

The background features a dark blue gradient with various digital motifs. On the left, a green bar chart with five bars of varying heights is overlaid with a red line graph. Scattered throughout the background are white binary digits (0s and 1s). On the right side, there is a network diagram consisting of red and blue nodes connected by thin lines, forming a complex web. The overall aesthetic is high-tech and data-oriented.

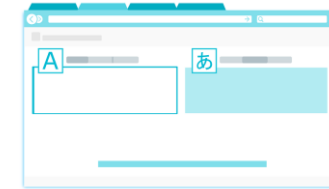
FIAP

PLATAFORMAS E SERVIÇOS COGNITIVOS

PROF. DR. FERNANDO TIMOTEO FERNANDES

Vimos...

- Serviço de Tradução de Idiomas (Language Translator)



- Analisador de Tons (Tone Analyzer)



- Natural Language Understanding

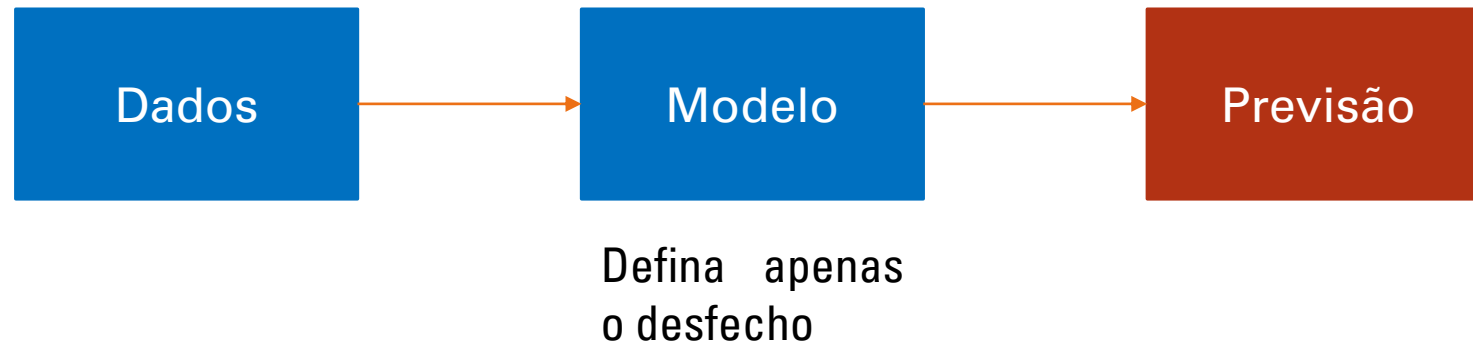


Agenda

- Serviços de IA e machine learning
 - AWS Sagemaker

AWS Sagemaker

- Ferramenta que permite desenvolver modelos de machine learning (ML)
- Permite criar ambientes para rodar códigos em python ou r
- Permite rodar AutoML para mostrar a viabilidade de um modelo de ML



AWS Sagemaker

- **Ground Truth** – Solicita o rotulamento de dados usando humanos para validação.
- **Notebooks (bloco de anotações)** – Permite criar Jupyter notebooks para treinar e fazer o deploy de modelos
- **AutoPilot** – Serviço de Auto ML que permite demonstrar a viabilidade de um projeto de ML
- **Canvas (Tela)** – Permite criar modelos de machine learning sem rodar código e criar dashboards

aws

Services

Q

Search for services, features, blogs, docs, and more

[Alt+S]

Norte da Virgínia ▾

voclabs/user2047112=Test_Student @ 5742-9692-456

Resource Groups & Tag Editor

Amazon SageMaker

X

Conceitos básicos

Painel de controle

Studio

Studio Lab

Tela

RStudio

Painel do SageMaker

Imagens

Configurações do ciclo de vida

Pesquisar

► Ground Truth

▼ Bloco de anotações

Instâncias do bloco de anotações

Amazon SageMaker > Instâncias do bloco de anotações

Instâncias do bloco de anotações

Q

Pesquisar instâncias do bloco de anotações

↺

Ações ▾

Criar instância do bloco de anotações

< 1 > ⚙

Nome ▾	Instância	Hora de criação ▾	Status ▾	Ações
Não há nenhum recurso no momento.				

6

Amazon SageMaker > Instâncias do bloco de anotações > Criar instância do bloco de anotações

Criar instância do bloco de anotações

O Amazon SageMaker fornece instâncias de bloco de anotações pré-compiladas totalmente gerenciadas que executam bloco de anotações Jupyter. As instâncias de bloco de anotações incluem código de exemplo para treinamento de modelo comum e exercícios de hospedagem. [Saiba mais](#)

Configurações da instância do bloco de anotações

Nome da instância de bloco de anotações

ftf-instancia-demo-fiap

No máximo 63 caracteres alfanuméricos. Pode incluir hífens (-), mas não espaços. Deve ser exclusivo na sua conta em uma Região da AWS.

Tipo da instância do bloco de anotações

ml.t3.medium

► Configuração adicional

Permissões e criptografia

Função do IAM

As instâncias de bloco de anotações exigem permissões para chamar outros serviços, incluindo o SageMaker e o S3. Escolha uma função ou deixe-nos criar uma função com o [AmazonSageMakerFullAccess](#) política do IAM anexada.

LabRole

Acesso raiz - *opcional*

- ☒ **Habilitar:** conceder aos usuários acesso raiz ao bloco de anotações
- ☐ **Desabilitar:** não conceder aos usuários acesso raiz ao bloco de anotações
- As configurações de ciclo de vida sempre têm acesso raiz

Chave de criptografia - *opcional*

Criptografe seus dados de bloco de anotações. Escolha uma chave KMS existente ou insira o ARN de uma chave.

Nenhuma criptografia personalizada

► Rede - *opcional*

► Repositórios Git - *opcional*

► Tags - *opcional*

Cancelar

Criar instância do bloco de anotações

aws

Services

Search for services, features, blogs, docs, and more

[Alt+S]

Norte da Virgínia

voclabs/user20

Resource Groups & Tag Editor

Amazon SageMaker

Conceitos básicos

Painel de controle

Studio

Studio Lab

Tela

RStudio

Painel do SageMaker

Amazon SageMaker

Instâncias do bloco de anotações

Instâncias do bloco de anotações

Pesquisar instâncias do bloco de anotações

	Nome	Instância	Hora de criação	Status
	ftf-instancia-demo-fiap	ml.t3.medium	Aug 28, 2022 13:35 UTC	InService

Ações

Abrir o Jupyter

Abrir o JupyterLab

Parar

Iniciar

Atualizar configurações

Adicionar/editar tags

Excluir

Criar instâ

Home Amazon SageMaker

no-fiap.notebook.us-east-1.sagemaker.aws/tree

jupyter

Open JupyterLab Quit Logout

Files Running Clusters SageMaker Examples Conda

Select items to perform actions on them.

Upload New

0 /

The notebook list is empty.

Notebook:

- R
- Sparkmagic (PySpark)
- Sparkmagic (Spark)
- Sparkmagic (SparkR)
- conda_amazonei_mxnet_p36
- conda_amazonei_pytorch_latest_p37
- conda_amazonei_tensorflow2_p36
- conda_mxnet_p37
- conda_python3
- conda_pytorch_p38
- conda_tensorflow2_p38

ftf-instancia-demo-fiap.notebook.us-east-1.sagemaker.aws/notebooks/Untitled.ipynb?kernel_name=conda_python3



Untitled Last Checkpoint: 2 minutos atrás (unsaved changes)



Logout

File Edit View Insert Cell Kernel Widgets Help

Trusted

conda_python3



Demonstração ¶

In [1]: `import pandas as pd`

In []:

Tarefa – Crie uma instância do jupyter

- ☐ No AWS Learner Lab, faça:
- ☐ Acesse o AWS Sagemaker
- ☐ Crie uma instância do Jupyter Notebook
- ☐ **Encerre o lab**

Jupyter Lab

The screenshot shows the Amazon SageMaker console interface. The top navigation bar includes the AWS logo, 'Services', a search bar, and the current region 'Norte da Virgínia'. The left sidebar shows the 'Amazon SageMaker' section with options like 'Conceitos básicos', 'Painel de controle', 'Studio', and 'Studio Lab'. The main content area is titled 'Instâncias do bloco de anotações' and contains a table of annotation instances.

	Nome	Instância	Hora de criação	Status	Ações
<input type="radio"/>	PipelineNotebooks	ml.m5.4xlarge	Aug 28, 2022 14:01 UTC	✓ InService	Abrir o Jupyter Abrir o JupyterLab

An orange arrow points to the 'Abrir o JupyterLab' link in the 'Ações' column of the table.

JupyterLab

The screenshot displays the JupyterLab web interface. At the top is a menu bar with options: File, Edit, View, Run, Kernel, Git, Tabs, Settings, and Help. Below the menu is a toolbar with icons for file operations. On the left is a sidebar with a file browser showing the directory `/ pt_br /` containing a file `PythonCheatSheet.ipynb` modified 2 minutes ago. The main area is titled 'Launcher' and shows a grid of environment icons under the heading 'pt_br'. The 'Notebook' section contains icons for Python environments (conda_amazonei_pytorch_latest_p, conda_amazonei_mxnet_p36, conda_amazonei_tensorflow2_p3, conda_mxnet_p3_7, conda_python3, conda_pytorch_p38, conda_tensorflow_w2_p38), R (R), and Sparkmagic (PySpark). The 'Console' section contains similar icons for the same environments, with Sparkmagic (Spark) and Sparkmagic (SparkR) also present.

File Edit View Run Kernel Git Tabs Settings Help

/ pt_br /

Name Last Modified

PythonCheatSheet.ipynb 2 minutes ago

Launcher

pt_br

Notebook

conda_amazonei_pytorch_latest_p conda_amazonei_mxnet_p36 conda_amazonei_tensorflow2_p3 conda_mxnet_p3_7 conda_python3 conda_pytorch_p38 conda_tensorflow_w2_p38 R Sparkmagic (PySpark)

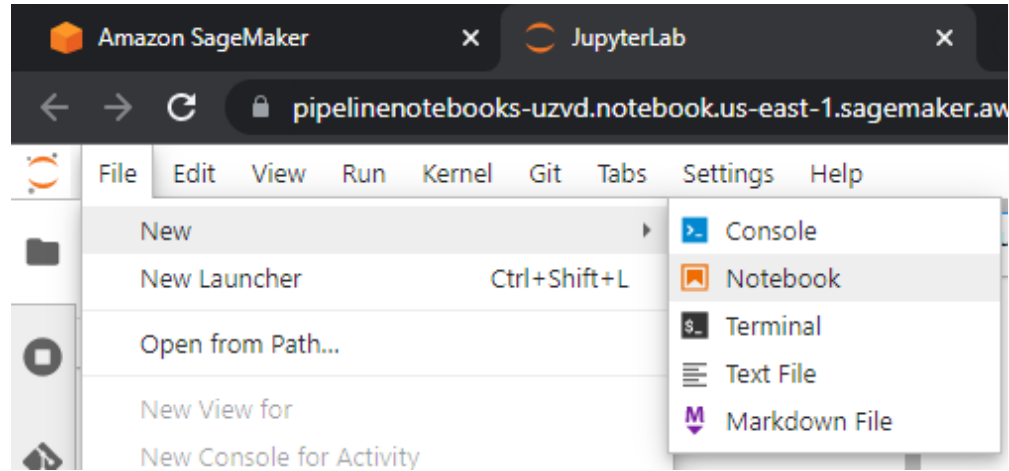
Sparkmagic (Spark) Sparkmagic (SparkR)

Console

conda_amazonei_pytorch_latest_p conda_amazonei_mxnet_p36 conda_amazonei_tensorflow2_p3 conda_mxnet_p3_7 conda_python3 conda_pytorch_p38 conda_tensorflow_w2_p38 R Sparkmagic (PySpark)

Sparkmagic (Spark) Sparkmagic (SparkR)

JupyterLab



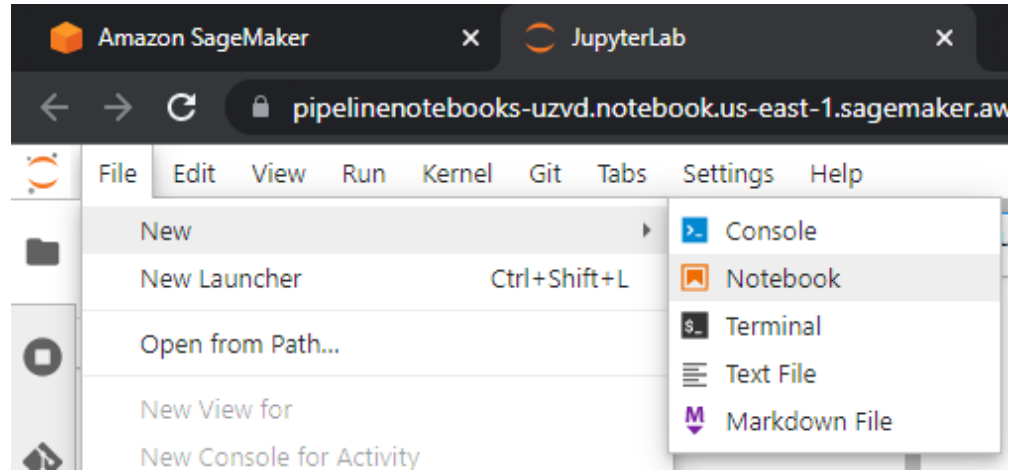
Select Kernel

Select kernel for: "Untitled.ipynb"

conda_python3

Select

JupyterLab



Select Kernel

Select kernel for: "Untitled.ipynb"

conda_python3

Select

JupyterLab

```
[3]: import warnings, requests, zipfile, io
warnings.simplefilter('ignore')
import pandas as pd
from scipy.io import arff

[5]: f_zip = 'http://archive.ics.uci.edu/ml/machine-learning-databases/00212/vertebral_column_data.zip'
r = requests.get(f_zip, stream=True)
Vertebral_zip = zipfile.ZipFile(io.BytesIO(r.content))
Vertebral_zip.extractall()

[6]: data = arff.loadarff('column_2C_weka.arff')
df = pd.DataFrame(data[0])
df.head()
```

	pelvic_incidence	pelvic_tilt	lumbar_lordosis_angle	sacral_slope	pelvic_radius	degree_spondylolisthesis	class
0	63.027817	22.552586	39.609117	40.475232	98.672917	-0.254400	b'Abnormal'
1	39.056951	10.060991	25.015378	28.995960	114.405425	4.564259	b'Abnormal'
2	68.832021	22.218482	50.092194	46.613539	105.985135	-3.530317	b'Abnormal'
3	69.297008	24.652878	44.311238	44.644130	101.868495	11.211523	b'Abnormal'
4	49.712859	9.652075	28.317406	40.060784	108.168725	7.918501	b'Abnormal'

```
import warnings, requests, zipfile, io
warnings.simplefilter('ignore')
import pandas as pd
from scipy.io import arff
```

```
f_zip = 'http://archive.ics.uci.edu/ml/machine-learning-databases/00212/vertebral_column_data.zip'
```

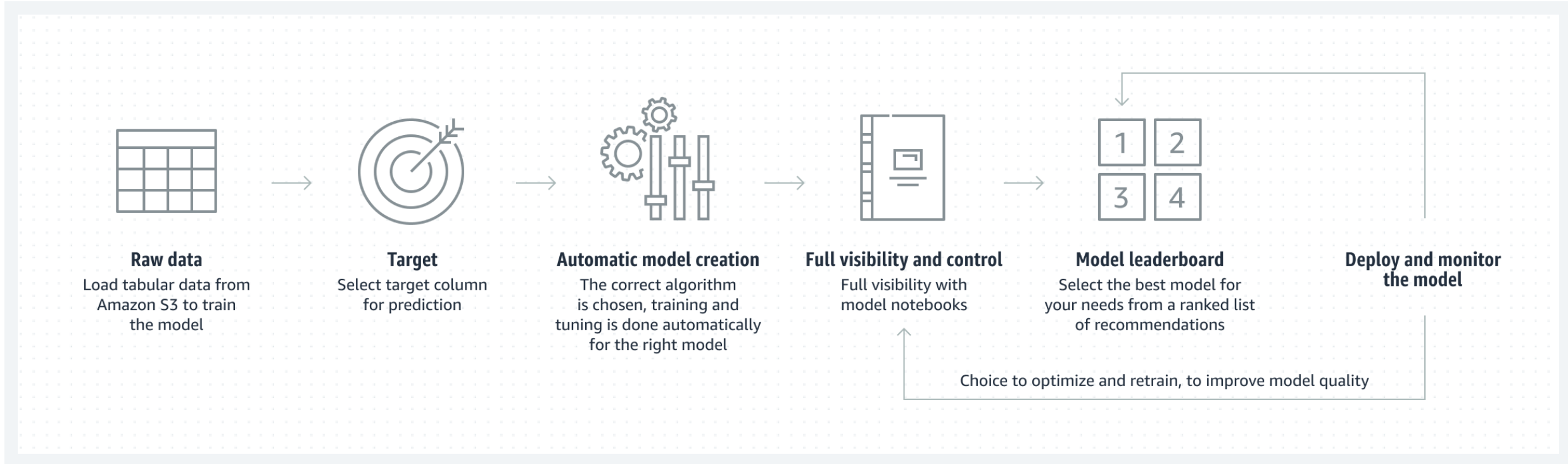
```
r = requests.get(f_zip, stream=True)
Vertebral_zip = zipfile.ZipFile(io.BytesIO(r.content))
Vertebral_zip.extractall()
```

```
data = arff.loadarff('column_2C_weka.arff')
df = pd.DataFrame(data[0])
df.head()
```

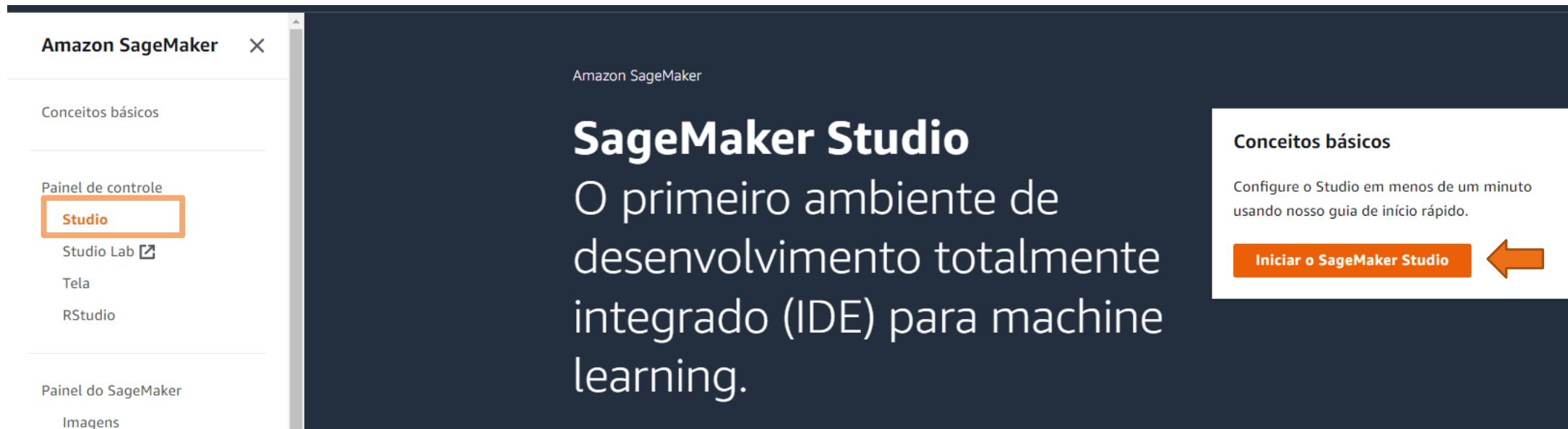

Tarefa – Abrir o Jupyter Lab

- ☐ No AWS Learner Lab, faça:
- ☐ Acesse o AWS Sagemaker
- ☐ Crie uma instância do Jupyter Lab
- ☐ Crie um novo notebook
- ☐ Copie e cole o código do slide anterior
- ☐ **Encerre o lab**

AutoPilot



AutoPilot



The screenshot shows the Amazon SageMaker Studio console. On the left is a navigation sidebar with the following sections: 'Amazon SageMaker' (with a close button), 'Conceitos básicos', 'Painel de controle' (containing 'Studio' which is highlighted with an orange box, 'Studio Lab' with an external link icon, 'Tela', and 'RStudio'), and 'Painel do SageMaker' (containing 'Imagens'). The main content area has a dark blue background and features the text 'Amazon SageMaker' at the top, followed by 'SageMaker Studio' in large white font, and 'O primeiro ambiente de desenvolvimento totalmente integrado (IDE) para machine learning.' below it. On the right side of the main area, there is a white box titled 'Conceitos básicos' containing the text 'Configure o Studio em menos de um minuto usando nosso guia de início rápido.' and an orange button labeled 'Iniciar o SageMaker Studio'. An orange arrow points from this button towards the left.

Amazon SageMaker

SageMaker Studio

O primeiro ambiente de desenvolvimento totalmente integrado (IDE) para machine learning.

Conceitos básicos

Configure o Studio em menos de um minuto usando nosso guia de início rápido.

[Iniciar o SageMaker Studio](#)

AutoPilot

Amazon SageMaker

Conceitos básicos

Painel de controle

Studio

Studio Lab

Tela

RStudio

Painel do SageMaker

Imagens

Configurações do ciclo de

Amazon SageMaker > Painel de controle

Painel de controle

Configure e gerencie o domínio, os usuários e os aplicações do SageMaker.

Usuários

Adicionar usuário

Nome

Modificado em

Criado em

default-1661699253429

Aug 28, 2022 15:13 UTC

Aug 28, 2022 15:13 UTC

Executar aplicação

Studio

Tela

Apps

21

S3 – Adicionar arquivo e liberar acesso ao Sagemaker

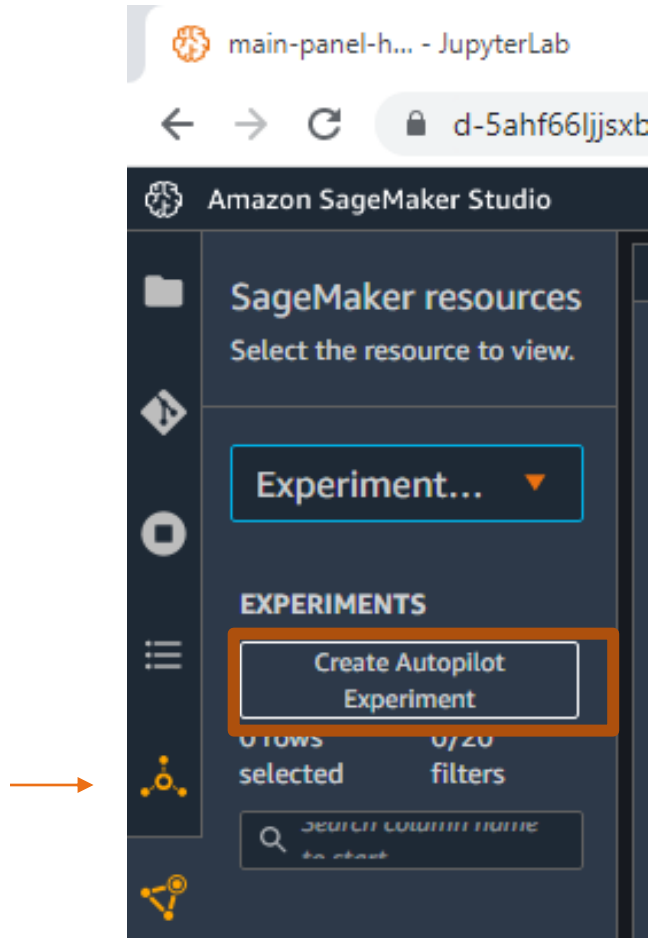
The screenshot shows the AWS S3 console interface. At the top, there's a navigation bar with the AWS logo, 'Services' menu, a search bar, and user information. Below this, a breadcrumb trail shows 'Amazon S3 > Buckets > sagemaker-studio-351655467910-0ebadzp1wfkq'. The bucket name is prominently displayed with an 'Info' link. A red badge indicates 'Publicamente acessível'. Below the bucket name, there are tabs for 'Objetos', 'Propriedades', 'Permissões', 'Métricas', 'Gerenciamento', and 'Pontos de acesso'. The 'Objetos' tab is selected, showing a list of objects. Above the list, there are buttons for 'Copiar URI do S3', 'Copiar URL', 'Fazer download', 'Abrir', 'Excluir', 'Ações', 'Criar pasta', and 'Carregar'. A search bar for objects is also present. The object list has columns for selection, name, type, last modification, size, and storage class.

	Nome	Tipo	Última modificação	Tamanho	Classe de armazenamento
<input type="checkbox"/>	cvd_test.csv	csv	1 Sep 2022 07:47:11 PM -03	78.0 B	Padrão
<input type="checkbox"/>	cvd.csv	csv	1 Sep 2022 07:47:10 PM -03	35.1 KB	Padrão

S3 – Editar permissões do bucket S3

```
{
  "Version": "2008-10-17",
  "Id": "Acesso S3 Sagemaker",
  "Statement": [
    {
      "Effect": "Allow",
      "Principal": "*",
      "Action": "s3:*",
      "Resource": "arn:aws:s3:::sagemaker-studio-
202337295011-1o795s5nu2x"
    }
  ]
}
```

AutoPilot – Criar um experimento



AutoPilot – Criar um experimento

Amazon SageMaker Studio

File Edit View Run Kernel Git Tabs Settings Help

Create experiment × cvd.csv ×

Filter files by name 🔍

/

Name ▲

cvd.csv

Create an Autopilot experiment

When you create an Autopilot experiment, Amazon SageMaker analyzes your data and creates a notebook with candidate model definitions. This notebook provides visibility into how models are selected, trained, and tuned.

Experiment and data details → Deployment and advanced settings → Review and create

Experiment name ⓘ

TesteAutoPilot

Input data

Specify the input data location and choose how to split your data.

S3 location ⓘ

s3://sagemaker-studio-202337295011-1o795s5nu2x/cvd.csv

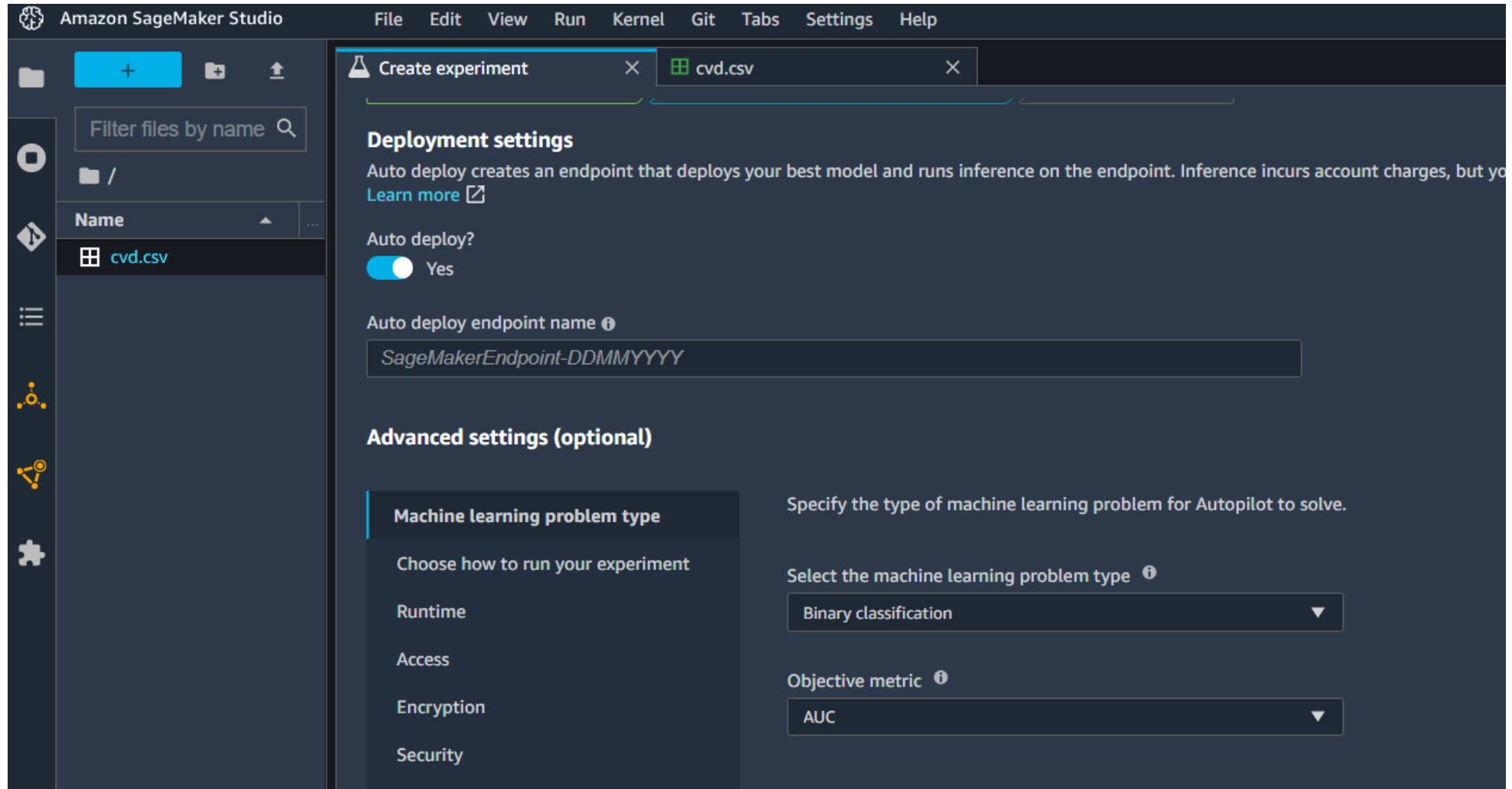
Is your S3 input a manifest file? ⓘ

☐ No

Target ⓘ

HeartDisease ▼

AutoPilot – Criar um experimento



AutoPilot – Criar um experimento

The screenshot shows the Amazon SageMaker Studio interface. On the left is a file explorer sidebar with a search bar and a list of files, including 'cvd.csv'. The main window has a menu bar (File, Edit, View, Run, Kernel, Git, Tabs, Settings, Help) and a tab bar with 'Create experiment' and 'cvd.csv'. The 'Review and create' section is active, displaying configuration details for an experiment named 'TesteAutoPilot'. The configuration includes the input data location (S3://sagemaker-studio-202337295011-1o795s5nu2x/cvd.csv), a target of 'HeartDisease', and options for auto-splitting data and auto-creating output data location, both set to 'Yes'. An orange 'Create experiment' button is in the top right. At the bottom right, there are buttons for 'Cancel', 'Previous: Deployment and advanced settings', and 'Create experiment'.

Amazon SageMaker Studio

File Edit View Run Kernel Git Tabs Settings Help

Create experiment × cvd.csv ×

Filter files by name

Name

cvd.csv

Review and create

Review your configuration details.

Experiment and data details

Experiment name
TesteAutoPilot

Input data location
s3://sagemaker-studio-202337295011-1o795s5nu2x/cvd.csv

Is your S3 input a manifest file?
No

Target
HeartDisease

Auto split data?
Yes

Auto create output data location?
Yes

Create experiment

Cancel Previous: Deployment and advanced settings Create experiment

AutoPilot – Criar um experimento

The screenshot displays the Amazon SageMaker Studio web interface. The top navigation bar includes 'File', 'Edit', 'View', 'Run', 'Kernel', 'Git', 'Tabs', 'Settings', and 'Help'. The left sidebar contains a file explorer with a search bar and a list of files, including 'cvd.csv'. The main workspace is titled 'TesteAutoPilot' and shows the 'Problem type: BinaryClassification'. A large, faint atomic symbol is centered in the workspace. Below the title, a list of steps is shown: Pre-processing, Candidate Definitions Generated, Feature Engineering, Model Tuning, Explainability Report Generated, Insights Report Generated, and Deploying Model. A message states: 'A default experiment will generate 250 models and can take hours to complete. Check back later to see your experiment results. If experiment is taking too long to run, you can stop the experiment'. At the bottom, there are tabs for 'Models' and 'Job profile', and a message: 'Your models will display here as they are generated.'.

Amazon SageMaker Studio

File Edit View Run Kernel Git Tabs Settings Help

cvd.csv testeautopilot

AUTOPILOT JOB

TesteAutoPilot

Problem type: BinaryClassification

less than 5 seconds ago Stop Experiment

- > Pre-processing
- > Candidate Definitions Generated
- > Feature Engineering
- > Model Tuning
- > Explainability Report Generated
- > Insights Report Generated
- > Deploying Model

A default experiment will generate 250 models and can take hours to complete. Check back later to see your experiment results. If experiment is taking too long to run, you can stop the experiment

Models Job profile

Your models will display here as they are generated.

AutoPilot – Criar um experimento

The screenshot displays the Amazon SageMaker Studio interface. The top navigation bar includes 'File', 'Edit', 'View', 'Run', 'Kernel', 'Git', 'Tabs', 'Settings', and 'Help'. The left sidebar shows a file explorer with a search bar and a list of files, including 'cvd.csv'. The main workspace is titled 'AUTOPILOT JOB' and 'TesteAutoPilot'. It indicates the 'Problem type: BinaryClassification'. A large, faint white crosshair is centered on the workspace. On the right, there are buttons for 'Open candidate generation notebook' and 'Open data exploration notebook', along with a 'Stop Experiment' button and a refresh icon labeled 'half a minute ago'. Below the workspace, a list of steps is shown: 'Pre-processing', 'Candidate Definitions Generated', 'Feature Engineering' (highlighted with a blue arrow), 'Model Tuning', 'Explainability Report Generated', 'Insights Report Generated', and 'Deploying Model'. At the bottom, there are tabs for 'Models' and 'Job profile', and a message stating 'Your models will display here as they are generated.'

Amazon SageMaker Studio

File Edit View Run Kernel Git Tabs Settings Help

cvd.csv testeautopilot

AUTOPILOT JOB

TesteAutoPilot

Problem type: BinaryClassification

half a minute ago Stop Experiment

Open candidate generation notebook Open data exploration notebook

Pre-processing

Candidate Definitions Generated

Feature Engineering

Model Tuning

Explainability Report Generated

Insights Report Generated

Deploying Model

Models Job profile

Your models will display here as they are generated.

AutoPilot – Criar um experimento

cvd.csv

testeautopilot

AUTOPILOT JOB

1 minute ago

TesteAutoPilot

Problem type: BinaryClassification

Best model endpoint: An error occurred deploying the best model.

ModelsJob profile

Best model ⓘ

AucObjective

F1

LogLoss

Recall

Precision

Accuracy

BalancedAccuracy

Algorithm

View model details

TesteAutoPilotOjmHtSbLPuXursZbL1-041-b2906b30

0.937

0.86

0.314

0.851

0.87

0.876

0.873

XGBoost

1 row selected

Deploy model

AutoPilot – Criar um experimento

Setup SageMaker endpoint documentation [🔗](#)

Endpoint name ⓘ

Instance type ⓘ

Instance count ⓘ

Data capture ⓘ
☐ Save prediction requests
☐ Save prediction responses

Inference Response Content ⓘ

ADVANCED SETTINGS - Optional ▼

Test inference
Test and validate your model by sending a request to the SageMaker hosted endpoint and receiving a response from your model.

JSON editor

```
1 {  
2  
3 }
```

› Configure endpoint URL and headers - *optional*

AutoPilot – Criar um experimento

Resource Groups & Tag Editor

Configurações do ciclo de vida

Pesquisar

▶ Ground Truth

▶ Bloco de anotações

▶ Processando

▶ Treinamento

▼ Inferência

Amazon SageMaker > Endpoints

Endpoints

↺

Atualizar endpoint

Ações ▼

Criar endpoint

🔍

Pesquisar endpoints

<

1

>

⚙️

	Nome ▼	ARN	Hora de criação ▼	Status ▼	Última atualização
<input type="radio"/>	endpoint-autopilot-cvd	arn:aws:sagemaker:us-east-1:202337295011:endpoint/endpoint-autopilot-cvd	Aug 28, 2022 17:57 UTC	✔️ InService	Aug 28, 2022 18:03 UTC

Status

✔️ InService

Hora de criação

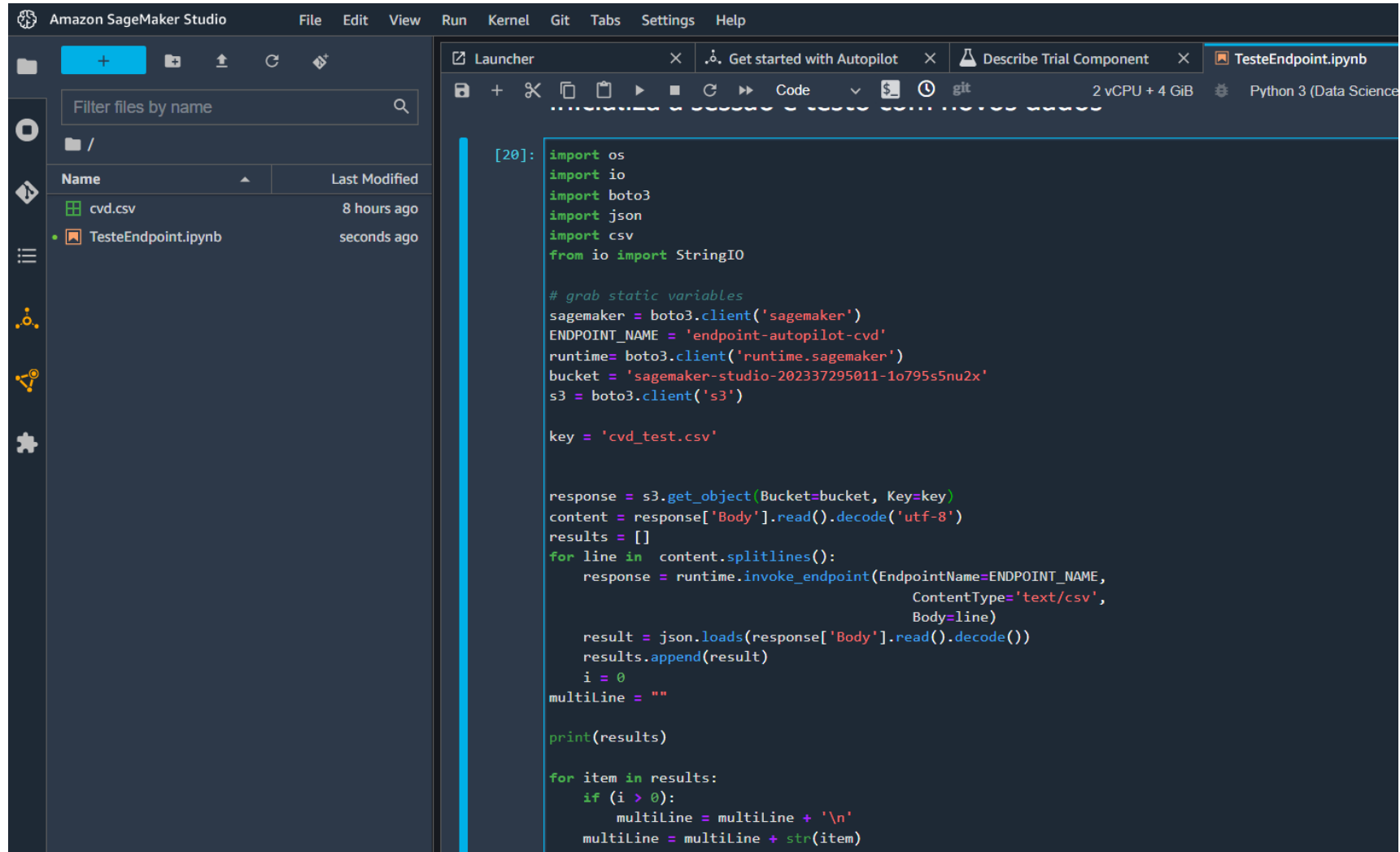
Sun Aug 28 2022 14:57:35 GMT-0300 (Horário Padrão de Brasília)

URL

<https://runtime.sagemaker.us-east-1.amazonaws.com/endpoints/endpoint-autopilot-cvd/invocations>

Saiba mais sobre a API [🔗](#)

AutoPilot – Testar um experimento



The screenshot displays the Amazon SageMaker Studio interface. On the left, a file explorer shows a directory with two files: 'cvd.csv' (modified 8 hours ago) and 'TesteEndpoint.ipynb' (modified seconds ago). The main area shows the 'TesteEndpoint.ipynb' notebook with a code cell [20]: containing the following Python code:

```
[20]: import os
import io
import boto3
import json
import csv
from io import StringIO

# grab static variables
sagemaker = boto3.client('sagemaker')
ENDPOINT_NAME = 'endpoint-autopilot-cvd'
runtime = boto3.client('runtime.sagemaker')
bucket = 'sagemaker-studio-202337295011-1o795s5nu2x'
s3 = boto3.client('s3')

key = 'cvd_test.csv'

response = s3.get_object(Bucket=bucket, Key=key)
content = response['Body'].read().decode('utf-8')
results = []
for line in content.splitlines():
    response = runtime.invoke_endpoint(EndpointName=ENDPOINT_NAME,
                                      ContentType='text/csv',
                                      Body=line)
    result = json.loads(response['Body'].read().decode())
    results.append(result)
    i = 0
multiline = ""

print(results)

for item in results:
    if (i > 0):
        multiline = multiline + '\n'
    multiline = multiline + str(item)
```


AutoPilot – Testar um experimento

```
import os
import io
import boto3
import json
import csv
from io import StringIO

# grab static variables
sagemaker = boto3.client('sagemaker')
ENDPOINT_NAME = 'endpoint-autopilot-cvd'
runtime = boto3.client('runtime.sagemaker')
bucket = 'sagemaker-studio-202337295011-1o795s5nu2x'
s3 = boto3.client('s3')

key = 'cvd_test.csv'

response = s3.get_object(Bucket=bucket, Key=key)
content = response['Body'].read().decode('utf-8')
results = []
for line in content.splitlines():
    response = runtime.invoke_endpoint(EndpointName=ENDPOINT_NAME,
                                       ContentType='text/csv',
                                       Body=line)

    result = json.loads(response['Body'].read().decode())
    results.append(result)
    i = 0

multiline = ""

print(results)

for item in results:
    if (i > 0):
        multiline = multiline + '\n'
        multiline = multiline + str(item)
        i+=1

file_name = "predictions.csv"
s3_resource = boto3.resource('s3')
s3_resource.Object(bucket, file_name).put(Body=multiline)

# Deleting Endpoint
#sagemaker.delete_endpoint(EndpointName=ENDPOINT_NAME)
```

Tarefa – Crie um experimento

- ☐ No AWS Learner Lab, faça:
- ☐ Acesse o AWS Sagemaker
- ☐ Acesse o Sagemaker Studio
- ☐ Crie um experimento com o arquivo disponibilizado em sala (cvd.csv) – **Obs: demora +1 hora**
- ☐ Faça o deploy e teste o experimento com um notebook
- ☐ **Encerre o lab**

Obrigado!