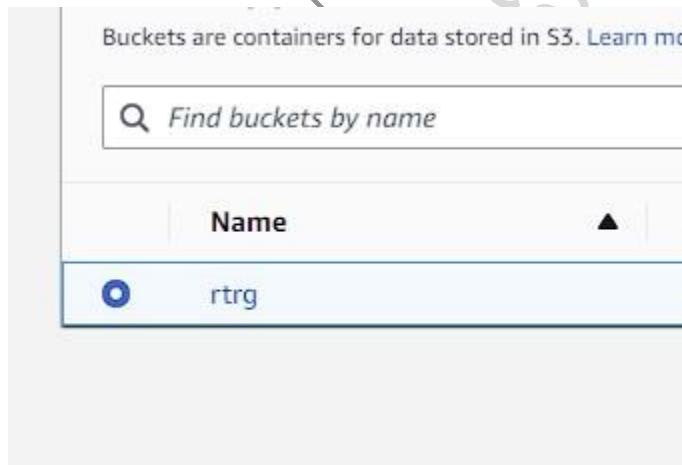
In order to delete your domain

You have to first delete all your buckets and delete the objects within them

After that you can delete your user for your domain

Then delete your domain entirely

# How to delete the objects in your bucket



Click on the blue text of your bucket name

# Click on the checkmark to select all your objects

Objects (8)

Objects are the fundamental entities stored in Amazon S3. You can use Amazon S3 inventory [\[?\]](#)

Name

COMPSFI212Lab1SP23 (2).docx

COMPSFI212Lab1SP23 (3).docx

GameServerKeyPair.pem

helper.py

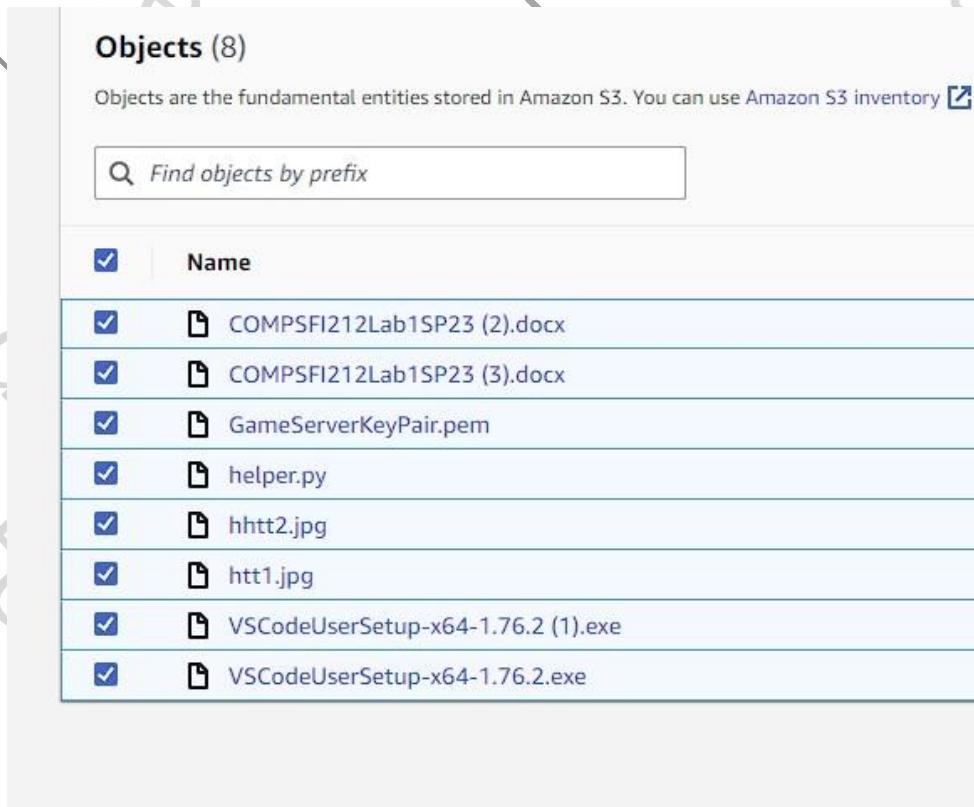
hhtt2.jpg

htt1.jpg

VSCodeUserSetup-x64-1.76.2 (1).exe

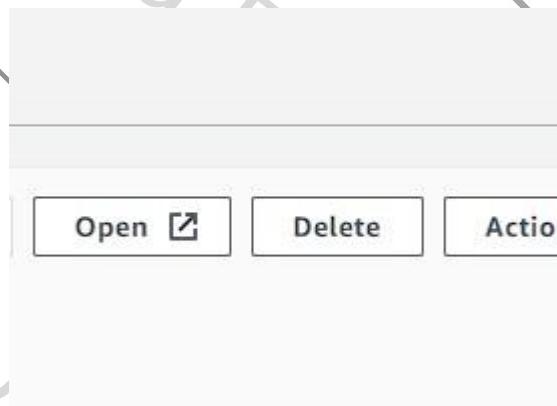
VSCodeUserSetup-x64-1.76.2.exe

Find objects by prefix

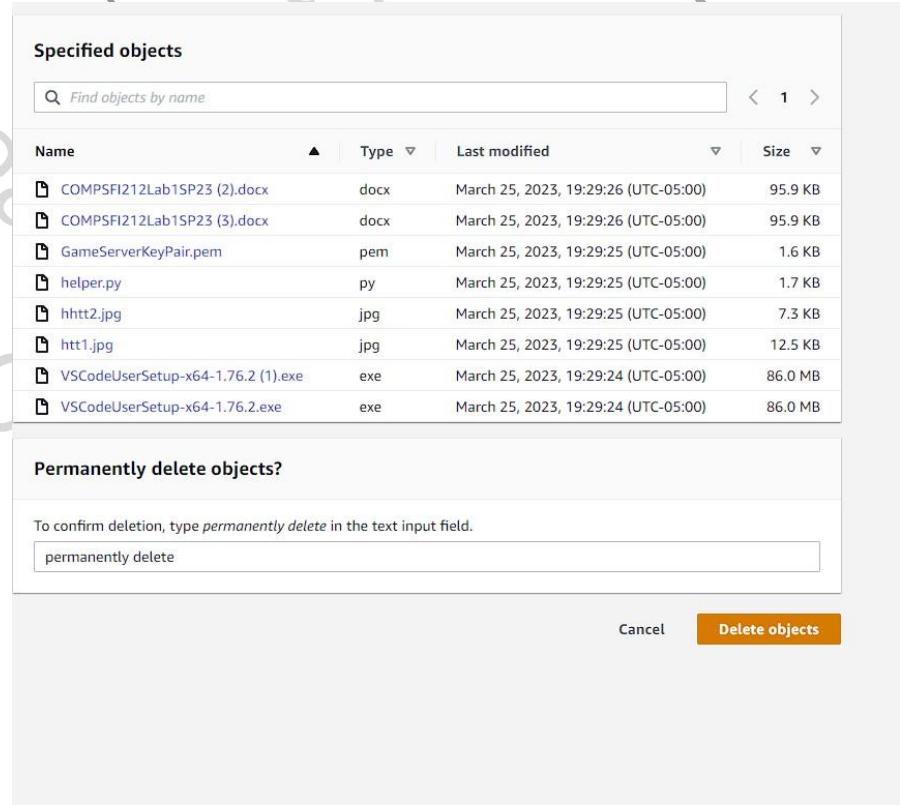


The screenshot shows the 'Objects' section of the AWS S3 console. It displays a list of eight objects: 'COMPSFI212Lab1SP23 (2).docx', 'COMPSFI212Lab1SP23 (3).docx', 'GameServerKeyPair.pem', 'helper.py', 'hhtt2.jpg', 'htt1.jpg', 'VSCodeUserSetup-x64-1.76.2 (1).exe', and 'VSCodeUserSetup-x64-1.76.2.exe'. Each object entry has a checkbox to its left, and all checkboxes are checked. A search bar at the top is empty. A large watermark reading 'Created By Justin Cortez' is diagonally across the page.

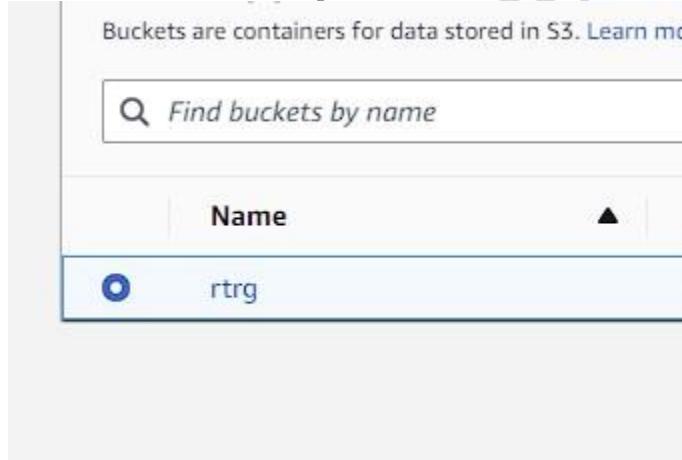
Click delete



# Copy and past “permanently delete” and click delete objects

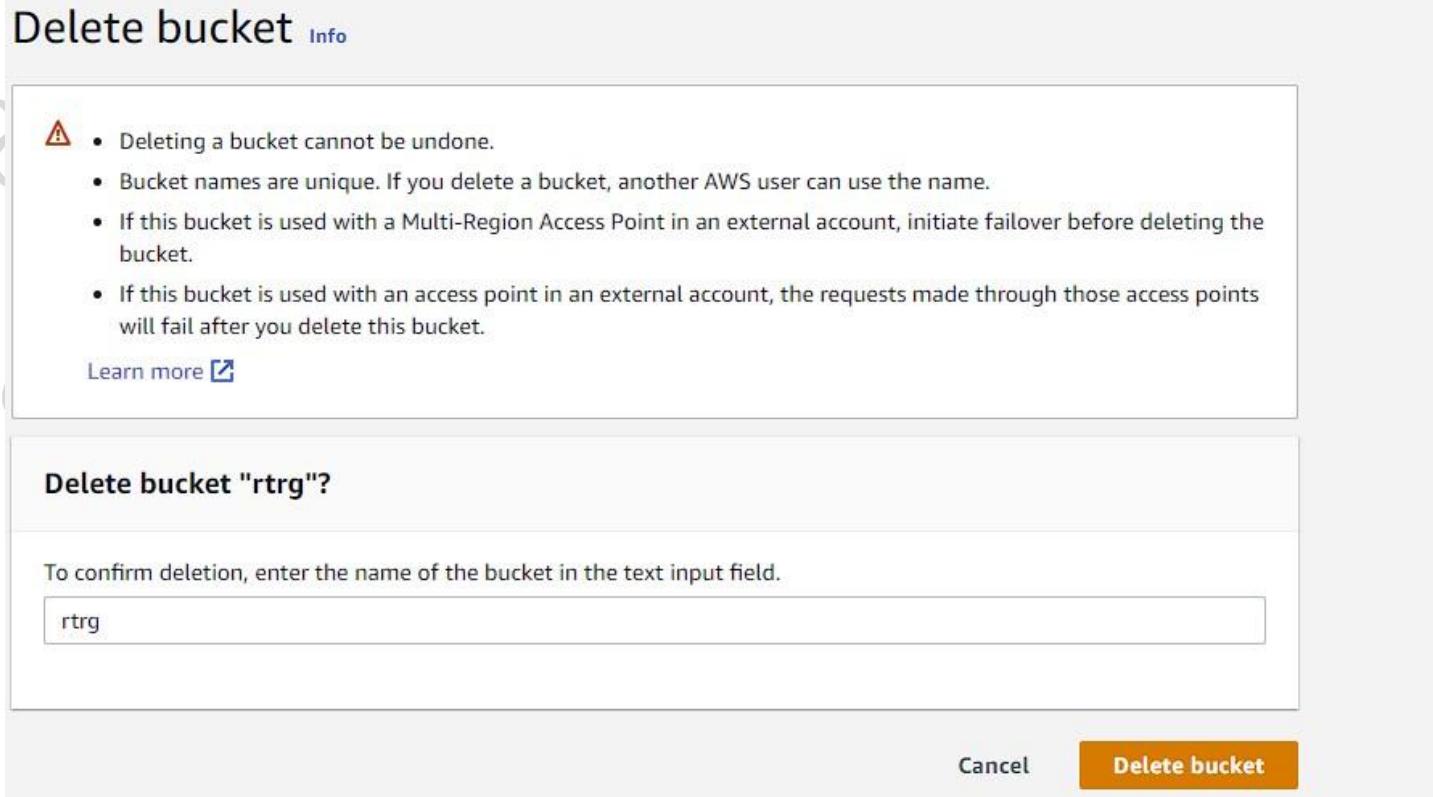


Now go back to your bucket list screen and click

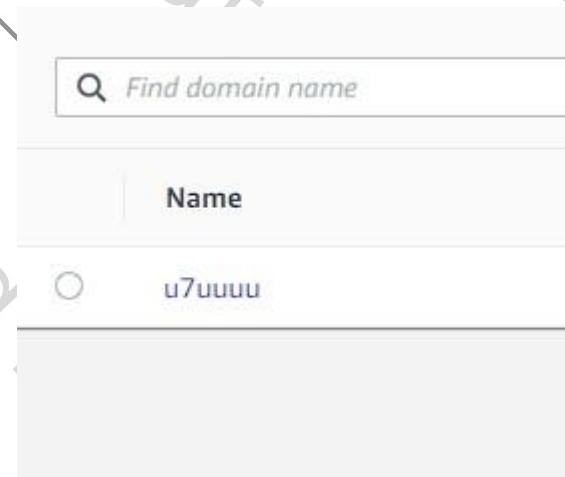


On the circle next to your bucket name and click delete

# Now enter your bucket name and click delete bucket



Go to Amazon SageMaker | Click domains and click on



Your domain

Click on user

## User profiles Info

A user profile represents a single user within a

 Search users

### Name

default-1679791329896

default-1679791062770

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Cortez

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Cortez

Click on edit

arn::026471298429:role/  
role/AmazonSageMaker-  
nRole-  
1T200214

uwmunkdrha

0500 (Central Daylight Time)

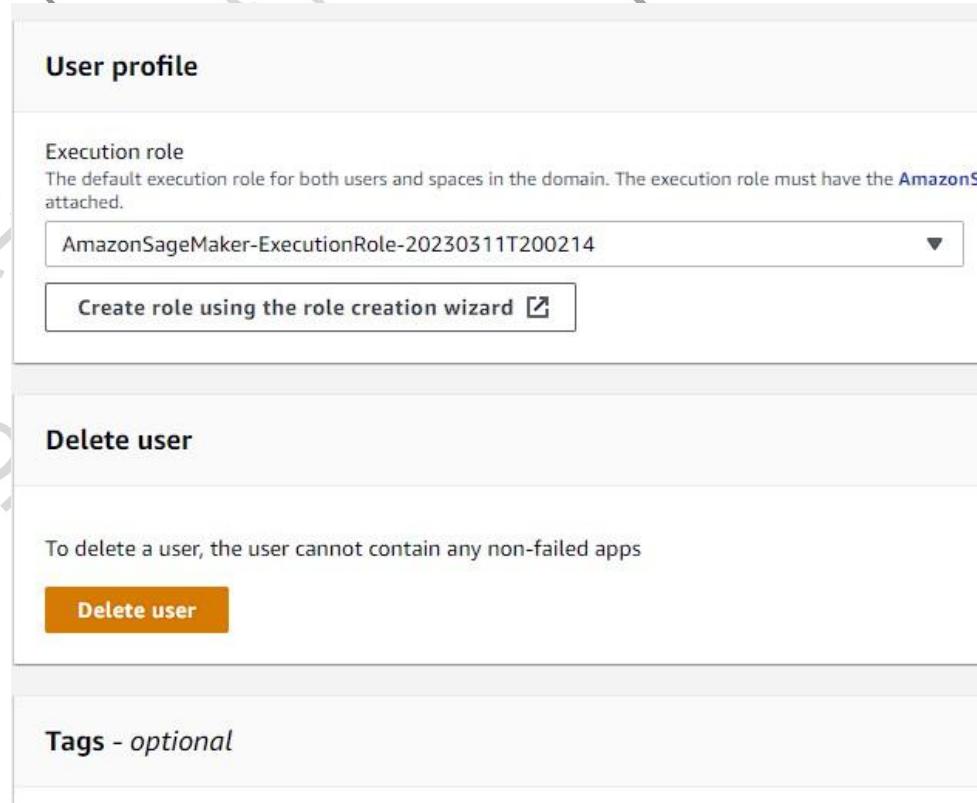
Modified On

Sat Mar 25 2023 19:42:20 GMT-  
0500 (Central Daylight Time)

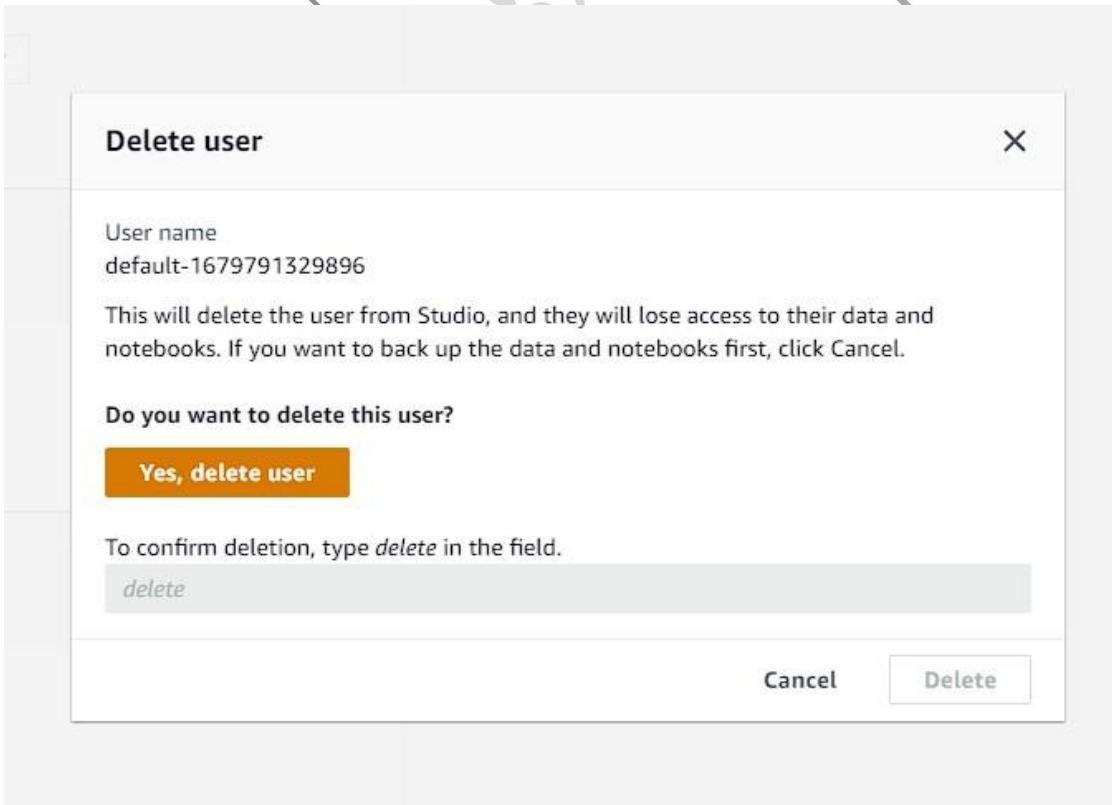
Cancel

Edit

Click delete user



Click “Yes, delete user” and type delete



Created By Justin  
Cortez  
Cortez

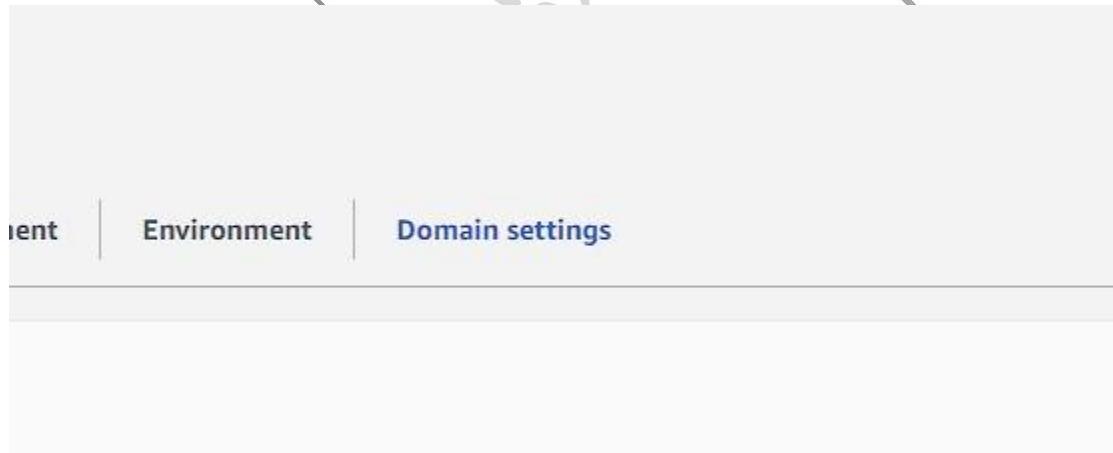
# Click on domains

The screenshot shows the 'Domain details' page for a domain named 'u7uuuu'. The top navigation bar includes a warning message: '⚠️ NO new Jupyter Lab / Version apps can be created from March 30, 2024'. The breadcrumb navigation shows 'Amazon SageMaker > Domains > Domain: u7uuuu'. Below the title 'u7uuuu' and 'Domain details', there is a sub-header 'Configure and manage the domain.' followed by tabs: 'User profiles' (which is underlined), 'Space management', 'Environment', and 'Domain'. The 'User profiles' section contains a sub-header 'User profiles Info' and a descriptive text: 'A user profile represents a single user within a domain. It is the main way to reference a user in your environment.' Below this is a search bar labeled 'Search users' with a magnifying glass icon. A table header is visible with columns 'Name' and 'Modified on'.

Name	Modified on
------	-------------

Created By Justin Cortez  
Justin Cortez

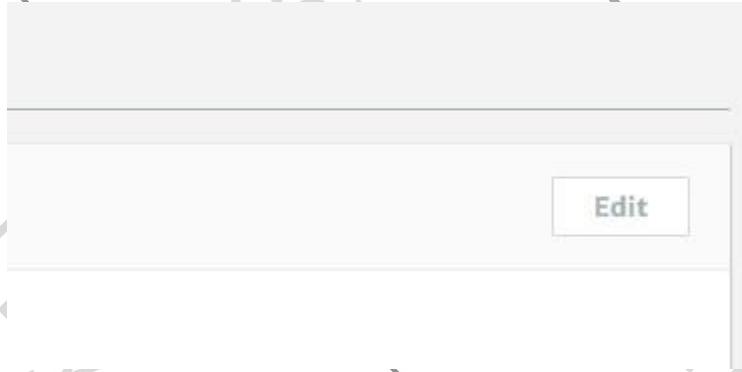
Click on domain settings



Created By Justin  
Cortez

Cortez  
Justin

Click on edit on the right side of the screen



# Click delete domain and you're done

## General settings

Configurations that are shared across the entire SageMaker Domain.

### Delete domain

To delete a domain, the domain cannot contain any user profiles or spaces. To delete a user profile or space, the profile or space cannot contain any non-failed apps.

[Delete domain](#)

**OpenCV**

Available on Windows and Linux

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Cortez

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