BIG DATA PROJECT (PRACTICE PROJECT - REFERENCE FOR LEARNING)

Amazon review and sentiment analysis using aws sample files (Text classification)

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As a part of understanding the workings of the SageMaker, we implement a practice project on sagemaker prior to our actual project implementation. In this practice project we used the follow source as base [1] and executed sentiment analysis and text categorization on Amazon Review dataset available publicly. This dataset was clean and easy to work on.

In [1]:

```
import boto3
import pandas as pd
import numpy as np
import sagemaker
print(f'SageMaker version: {sagemaker.__version__}')
```

```
SageMaker version: 2.70.0
```

In [2]:

```
role = sagemaker.get_execution_role()

#source default session parameters (region, default S3 bucket etc)
region = boto3.Session().region_name
sagemaker_session = sagemaker.Session()
s3_client = boto3.client('s3', region_name=region)
sagemaker_client = boto3.client("sagemaker-runtime")
default_bucket = sagemaker_session.default_bucket()
prefix = 'sagemaker-pipelines-nlp-demo'
```

In [3]:

```
!mkdir -p data
!wget https://sagemaker-sample-files.s3.amazonaws.com/datasets/tabular/womens_clothing_ecommerce/Womens_Clothing_
E-Commerce_Reviews.csv -O 'data/Womens Clothing E-Commerce Reviews.csv'
```

```
--2021-12-09 04:21:22--  https://sagemaker-sample-files.s3.amazonaws.com/datasets/tabular/womens_clo
thing_ecommerce/Womens_Clothing_E-Commerce_Reviews.csv
Resolving sagemaker-sample-files.s3.amazonaws.com (sagemaker-sample-files.s3.amazonaws.com)... 52.21
7.197.41
Connecting to sagemaker-sample-files.s3.amazonaws.com (sagemaker-sample-files.s3.amazonaws.com)|52.2
17.197.41|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 8483448 (8.1M) [text/csv]
Saving to: ‘data/Womens Clothing E-Commerce Reviews.csv’

data/Womens Clothin 100%[===================>]   8.09M  10.2MB/s    in 0.8s

2021-12-09 04:21:23 (10.2 MB/s) - ‘data/Womens Clothing E-Commerce Reviews.csv’ saved [8483448/84834
48]
```

In [4]:

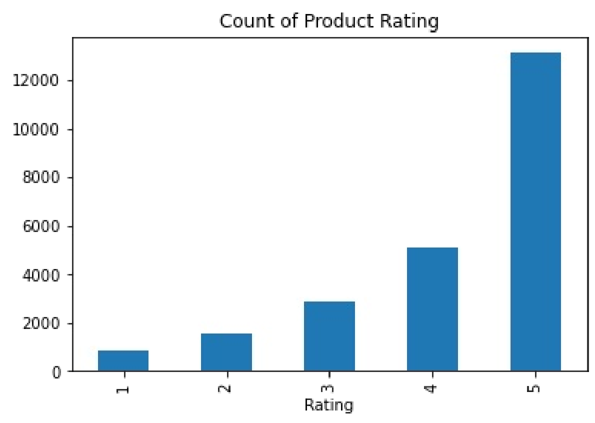
```
df = pd.read_csv('data/Womens Clothing E-Commerce Reviews.csv',  index_col=0)
df.head()
```

Out[4]:

	Clothing ID	Age	Title	Review Text	Rating	Recommended IND	Positive Feedback Count	Division Name	Department Name	Class Name
0	767	33	NaN	Absolutely wonderful - silky and sexy and comf...	4	1	0	Initmates	Intimate	Intimates
1	1080	34	NaN	Love this dress! it's sooo pretty. i happene...	5	1	4	General	Dresses	Dresses
2	1077	60	Some major design flaws	I had such high hopes for this dress and reall...	3	0	0	General	Dresses	Dresses
3	1049	50	My favorite buy!	I love, love, love this jumpsuit. it's fun, fl...	5	1	0	General Petite	Bottoms	Pants
4	847	47	Flattering shirt	This shirt is very flattering to all due to th...	5	1	6	General	Tops	Blouses

In [5]:

```
plot = df.groupby('Rating')['Rating'].count().plot(kind='bar', title = 'Count of Product Rating')
```



In [6]:

```
#upload the data to your default S3 bucket or another S3 bucket of your choosing
local_path = "data/Womens Clothing E-Commerce Reviews.csv"

base_uri = f"s3://{default_bucket}/{prefix}/data"
input_data_uri = sagemaker.s3.S3Uploader.upload(
    local_path=local_path,
    desired_s3_uri=base_uri,
)
print(input_data_uri)
```

```
s3://sagemaker-us-east-2-785516319285/sagemaker-pipelines-nlp-demo/data/Womens Clothing E-Commerce R
eviews.csv
```

In [7]:

```python
from sagemaker.workflow.parameters import (ParameterInteger, ParameterString)

#specify location of input data
input_data = ParameterString(
    name="InputData",
    default_value=input_data_uri,
)

#specify default number of instances for processing step
processing_instance_count = ParameterInteger(
    name="ProcessingInstanceCount",
    default_value=1
)

#specify default instance type for processing step
processing_instance_type = ParameterString(
    name="ProcessingInstanceType",
    default_value="ml.m4.xlarge"
)

#specify default instance type for training step
train_instance_type = ParameterString(
    name="TrainingInstanceType",
    default_value="ml.m4.xlarge",
)

#specify default model approval mode
model_approval_status = ParameterString(
    name="ModelApprovalStatus",
    default_value="Approved"
)
```

In [8]:

```
!mkdir -p code
```

In [9]:

```
%%writefile code/preprocessing.py

import numpy as np
import pandas as pd
import string
from sklearn.utils import resample

base_dir = "/opt/ml/processing"

df = pd.read_csv( f"{base_dir}/input/Womens Clothing E-Commerce Reviews.csv")
df = df[df['Review Text'].notna()] # drop rows where Review text is missing

def process_review(text):
    punctuation = string.punctuation
    review = text.lower()
    review = review.replace("\r\n", " ").replace("\n\n", " ")
    translator = str.maketrans("","", punctuation)
    review  = review.translate(translator)
    return review

# create columns for concat reviews and new labels
df['Complete_Review'] = df['Title'] + ' ' + df['Review Text']
df = df[df['Complete_Review'].notna()] # drop rows where review text is missing
df['Label'] = df['Rating'].map({1:'negative',2:'negative',3:'none',4:'none',5:'positive'})
df = df.loc[df['Label'].isin(['negative','positive'])] # only use positive and negative reviews
df['Review'] = df['Complete_Review'].astype(str).apply(process_review)
df['Processed'] = '__label__' + df['Label'].astype(str) + ' ' + df['Review']

# create train:test split
train, validation, test = np.split(df, [int(0.7 * len(df)), int(0.85 * len(df))])

# deal with unbalanced classes
# only include resampling for training set so no data leakeage for validation sets
positive = train.loc[train['Label']=='positive']
negative = train.loc[train['Label']=='negative']

# oversample the minority classes
negative_oversample = resample(negative, replace=True, n_samples=len(positive))

# remake training set using balanced class camples
train = pd.concat([positive,negative_oversample])

# create Series datasets for BlazingText format
train = train['Processed']
validation = validation['Processed']
test = test['Processed']

# save datasets
pd.DataFrame(train).to_csv(f"{base_dir}/train/train.csv", header=False, index=False)
pd.DataFrame(validation).to_csv(f"{base_dir}/validation/validation.csv", header=False, index=False)
pd.DataFrame(test).to_csv(f"{base_dir}/test/test.csv", header=False, index=False)

print(f"Number of reviews in the training dataset: {train.shape[0]}")
print(f"Number of reviews in the validation set: {validation.shape[0]}")
```

```
Writing code/preprocessing.py
```

In [10]:

```
from sagemaker.sklearn.processing import SKLearnProcessor

framework_version = "0.23-1"

sklearn_processor = SKLearnProcessor(
    framework_version=framework_version,
    instance_type=processing_instance_type,
    instance_count=processing_instance_count,
    base_job_name="sklearn-nlp-process",
    role=role,
)
```

In [11]:

```
from sagemaker.processing import ProcessingInput, ProcessingOutput
from sagemaker.workflow.steps import ProcessingStep

s3_client.upload_file(Filename='./code/preprocessing.py', Bucket=default_bucket, Key=f'{prefix}/code/preprocessin
g.py')
preprocess_script_uri = f's3://{default_bucket}/{prefix}/code/preprocessing.py'

process_step = ProcessingStep(
    name="BTDemoProcessStep",
    processor=sklearn_processor,
    inputs=[
        ProcessingInput(source=input_data, destination="/opt/ml/processing/input"),
    ],
    outputs=[
        ProcessingOutput(output_name="train", source="/opt/ml/processing/train"),
        ProcessingOutput(output_name="validation", source="/opt/ml/processing/validation"),
        ProcessingOutput(output_name="test", source="/opt/ml/processing/test"),
    ],
    code=preprocess_script_uri,
)
```

In [12]:

```
# set up estimator:

from sagemaker.estimator import Estimator

bt_estimator = Estimator(
    role=role,
    instance_type=train_instance_type,
    instance_count=1,
    image_uri=sagemaker.image_uris.retrieve("blazingtext", region),
    output_path=f's3://{default_bucket}/{prefix}/training_jobs',
    base_job_name='bt-model-estimator',
    input_mode = 'File'
)

#for more info on hyperparameters, see: https://docs.aws.amazon.com/sagemaker/latest/dg/blazingtext.html
bt_estimator.set_hyperparameters(mode="supervised",
                                 epochs=25,
                                 learning_rate=0.02,
                                 min_count=2,
                                 early_stopping=True,
                                 patience=4,
                                 min_epochs=10,
                                 word_ngrams=3
                                )
```

In [13]:

```
# set up model training step
from sagemaker.inputs import TrainingInput
from sagemaker.workflow.steps import TrainingStep

train_step = TrainingStep(
    name='BTDemoTrainStep',
    estimator=bt_estimator,
    inputs={
        'train': sagemaker.inputs.TrainingInput(
            s3_data=process_step.properties.ProcessingOutputConfig.Outputs['train'].S3Output.S3Uri,
            content_type="text/csv"
        ),
        'validation': sagemaker.inputs.TrainingInput(
            s3_data=process_step.properties.ProcessingOutputConfig.Outputs['test'].S3Output.S3Uri,
            content_type="text/csv"
        )
    }
)
```

In [14]:

```
from sagemaker.workflow.steps import CreateModelStep

model = sagemaker.model.Model(
    name='nlp-blaztext-model',
    image_uri=train_step.properties.AlgorithmSpecification.TrainingImage,
    model_data=train_step.properties.ModelArtifacts.S3ModelArtifacts,
    sagemaker_session=sagemaker_session,
    role=role
)

inputs = sagemaker.inputs.CreateModelInput(
    instance_type="ml.m4.xlarge"
)

create_model_step = CreateModelStep(
    name="BTDemoCreatemodelStep",
    model=model,
    inputs=inputs
)
```

In [15]:

```
%%writefile code/deploy_model.py

import time
from datetime import datetime
import boto3
import argparse


# Parse argument variables passed via the DeployModel processing step
parser = argparse.ArgumentParser()
parser.add_argument('--model-name', type=str)
parser.add_argument('--region', type=str)
parser.add_argument('--endpoint-instance-type', type=str)
parser.add_argument('--endpoint-name', type=str)
args = parser.parse_args()

region = args.region
boto3.setup_default_session(region_name=region)
sagemaker_boto_client = boto3.client('sagemaker')

# truncate name per sagameker length requirememnts (63 char max) if necessary
endpoint_config_name = f'{args.endpoint_name}-config-{datetime.now().strftime("%Y%m%d-%H%M%S")}'

# create new endpoint config file
create_ep_config_response = sagemaker_boto_client.create_endpoint_config(
    EndpointConfigName=endpoint_config_name,
    ProductionVariants=[{
        'InstanceType': args.endpoint_instance_type,
        'InitialVariantWeight': 1,
        'InitialInstanceCount': 1,
        'ModelName': args.model_name,
        'VariantName': 'AllTraffic'
        }])

print("ModelName: {}".format(args.model_name))

# create endpoint if model endpoint does not already exist, otherwise update the endpoint
try:
    create_endpoint_response = sagemaker_boto_client.create_endpoint(
        EndpointName=args.endpoint_name,
        EndpointConfigName=endpoint_config_name
    )
except:
    create_endpoint_response = sagemaker_boto_client.update_endpoint(
        EndpointName=args.endpoint_name,
        EndpointConfigName=endpoint_config_name
    )

endpoint_info = sagemaker_boto_client.describe_endpoint(EndpointName=args.endpoint_name)
endpoint_status = endpoint_info['EndpointStatus']

while endpoint_status != 'InService':
    endpoint_info = sagemaker_boto_client.describe_endpoint(EndpointName=args.endpoint_name)
    endpoint_status = endpoint_info['EndpointStatus']
    print('Endpoint status:', endpoint_status)
    if endpoint_status != 'InService':
        time.sleep(30)
```

```
Writing code/deploy_model.py
```

In [16]:

```
s3_client.upload_file(Filename='./code/deploy_model.py', Bucket=default_bucket, Key=f'{prefix}/code/deploy_model.
py')
deploy_model_script_uri = f's3://{default_bucket}/{prefix}/code/deploy_model.py'
pipeline_endpoint_name = 'nlp-blaztext-model-endpoint'

deployment_instance_type = "ml.m4.xlarge"

deploy_model_processor = SKLearnProcessor(
    framework_version='0.23-1',
    role=role,
    instance_type='ml.m5.xlarge',
    instance_count=1,
    volume_size_in_gb=60,
    base_job_name='nlp-blaztext-deploy-model',
    sagemaker_session=sagemaker_session)

deploy_step = ProcessingStep(
    name='BTDemoDeployStep',
    processor=deploy_model_processor,
    job_arguments=[
        "--model-name", create_model_step.properties.ModelName,
        "--region", region,
        "--endpoint-instance-type", deployment_instance_type,
        "--endpoint-name", pipeline_endpoint_name
    ],
    code=deploy_model_script_uri)
```

In [17]:

```
from sagemaker.workflow.step_collections import RegisterModel

register_step = RegisterModel(
    name="BTDemoRegistermodelStep",
    estimator=bt_estimator,
    model_data=train_step.properties.ModelArtifacts.S3ModelArtifacts,
    content_types=["text/csv"],
    response_types=["text/csv"],
    inference_instances=["ml.t2.medium", "ml.m5.xlarge"],
    transform_instances=["ml.m5.xlarge"],
    model_package_group_name=prefix,
    approval_status=model_approval_status,
)
```

In [18]:

```
from sagemaker.workflow.pipeline import Pipeline

#run full pipeline
steps_full = [process_step,
              train_step,
              create_model_step,
              deploy_step,
              register_step]

#run data processing step
steps_preprocessing = [process_step]

pipeline_name = 'BlazingTextPipeline'

pipeline = Pipeline(
    name=pipeline_name,
    parameters=[
        processing_instance_type,
        processing_instance_count,
        train_instance_type,
        model_approval_status,
        input_data
    ],
    steps=steps_full, #switch to steps_preprocessing if you would like to run only the data processing step
)
```

In [19]:

```
import json

definition = json.loads(pipeline.definition())
definition
```

```
No finished training job found associated with this estimator. Please make sure this estimator is on
ly used for building workflow config
```

Out[19]:

```
{'Version': '2020-12-01',
 'Metadata': {},
 'Parameters': [{'Name': 'ProcessingInstanceType',
   'Type': 'String',
   'DefaultValue': 'ml.m4.xlarge'},
  {'Name': 'ProcessingInstanceCount', 'Type': 'Integer', 'DefaultValue': 1},
  {'Name': 'TrainingInstanceType',
   'Type': 'String',
   'DefaultValue': 'ml.m4.xlarge'},
  {'Name': 'ModelApprovalStatus',
   'Type': 'String',
   'DefaultValue': 'Approved'},
  {'Name': 'InputData',
   'Type': 'String',
   'DefaultValue': 's3://sagemaker-us-east-2-785516319285/sagemaker-pipelines-nlp-demo/data/Womens C
lothing E-Commerce Reviews.csv'}],
 'PipelineExperimentConfig': {'ExperimentName': {'Get': 'Execution.PipelineName'},
  'TrialName': {'Get': 'Execution.PipelineExecutionId'}},
 'Steps': [{'Name': 'BTDemoProcessStep',
   'Type': 'Processing',
   'Arguments': {'ProcessingResources': {'ClusterConfig': {'InstanceType': {'Get': 'Parameters.Proce
ssingInstanceType'},
      'InstanceCount': {'Get': 'Parameters.ProcessingInstanceCount'},
      'VolumeSizeInGB': 30}},
    'AppSpecification': {'ImageUri': '257758044811.dkr.ecr.us-east-2.amazonaws.com/sagemaker-scikit-
learn:0.23-1-cpu-py3',
     'ContainerEntrypoint': ['python3',
      '/opt/ml/processing/input/code/preprocessing.py']},
    'RoleArn': 'arn:aws:iam::785516319285:role/service-role/AmazonSageMaker-ExecutionRole-20211130T1
35248',
    'ProcessingInputs': [{'InputName': 'input-1',
      'AppManaged': False,
      'S3Input': {'S3Uri': {'Get': 'Parameters.InputData'},
       'LocalPath': '/opt/ml/processing/input',
       'S3DataType': 'S3Prefix',
       'S3InputMode': 'File',
       'S3DataDistributionType': 'FullyReplicated',
       'S3CompressionType': 'None'}},
     {'InputName': 'code',
      'AppManaged': False,
      'S3Input': {'S3Uri': 's3://sagemaker-us-east-2-785516319285/sagemaker-pipelines-nlp-demo/code/
preprocessing.py',
       'LocalPath': '/opt/ml/processing/input/code',
       'S3DataType': 'S3Prefix',
       'S3InputMode': 'File',
       'S3DataDistributionType': 'FullyReplicated',
       'S3CompressionType': 'None'}}],
    'ProcessingOutputConfig': {'Outputs': [{'OutputName': 'train',
       'AppManaged': False,
       'S3Output': {'S3Uri': 's3://sagemaker-us-east-2-785516319285/sklearn-nlp-process-2021-12-09-0
4-24-14-575/output/train',
        'LocalPath': '/opt/ml/processing/train',
        'S3UploadMode': 'EndOfJob'}},
      {'OutputName': 'validation',
       'AppManaged': False,
       'S3Output': {'S3Uri': 's3://sagemaker-us-east-2-785516319285/sklearn-nlp-process-2021-12-09-0
4-24-14-575/output/validation',
        'LocalPath': '/opt/ml/processing/validation',
        'S3UploadMode': 'EndOfJob'}},
      {'OutputName': 'test',
       'AppManaged': False,
       'S3Output': {'S3Uri': 's3://sagemaker-us-east-2-785516319285/sklearn-nlp-process-2021-12-09-0
4-24-14-575/output/test',
        'LocalPath': '/opt/ml/processing/test',
        'S3UploadMode': 'EndOfJob'}}]}}},
  {'Name': 'BTDemoTrainStep',
   'Type': 'Training',
   'Arguments': {'AlgorithmSpecification': {'TrainingInputMode': 'File',
     'TrainingImage': '825641698319.dkr.ecr.us-east-2.amazonaws.com/blazingtext:1'},
    'OutputDataConfig': {'S3OutputPath': 's3://sagemaker-us-east-2-785516319285/sagemaker-pipelines-
nlp-demo/training_jobs'},
    'StoppingCondition': {'MaxRuntimeInSeconds': 86400},
    'ResourceConfig': {'InstanceCount': 1,
     'InstanceType': {'Get': 'Parameters.TrainingInstanceType'},
     'VolumeSizeInGB': 30},
    'RoleArn': 'arn:aws:iam::785516319285:role/service-role/AmazonSageMaker-ExecutionRole-20211130T1
35248',
    'InputDataConfig': [{'DataSource': {'S3DataSource': {'S3DataType': 'S3Prefix',
        'S3Uri': {'Get': "Steps.BTDemoProcessStep.ProcessingOutputConfig.Outputs['train'].S3Output.S
3Uri"},
        'S3DataDistributionType': 'FullyReplicated'}},
      'ContentType': 'text/csv',
      'ChannelName': 'train'},
     {'DataSource': {'S3DataSource': {'S3DataType': 'S3Prefix',
        'S3Uri': {'Get': "Steps.BTDemoProcessStep.ProcessingOutputConfig.Outputs['test'].S3Output.S3
Uri"},
        'S3DataDistributionType': 'FullyReplicated'}},
      'ContentType': 'text/csv',
      'ChannelName': 'validation'}],
    'HyperParameters': {'mode': 'supervised',
     'epochs': '25',
     'learning_rate': '0.02',
     'min_count': '2',
     'early_stopping': 'True',
     'patience': '4',
     'min_epochs': '10',
     'word_ngrams': '3'},
    'ProfilerRuleConfigurations': [{'RuleConfigurationName': 'ProfilerReport-1639023854',
      'RuleEvaluatorImage': '915447279597.dkr.ecr.us-east-2.amazonaws.com/sagemaker-debugger-rules:l
atest',
      'RuleParameters': {'rule_to_invoke': 'ProfilerReport'}}],
    'ProfilerConfig': {'S3OutputPath': 's3://sagemaker-us-east-2-785516319285/sagemaker-pipelines-nl
p-demo/training_jobs'}}},
  {'Name': 'BTDemoCreatemodelStep',
   'Type': 'Model',
   'Arguments': {'ExecutionRoleArn': 'arn:aws:iam::785516319285:role/service-role/AmazonSageMaker-Ex
ecutionRole-20211130T135248',
    'PrimaryContainer': {'Image': {'Get': 'Steps.BTDemoTrainStep.AlgorithmSpecification.TrainingImag
e'},
     'Environment': {},
     'ModelDataUrl': {'Get': 'Steps.BTDemoTrainStep.ModelArtifacts.S3ModelArtifacts'}}}},
  {'Name': 'BTDemoDeployStep',
   'Type': 'Processing',
   'Arguments': {'ProcessingResources': {'ClusterConfig': {'InstanceType': 'ml.m5.xlarge',
      'InstanceCount': 1,
      'VolumeSizeInGB': 60}},
    'AppSpecification': {'ImageUri': '257758044811.dkr.ecr.us-east-2.amazonaws.com/sagemaker-scikit-
learn:0.23-1-cpu-py3',
     'ContainerArguments': ['--model-name',
      {'Get': 'Steps.BTDemoCreatemodelStep.ModelName'},
      '--region',
      'us-east-2',
      '--endpoint-instance-type',
      'ml.m4.xlarge',
      '--endpoint-name',
      'nlp-blaztext-model-endpoint'],
     'ContainerEntrypoint': ['python3',
      '/opt/ml/processing/input/code/deploy_model.py']},
    'RoleArn': 'arn:aws:iam::785516319285:role/service-role/AmazonSageMaker-ExecutionRole-20211130T1
35248',
    'ProcessingInputs': [{'InputName': 'code',
      'AppManaged': False,
      'S3Input': {'S3Uri': 's3://sagemaker-us-east-2-785516319285/sagemaker-pipelines-nlp-demo/code/
deploy_model.py',
       'LocalPath': '/opt/ml/processing/input/code',
       'S3DataType': 'S3Prefix',
       'S3InputMode': 'File',
       'S3DataDistributionType': 'FullyReplicated',
       'S3CompressionType': 'None'}}]}},
  {'Name': 'BTDemoRegistermodelStep',
   'Type': 'RegisterModel',
   'Arguments': {'ModelPackageGroupName': 'sagemaker-pipelines-nlp-demo',
    'InferenceSpecification': {'Containers': [{'Image': '825641698319.dkr.ecr.us-east-2.amazonaws.co
m/blazingtext:1',
       'ModelDataUrl': {'Get': 'Steps.BTDemoTrainStep.ModelArtifacts.S3ModelArtifacts'}}],
     'SupportedContentTypes': ['text/csv'],
     'SupportedResponseMIMETypes': ['text/csv'],
     'SupportedRealtimeInferenceInstanceTypes': ['ml.t2.medium',
      'ml.m5.xlarge'],
     'SupportedTransformInstanceTypes': ['ml.m5.xlarge']},
    'ModelApprovalStatus': {'Get': 'Parameters.ModelApprovalStatus'}}}]}
```

In [20]:

```
pipeline.upsert(role_arn=role)
```

```
No finished training job found associated with this estimator. Please make sure this estimator is on
ly used for building workflow config
```

Out[20]:

```
{'PipelineArn': 'arn:aws:sagemaker:us-east-2:785516319285:pipeline/blazingtextpipeline',
 'ResponseMetadata': {'RequestId': '2728447d-75b8-4c84-b9a2-47b78f7af583',
  'HTTPStatusCode': 200,
  'HTTPHeaders': {'x-amzn-requestid': '2728447d-75b8-4c84-b9a2-47b78f7af583',
   'content-type': 'application/x-amz-json-1.1',
   'content-length': '87',
   'date': 'Thu, 09 Dec 2021 04:24:27 GMT'},
  'RetryAttempts': 0}}
```

In [21]:

```
execution = pipeline.start()
```

In [22]:

```
execution.describe()
```

Out[22]:

```
{'PipelineArn': 'arn:aws:sagemaker:us-east-2:785516319285:pipeline/blazingtextpipeline',
 'PipelineExecutionArn': 'arn:aws:sagemaker:us-east-2:785516319285:pipeline/blazingtextpipeline/exec
ution/gb89ius4dtab',
 'PipelineExecutionDisplayName': 'execution-1639023874392',
 'PipelineExecutionStatus': 'Executing',
 'PipelineExperimentConfig': {'ExperimentName': 'blazingtextpipeline',
  'TrialName': 'gb89ius4dtab'},
 'CreationTime': datetime.datetime(2021, 12, 9, 4, 24, 34, 285000, tzinfo=tzlocal()),
 'LastModifiedTime': datetime.datetime(2021, 12, 9, 4, 24, 34, 285000, tzinfo=tzlocal()),
 'CreatedBy': {},
 'LastModifiedBy': {},
 'ResponseMetadata': {'RequestId': '7deba880-0baf-40ea-a7bd-36c50a9a5cdf',
  'HTTPStatusCode': 200,
  'HTTPHeaders': {'x-amzn-requestid': '7deba880-0baf-40ea-a7bd-36c50a9a5cdf',
   'content-type': 'application/x-amz-json-1.1',
   'content-length': '498',
   'date': 'Thu, 09 Dec 2021 04:24:37 GMT'},
  'RetryAttempts': 0}}
```

In [23]:

```
execution.wait()
```

In [24]:

```
execution.list_steps()
```

Out[24]:

```
[{'StepName': 'BTDemoDeployStep',
  'StartTime': datetime.datetime(2021, 12, 9, 4, 36, 9, 515000, tzinfo=tzlocal()),
  'EndTime': datetime.datetime(2021, 12, 9, 4, 42, 55, 447000, tzinfo=tzlocal()),
  'StepStatus': 'Succeeded',
  'Metadata': {'ProcessingJob': {'Arn': 'arn:aws:sagemaker:us-east-2:785516319285:processing-job/pip
elines-gb89ius4dtab-btdemodeploystep-oznlpc1zt5'}}},
 {'StepName': 'BTDemoCreatemodelStep',
  'StartTime': datetime.datetime(2021, 12, 9, 4, 36, 7, 990000, tzinfo=tzlocal()),
  'EndTime': datetime.datetime(2021, 12, 9, 4, 36, 9, 160000, tzinfo=tzlocal()),
  'StepStatus': 'Succeeded',
  'Metadata': {'Model': {'Arn': 'arn:aws:sagemaker:us-east-2:785516319285:model/pipelines-gb89ius4dt
ab-btdemocreatemodelste-algle9lgtp'}}},
 {'StepName': 'BTDemoRegistermodelStep',
  'StartTime': datetime.datetime(2021, 12, 9, 4, 36, 7, 990000, tzinfo=tzlocal()),
  'EndTime': datetime.datetime(2021, 12, 9, 4, 36, 9, 114000, tzinfo=tzlocal()),
  'StepStatus': 'Succeeded',
  'Metadata': {'RegisterModel': {'Arn': 'arn:aws:sagemaker:us-east-2:785516319285:model-package/sage
maker-pipelines-nlp-demo/1'}}},
 {'StepName': 'BTDemoTrainStep',
  'StartTime': datetime.datetime(2021, 12, 9, 4, 30, 3, 904000, tzinfo=tzlocal()),
  'EndTime': datetime.datetime(2021, 12, 9, 4, 36, 7, 225000, tzinfo=tzlocal()),
  'StepStatus': 'Succeeded',
  'Metadata': {'TrainingJob': {'Arn': 'arn:aws:sagemaker:us-east-2:785516319285:training-job/pipelin
es-gb89ius4dtab-btdemotrainstep-ifiqu56vgn'}}},
 {'StepName': 'BTDemoProcessStep',
  'StartTime': datetime.datetime(2021, 12, 9, 4, 24, 35, 77000, tzinfo=tzlocal()),
  'EndTime': datetime.datetime(2021, 12, 9, 4, 30, 3, 359000, tzinfo=tzlocal()),
  'StepStatus': 'Succeeded',
  'Metadata': {'ProcessingJob': {'Arn': 'arn:aws:sagemaker:us-east-2:785516319285:processing-job/pip
elines-gb89ius4dtab-btdemoprocessstep-bse4xkuqro'}}}]
```

In [25]:

```
import string

def process_review(text):
    punctuation = string.punctuation
    review = text.lower()
    review = review.replace("\r\n", " ").replace("\n\n", " ")
    translator = str.maketrans("","", punctuation)
    review  = review.translate(translator)
    return review
```

In [26]:

```
sentences = ["i loved this blouse when i saw it on-line, and the fabric is so soft!",
             "love the top, but very small to the size. ordered a medium and had to send back in exchange for x-l
arge",
             "horrible! this top was scratchy and too small."]
# process the reviews to predict the same as training data
processed_sentences = [ process_review(sent) for sent in sentences ]

payload = {"instances" : processed_sentences}
```

In [27]:

```
def get_predictions(payload, endpoint_name, client):
    response = client.invoke_endpoint(EndpointName=endpoint_name,
        Body=json.dumps(payload),
        ContentType='application/json')
    predictions = json.loads(response['Body'].read().decode('utf-8'))
    return list(zip(payload['instances'], predictions))
```

In [28]:

```
get_predictions(payload, pipeline_endpoint_name, sagemaker_client)
```

Out[28]:

```
[('i loved this blouse when i saw it online and the fabric is so soft',
  {'label': ['__label__positive'], 'prob': [0.9730098247528076]}),
 ('love the top but very small to the size ordered a medium and had to send back in exchange for xla
rge',
  {'label': ['__label__positive'], 'prob': [0.6169371008872986]}),
 ('horrible this top was scratchy and too small',
  {'label': ['__label__negative'], 'prob': [0.9998633861541748]})]
```

In [ ]:

```
```

In [ ]:

```
```