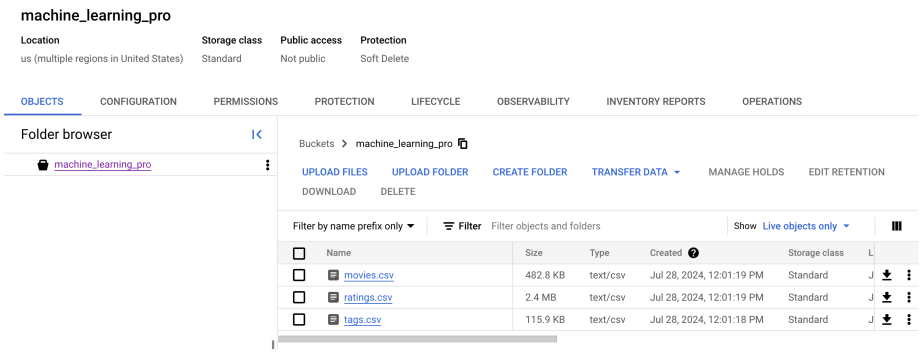
Week 8: Homework 2: Project: Movie Recommendation with MLlib - Collaborative Filtering (implementation 3)

Step-by-Step Guide for Deployment on GCP with Correct File Paths

1. Upload Data and Scripts to GCS

Upload the `movies.csv`, `ratings.csv`, and your PySpark script to your newly created GCS bucket, “machine_learning_pro”:




```
gsutil cp recommendation_engine.py gs://machine_learning_pro
```

```
nhaile96456@cloudshell:~ (cs570-big-data-analytics)$ vi recommendation_engine.py
nhaile96456@cloudshell:~ (cs570-big-data-analytics)$ gsutil cp recommendation_engine.py gs://machine_learning_pro
Copying file://recommendation_engine.py [Content-Type=text/x-python]...
/ [1 files][  2.2 KiB/  2.2 KiB]
Operation completed over 1 objects/2.2 KiB.
nhaile96456@cloudshell:~ (cs570-big-data-analytics)$
```

```
nhaile96456@cloudshell:~ (cs570-big-data-analytics)$ cat recommendation_engine.py
from pyspark.sql import SparkSession
from pyspark.sql.functions import col, explode
from pyspark.ml.evaluation import RegressionEvaluator
from pyspark.ml.recommendation import ALS
from pyspark.ml.tuning import ParamGridBuilder, CrossValidator
import argparse

# Parse command-line arguments
parser = argparse.ArgumentParser()
parser.add_argument('--input_path_movies', required=True)
parser.add_argument('--input_path_ratings', required=True)
args = parser.parse_args()

# Initialize Spark session
spark = SparkSession.builder.appName('Recommendations').getOrCreate()

# Load data from GCS
movies = spark.read.csv(args.input_path_movies, header=True)
ratings = spark.read.csv(args.input_path_ratings, header=True)

# Preprocess data
ratings = ratings \
    .withColumn('userId', col('userId').cast('integer')) \
    .withColumn('movieId', col('movieId').cast('integer')) \
    .withColumn('rating', col('rating').cast('float')) \
    .drop('timestamp')

# Split data into training and testing sets
(train, test) = ratings.randomSplit([0.8, 0.2], seed=1234)

# Build ALS model
als = ALS(userCol="userId", itemCol="movieId", ratingCol="rating", nonnegative=True, implicitPrefs=False, coldStartStrategy="drop")
param_grid = ParamGridBuilder() \
    .addGrid(als.rank, [10, 50, 100, 150]) \
    .addGrid(als.regParam, [.01, .05, .1, .15]) \
    .build()
evaluator = RegressionEvaluator(metricName="rmse", labelCol="rating", predictionCol="prediction")
cv = CrossValidator(estimator=als, estimatorParamMaps=param_grid, evaluator=evaluator, numFolds=5)

# Train model
model = cv.fit(train)
best_model = model.bestModel
```

5. Create the Cluster with the Desired Configuration

Create a Dataproc cluster:

```
gcloud dataproc clusters create spark-cluster-ml \
    --region us-west1 \
    --zone us-west1-a \
    --master-machine-type n1-standard-4 \
    --worker-machine-type n1-standard-4 \
    --num-workers 2
```

```
nhaile96456@cloudshell:~ (cs570-big-data-analytics)$ gcloud dataproc clusters create spark-cluster-ml \
    --region us-west1 \
    --zone us-west1-a \
    --master-machine-type n1-standard-4 \
    --worker-machine-type n1-standard-4 \
    --num-workers 2
Waiting on operation [projects/cs570-big-data-analytics/regions/us-west1/operations/1e458251-cf42-3918-bfaf-d2bd17061849].
Waiting for cluster creation operation...
WARNING: No image specified. Using the default image version. It is recommended to select a specific image version in production, as the default image version may change at any time.
WARNING: Consider using Auto Zone rather than selecting a zone manually. See https://cloud.google.com/dataproc/docs/concepts/configuring-clusters/auto-zone
WARNING: Failed to validate permissions required for default service account: '489433350597-compute@developer.gserviceaccount.com'. Cluster creation could still be successful if require
d permissions have been granted to the respective service accounts as mentioned in the document https://cloud.google.com/dataproc/docs/concepts/configuring-clusters/service-accounts#dat
aproc_service_accounts_2. This could be due to Cloud Resource Manager API hasn't been enabled in your project '489433350597' before or it is disabled. Enable it by visiting 'https://con
sole.developers.google.com/apis/api/cloudresourcemanager.googleapis.com/overview?project=489433350597'.
WARNING: The firewall rules for specified network or subnetwork would allow ingress traffic from 0.0.0.0/0, which could be a security risk.
WARNING: The specified custom staging bucket 'dataproc-staging-us-west1-489433350597-3eogpmd4' is not using uniform bucket level access IAM configuration. It is recommended to update bu
cket to enable the same. See https://cloud.google.com/storage/docs/uniform-bucket-level-access.
Waiting for cluster creation operation...done.
Created [https://dataproc.googleapis.com/v1/projects/cs570-big-data-analytics/regions/us-west1/clusters/spark-cluster-ml] Cluster placed in zone [us-west1-a].
nhaile96456@cloudshell:~ (cs570-big-data-analytics)$
```

6. Submit the PySpark Job with GCS Paths

Submit your PySpark job to the Dataproc cluster, specifying the GCS paths for the input files:

```
gcloud dataproc jobs submit pyspark
gs://machine_learning_pro/recommendation_engine.py \
    --cluster=spark-cluster-ml \
    --region=us-west1 \
    -- \
    --input_path_movies=gs://machine_learning_pro/movies.csv \
    --input_path_ratings=gs://machine_learning_pro/ratings.csv
```

```
.
+------+-------+---------+
|userId|movieId|   rating|
+------+-------+---------+
|   471|   3379| 4.822564|
|   471|   8477|4.6659493|
|   471|  33649|4.5504856|
|   471| 102217|   4.5333|
|   471|  92494|   4.5333|
|   471|  33779|   4.5333|
|   471| 171495| 4.527984|
|   471|   7096|4.4821672|
|   471|  84273|4.4345856|
|   471| 117531|4.4345856|
|    31|  33649|5.0889573|
|    31|   3379|4.9877176|
|    31|   6086|  4.85124|
|    31|   3200| 4.813297|
|    31| 171495|  4.79994|
|    31|  93988| 4.786241|
|    31| 184245|4.7817674|
|    31|  84273|4.7817674|
|    31|  26073|4.7817674|
|    31|   7071|4.7817674|
+------+-------+---------+
only showing top 20 rows
```

movieId	userId	rating	title	genres
67618	100	5.1201425	Strictly Sexual (...	Comedy|Drama|Romance
3379	100	5.064743	On the Beach (1959)	Drama
42730	100	5.042285	Glory Road (2006)	Drama
33649	100	5.021657	Saving Face (2004)	Comedy|Drama|Romance
117531	100	4.9267745	Watermark (2014)	Documentary
7071	100	4.9267745	Woman Under the I...	Drama
184245	100	4.9267745	De platte jungle ...	Documentary
26073	100	4.9267745	Human Condition I...	Drama|War
179135	100	4.9267745	Blue Planet II (2...	Documentary
84273	100	4.9267745	Zeitgeist: Moving...	Documentary

movieId	userId	rating	title	genres
1101	100	5.0	Top Gun (1986)	Action|Romance
1958	100	5.0	Terms of Endearme...	Comedy|Drama
2423	100	5.0	Christmas Vacatio...	Comedy
4041	100	5.0	Officer and a Gen...	Drama|Romance
5620	100	5.0	Sweet Home Alabam...	Comedy|Romance
368	100	4.5	Maverick (1994)	Adventure|Comedy|...
934	100	4.5	Father of the Bri...	Comedy
539	100	4.5	Sleepless in Seat...	Comedy|Drama|Romance
16	100	4.5	Casino (1995)	Crime|Drama
553	100	4.5	Tombstone (1993)	Action|Drama|Western

```
Job [b5e9e7b360a240208ec81a0882f7dc08] finished successfully.
done: true
driverControlFilesUri: gs://dataproc-staging-us-west1-489433350597-3eogpmd4/google-cloud-dataproc-metainfo/970c38dc-42f4-4de9-99f4-547c15b7c8d6/jobs/b5e9e7b360a240208ec81a0882f7dc08/
driverOutputResourceUri: gs://dataproc-staging-us-west1-489433350597-3eogpmd4/google-cloud-dataproc-metainfo/970c38dc-42f4-4de9-99f4-547c15b7c8d6/jobs/b5e9e7b360a240208ec81a0882f7dc08/d
riveroutput
jobUuid: 6dffe213-75a0-3e65-bd15-ea92ee3a0c34
placement:
  clusterName: spark-cluster-ml
  clusterUuid: 970c38dc-42f4-4de9-99f4-547c15b7c8d6
pysparkJob:
  args:
  - --input_path_movies=gs://machine_learning_pro/movies.csv
  - --input_path_ratings=gs://machine_learning_pro/ratings.csv
  mainPythonFileUri: gs://machine_learning_pro/recommendation_engine.py
reference:
  jobId: b5e9e7b360a240208ec81a0882f7dc08
  projectId: cs570-big-data-analytics
status:
  state: DONE
  stateStartTime: '2024-07-28T19:39:37.376720Z'
statusHistory:
- state: PENDING
  stateStartTime: '2024-07-28T19:12:16.260605Z'
- state: SETUP_DONE
  stateStartTime: '2024-07-28T19:12:16.296990Z'
- details: Agent reported job success
  state: RUNNING
  stateStartTime: '2024-07-28T19:12:16.599762Z'
yarnApplications:
- name: Recommendations
  progress: 1.0
  state: FINISHED
  trackingUrl: http://spark-cluster-ml-m:8088/proxy/application_1722193763321_0001/
nhaile96456@cloudshell:~ (cs570-big-data-analytics)$
```