Image Classification using AWS SageMaker

Thiviyaa S

Use AWS Sagemaker to train a pretrained model that can perform image classification by using the Sagemaker profiling, debugger, hyperparameter tuning and other good ML engineering practices. This can be done on either the provided dog breed classication data set or one of your choice.

Project Set Up and Installation

Enter AWS through the gateway in the course and open SageMaker Studio.

Download the starter files.

Download/Make the dataset available.

Dataset

The provided dataset is the dogbreed classification dataset which can be found in the classroom.

The project is designed to be dataset independent so if there is a dataset that is more interesting or relevant to your work, you are welcome to use it to complete the project.

Access

Upload the data to an S3 bucket through the AWS Gateway so that SageMaker has access to the data.

Hyperparameter Tuning

What kind of model did you choose for this experiment and why? Give an overview of the types of parameters and their ranges used for the hyperparameter search

ResNet50 Model:

-->The ResNet-18 pre-trained model is used in this project.

-->The ResNet-50 is an 18-layer deep convolutional neural network. This network's pre-trained version has been trained on over a million photos from the ImageNet collection. The network can classify photos into 1000 different object categories, including keyboards, mice, pencils, and a variety of animals.

-->The dataset we'll be working with is an Image dataset that contains photographs of dogs.

-->Training, validation, and testing are the three parts of the dataset.

Hyperparameter search:

-->Learning rate : -> default is 0.001 and the chosen range is =[0.0001, 0.1] -> learning rate is a ContinuousParameter.

-->epochs: -> defaut is 1e-08 and the chosen range is= [1e-9, 1e-8] -> the epochs is a IntegerParameter

-->Weight decay: -> default is 0.01 and the chosen range is = [1e-3, 1e-1]

-->Batch size : -> The chosen range is = [64, 128] -> batch-size is a CategoricalParameter

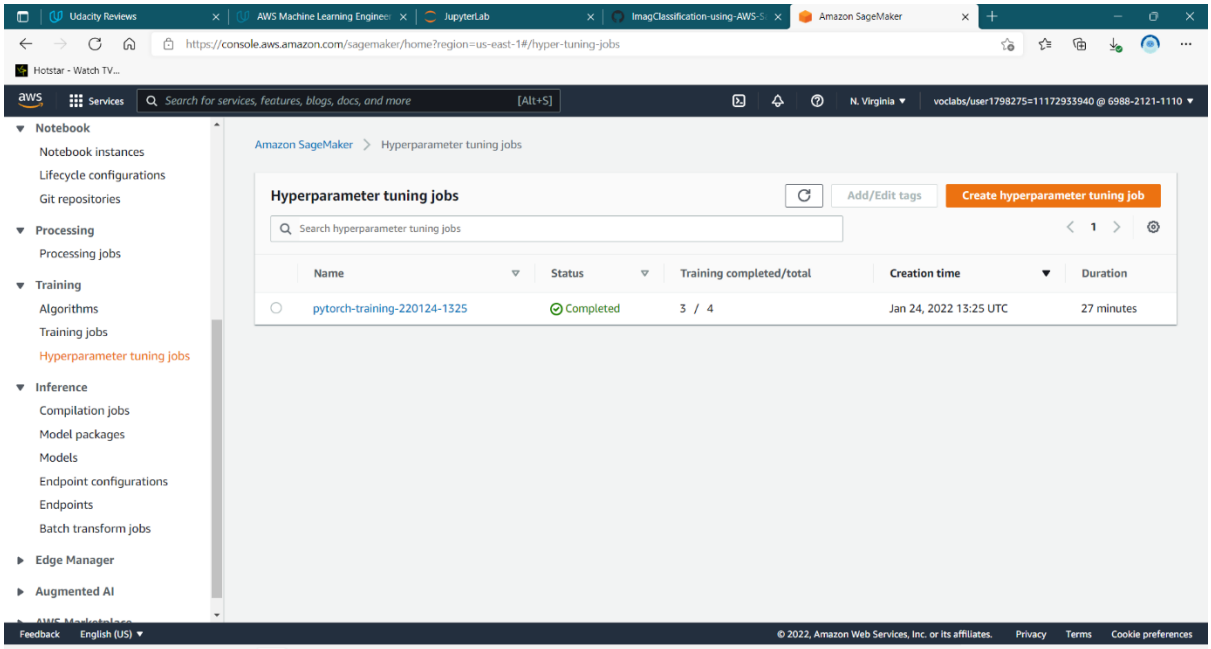
Remember that your README should:

- Include a screenshot of completed training jobs

- Logs metrics during the training process

- Tune at least two hyperparameters

- Retrieve the best best hyperparameters from all your training jobs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Amazon SageMaker > Hyperparameter tuning jobs
Hyperparameter tuning jobs
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Search hyperparameter tuning jobs
Name
Status
Training completed/total
Creation time
Duration
pytorch-training-220124-1325
Completed
3 / 4
Jan 24, 2022 13:25 UTC
27 minutes
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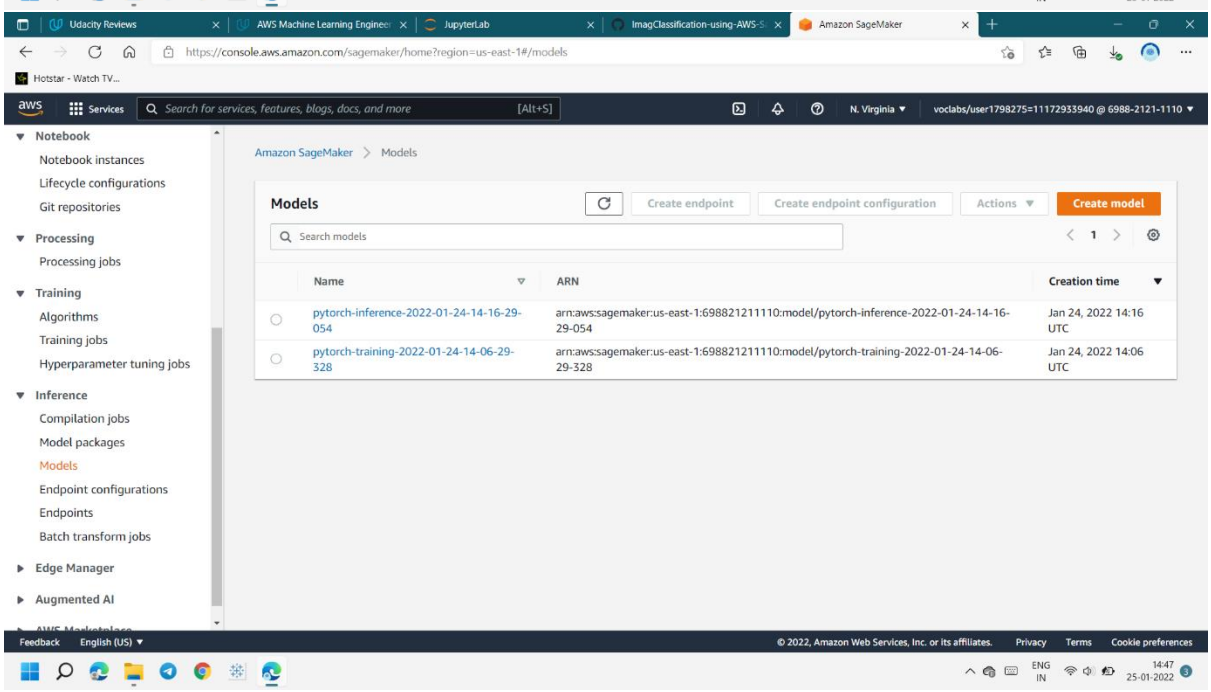
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Amazon SageMaker > Models
Models
Create endpoint
Create endpoint configuration
Actions
Create model
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Jan 24, 2022 14:16 UTC
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Jan 24, 2022 14:06 UTC
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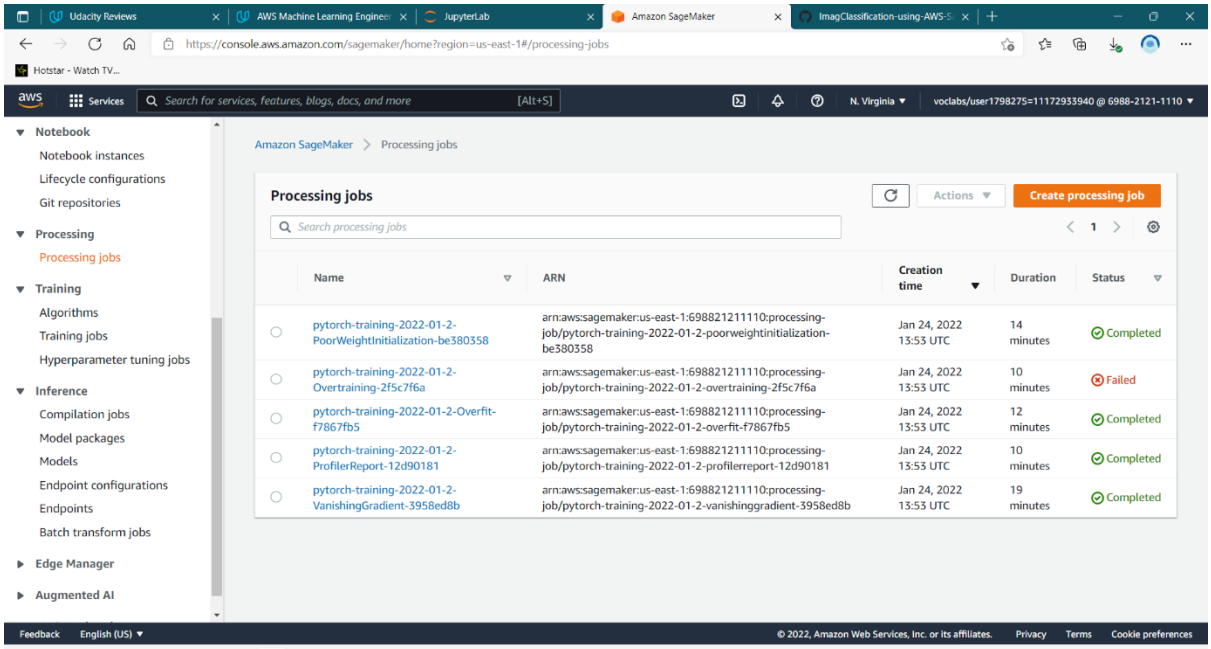
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Amazon SageMaker > Processing jobs
Processing jobs
Actions
Create processing job
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1
Name
ARN
Creation time
Duration
Status
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Jan 24, 2022 13:53 UTC
14 minutes
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Jan 24, 2022 13:53 UTC
10 minutes
Failed
pytorch-training-2022-01-2-Overfit-f7867fb5
arn:aws:sagemaker:us-east-1:698821211110:processing-job/pytorch-training-2022-01-2-overfit-f7867fb5
Jan 24, 2022 13:53 UTC
12 minutes
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Jan 24, 2022 13:53 UTC
10 minutes
Completed
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arn:aws:sagemaker:us-east-1:698821211110:processing-job/pytorch-training-2022-01-2-vanishinggradient-3958ed8b
Jan 24, 2022 13:53 UTC
19 minutes
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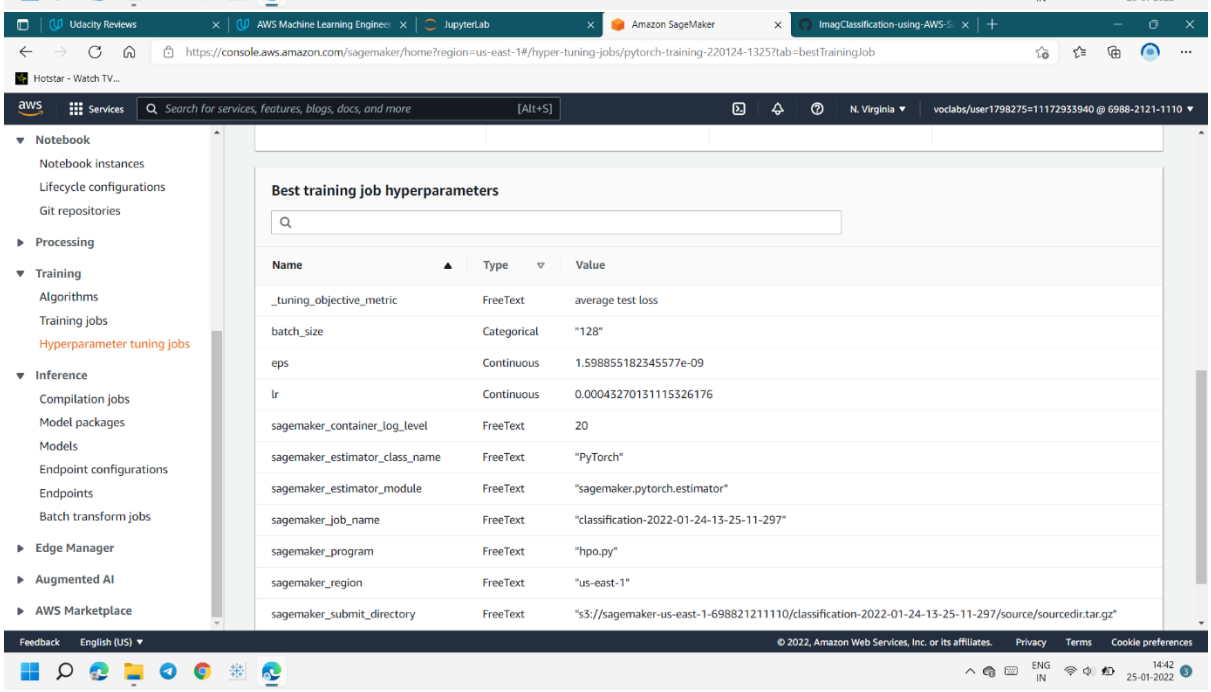
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Best training job hyperparameters
Name
Type
Value
_tuning_objective_metric
FreeText
average test loss
batch_size
Categorical
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Continuous
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lr
Continuous
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sagemaker_region
FreeText
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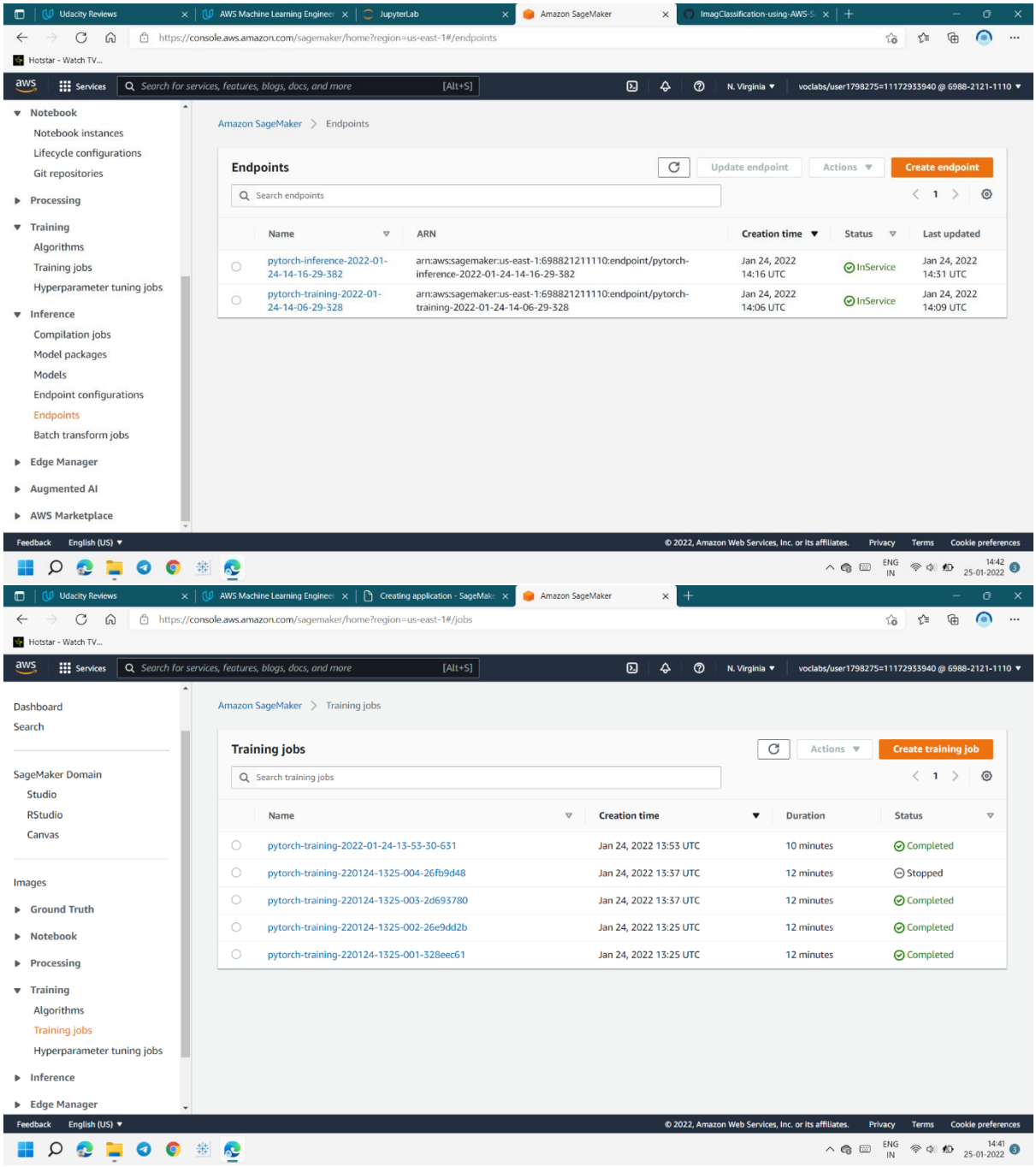


Debugging and Profiling

TODO: Give an overview of how you performed model debugging and profiling in Sagemaker

-->The sagemaker.debugger module was used to help with debugging and profiling.

-->The Amazon SageMaker Debugger gives you complete visibility into the training jobs for cutting-edge machine learning models.

-->This SageMaker Debugger module has high-level methods for configuring the Debugger to monitor, profile, and debug your training job.

-->When creating a SageMaker estimator, use the Debugger-specific settings to gain visibility and insights into your training job.

Results

TODO: What are the results/insights did you get by profiling/debugging your model?

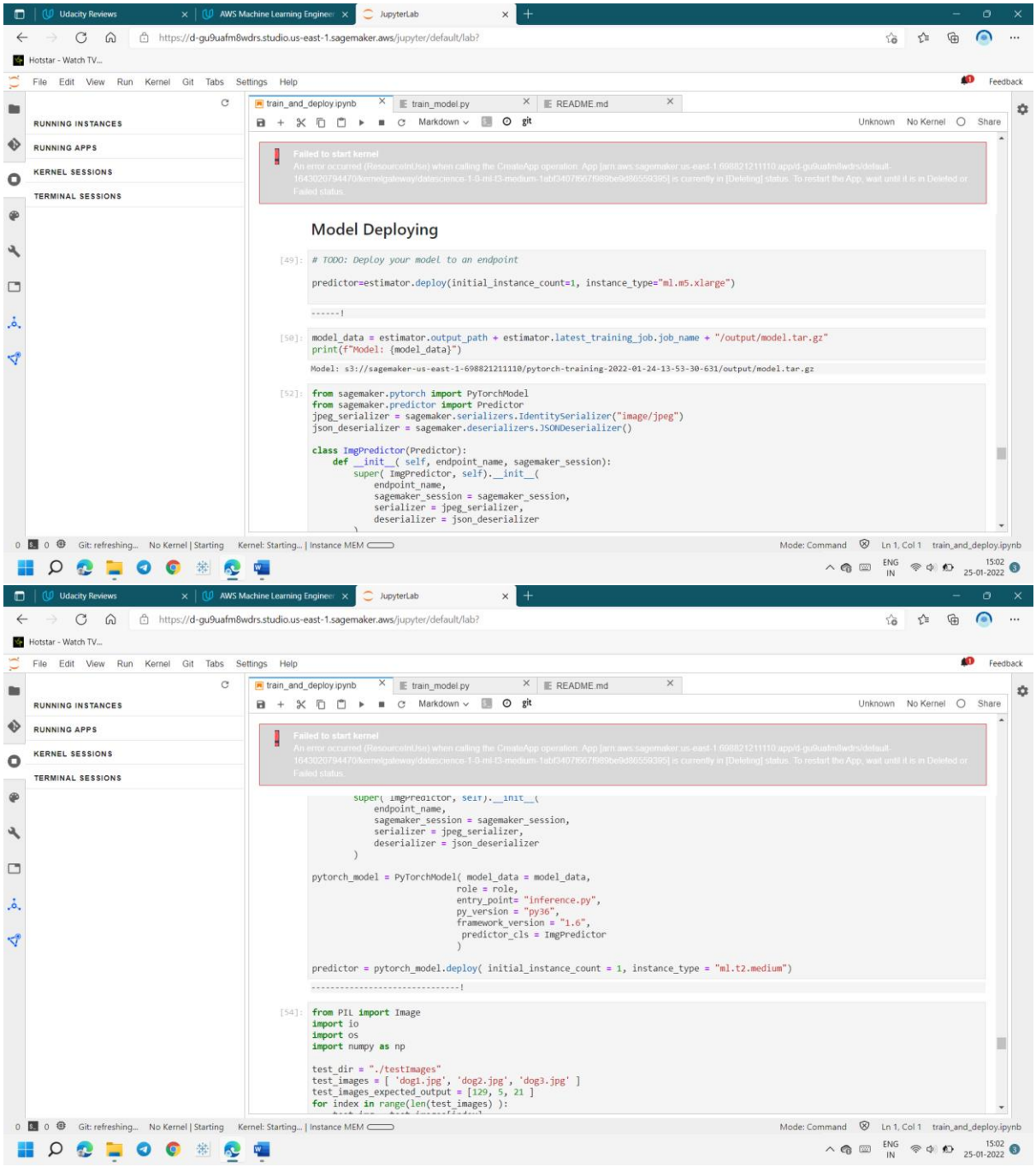
TODO Remember to provide the profiler html/pdf file in your submission.

Provided

Model Deployment

TODO: Give an overview of the deployed model and instructions on how to query the endpoint with a sample input.

TODO Remember to provide a screenshot of the deployed active endpoint in Sagemaker.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train_model.py
README.md
Markdown
git
Unknown
No Kernel
Share
Failed to start kernel
An error occurred (ResourceInUse) when calling the CreateApp operation: App [arn:aws:sagemaker:us-east-1:698821211110:app/d-gu9uafm8wdrs/default-1643020794470/kernelgateway/datascience-1-0-ml-t3-medium-1abf3407f667f989be9d80559395] is currently in [Deleting] status. To restart the App, wait until it is in Deleted or Failed status.
Model Deploying
[49]:
# TODO: Deploy your model to an endpoint
predictor=estimator.deploy(initial_instance_count=1, instance_type="ml.m5.xlarge")
------!
[50]:
model_data = estimator.output_path + estimator.latest_training_job.job_name + "/output/model.tar.gz"
print(f"Model: {model_data}")
Model: s3://sagemaker-us-east-1-698821211110/pytorch-training-2022-01-24-13-53-30-631/output/model.tar.gz
[52]:
from sagemaker.pytorch import PyTorchModel
from sagemaker.predictor import Predictor
jpeg_serializer = sagemaker.serializers.IdentitySerializer("image/jpeg")
json_deserializer = sagemaker.deserializers.JSONDeserializer()
class ImgPredictor(Predictor):
def __init__(self, endpoint_name, sagemaker_session):
super(ImgPredictor, self).__init__(
endpoint_name,
sagemaker_session = sagemaker_session,
serializer = jpeg_serializer,
deserializer = json_deserializer
)
Git: refreshing...
No Kernel | Starting
Kernel: Starting... | Instance MEM
Mode: Command
Ln 1, Col 1
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super(ImgPredictor, self).__init__(
endpoint_name,
sagemaker_session = sagemaker_session,
serializer = jpeg_serializer,
deserializer = json_deserializer
)
pytorch_model = PyTorchModel(model_data = model_data,
role = role,
entry_point= "inference.py",
py_version = "py36",
framework_version = "1.6",
predictor_cls = ImgPredictor
)
predictor = pytorch_model.deploy(initial_instance_count = 1, instance_type = "ml.t2.medium")
----------!
[54]:
from PIL import Image
import io
import os
import numpy as np
test_dir = "./testImages"
test_images = ['dog1.jpg', 'dog2.jpg', 'dog3.jpg']
test_images_expected_output = [129, 5, 21]
for index in range(len(test_images)):
Git: refreshing...
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train_and_deploy.ipynb
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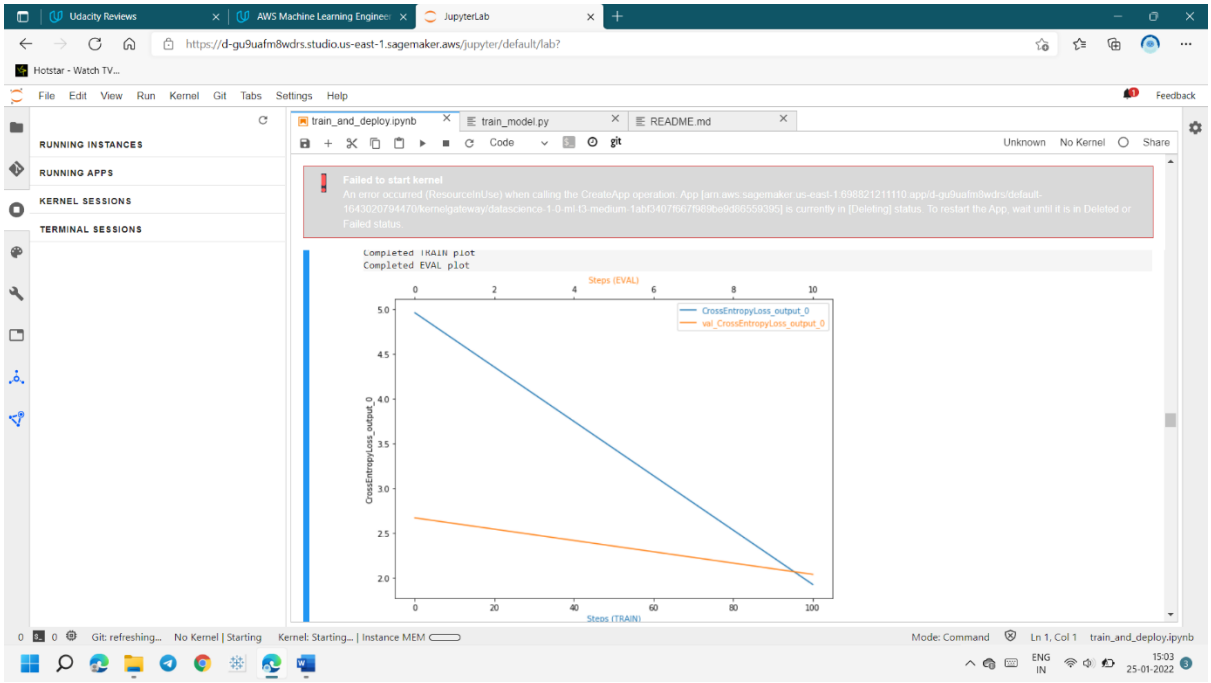
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Completed TRAIN plot
Completed EVAL plot
Steps (EVAL)
CrossEntropyLoss_output_0
val_CrossEntropyLoss_output_0
CrossEntropyLoss_output_0
Steps (TRAIN)
Git: refreshing...
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Kernel: Starting... | Instance MEM
Mode: Command
Ln 1, Col 1
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15:03
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