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# Big Data System Engineering with Scala

## Spring 2023

### Spark Assignment No. #2



## **-List of Tasks Implemented**

1. Performed EDA of the Titanic survival dataset.
2. Created new attributes in the dataset.
3. Trained a random forest model, computed its accuracy, and used the model to predict survival on the test dataset.

## **-Findings and analysis**

Explaining EDA statistics:

1. There are 577 males and 314 females in the training dataset. That is 65% males and 35% females.
2. Highest number of passengers (491) belong to the 3<sup>rd</sup> class ticket and lowest (184) belong to the 2<sup>nd</sup> class ticket.
3. Highest number of passengers (644) embarked from port Southampton.
4. Mean age is lowest for the 3<sup>rd</sup> class and highest for the 1<sup>st</sup> class for both Male and Female passengers.
5. Survival rate is highest for 1<sup>st</sup> class followed by 2<sup>nd</sup> and the 3<sup>rd</sup> classes respectively. Highest survival rate is for females in the 1<sup>st</sup> class at 96% followed by 92% in the 2<sup>nd</sup> class.

## -Code

```
1 import org.apache.spark.sql.{DataFrame, SparkSession}
2 import org.apache.spark.sql.functions._
3 import org.apache.spark.ml.classification.RandomForestClassifier
4 import org.apache.spark.ml.Pipeline
5 import org.apache.spark.ml.feature.{StringIndexer, VectorAssembler}
6 import org.apache.spark.ml.evaluation.MulticlassClassificationEvaluator
7
8 object SparkAssignment2 extends App {
9
10     // creating spark session
11     implicit val spark: SparkSession = SparkSession
12         .builder()
13         .appName("SparkAssignment2")
14         .master("local[*]")
15         .getOrCreate()
16
17     spark.sparkContext.setLogLevel("ERROR") // We want to ignore all of the INFO and WARN messages.
18
19     // Read train data from CSV file
20     val train = try {
21
22         spark.read
23             .option("header", true)
24             .option("inferSchema", true)
25             .csv(path = "src/main/resources/train.csv")
26     } catch {
27         case e: Exception =>
28             println(s"An error occurred while reading the ratings CSV file: ${e.getMessage}")
29             spark.emptyDataFrame
30     }
31
32     // Read test data from CSV file
33     val test = try {
34         spark.read
35             .option("header", true)
36             .option("inferSchema", true)
```

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  target
  build.properties
  src
  main
  resources
  scala
    SparkAssignment2
  test
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  build.sbt
External Libraries
Scratches and Consoles
Run: SparkAssignment2
Structure
  +-----+
  | male | 3 | 0.13544668587896252 |
  +-----+
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```

```
31 // Read test data from CSV file
32 val test = try {
33     spark.read
34         .option("header", true)
35         .option("inferSchema", true)
36         .csv(path = "src/main/resources/test.csv")
37 } catch {
38     case e: Exception =>
39         println(s"An error occurred while reading the ratings CSV file: ${e.getMessage}")
40         spark.emptyDataFrame
41 }
42
43 /// ***** SECTION 1: EXPLORATORY DATA ANALYSIS ***** ///
44
45 // Show the first 5 rows of the dataset
46 train.show(numRows = 5)
47
48 // Print the schema of the dataset
49 train.printSchema()
50
```

```
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```

```
49 train.printSchema()
50
51 // Compute summary statistics for numeric columns
52 train.describe(cols = "Age", "SibSp", "Parch", "Fare").show()
53
54 // Compute the count of each categorical value in the Sex column
55 train.groupBy(col = "Sex").count().show()
56
57 // Compute the count of each categorical value in the Pclass column
58 train.groupBy(col = "Pclass").count().show()
59
60 // Compute the count of each categorical value in the Embarked column
61 train.groupBy(col = "Embarked").count().show()
62
63 // Compute the mean age of passengers by sex and class
64 train.groupBy(col = "Sex", col = "Pclass")
65     .agg(avg(columnName = "Age").alias(alias = "mean_age"))
66     .show()
67
68 // Compute the survival rate by sex and class
```





```
100 val train_final = train_v3.withColumn(  
101     colName = "AgeGroup",  
102     when(col(colName = "Age").isNull, ageGroups(0))  
103     .when(col(colName = "Age") <= 1, ageGroups(1))  
104     .when(col(colName = "Age") <= 3, ageGroups(2))  
105     .when(col(colName = "Age") <= 12, ageGroups(3))  
106     .when(col(colName = "Age") <= 19, ageGroups(4))  
107     .when(col(colName = "Age") <= 35, ageGroups(5))  
108     .when(col(colName = "Age") <= 65, ageGroups(6))  
109     .otherwise(ageGroups(7))  
110 )  
111  
112  
113 val test_final = test_v3.withColumn(  
114     colName = "AgeGroup",  
115     when(col(colName = "Age").isNull, ageGroups(0))  
116     .when(col(colName = "Age") <= 1, ageGroups(1))  
117     .when(col(colName = "Age") <= 3, ageGroups(2))  
118     .when(col(colName = "Age") <= 12, ageGroups(3))  
119     .when(col(colName = "Age") <= 19, ageGroups(4))  
120 )
```

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```
File Edit View Navigate Code Refactor Build Run Tools Git Window Help CSYE7200-Spark-Assignment-2-Hrshikesh
CSYE7200-Spark-Assignment-2-Hrshikesh src main scala SparkAssignment2.scala
Project
  CSYE7200-Spark-Assignment-2-Hrshikesh
    .bsp
    .idea
    project [CSYE7200-Spark-Assignment-2-Hrshikesh]
      target
        build.properties
        src
          main
            resources
              scala
                SparkAssignment2
          test
        target
        build.sbt
    External Libraries
    Scratches and Consoles
Run: SparkAssignment2
  male 3|0.13544668587896252|
Git Run TODO Problems Terminal Services sbt shell Build
Successfully shared project on GitHub: CSYE7200-Spark-Assignment-2-Hrshikesh (22 minutes ago)
124:3 CRLF UTF-8 2 spaces master
5°C Cloudy 01:11 06-04-2023
```

```
127 // Define the features to use in the model
128 val features = Array("Pclass", "Sex", "Fare",
129 "Embarked", "FamSize", "FarePerPerson", "AgeGroup")
130
131 // Create StringIndexers for the Sex and Embarked columns
132
133 val sexIndexer = new StringIndexer()
134   .setInputCol("Sex")
135   .setOutputCol("SexIndex")
136   .setHandleInvalid("skip")
137
138 val embarkedIndexer = new StringIndexer()
139   .setInputCol("Embarked")
140   .setOutputCol("EmbarkedIndex")
141   .setHandleInvalid("skip")
142
143 val ageGroupIndexer = new StringIndexer()
144   .setInputCol("AgeGroup")
145   .setOutputCol("AgeGroupIndex")
146   .setHandleInvalid("skip")
147
148 SparkAssignment2
```

```
File Edit View Navigate Code Refactor Build Run Tools Git Window Help CSYE7200-Spark-Assignment-2-Hrshikesh
CSYE7200-Spark-Assignment-2-Hrshikesh src main scala SparkAssignment2.scala
Project
  CSYE7200-Spark-Assignment-2-Hrshikesh
    .bsp
    .idea
    project [CSYE7200-Spark-Assignment-2-Hrshikesh]
      target
        build.properties
        src
          main
            resources
              scala
                SparkAssignment2
          test
        target
        build.sbt
    External Libraries
    Scratches and Consoles
Run: SparkAssignment2
  male 3|0.13544668587896252|
Git Run TODO Problems Terminal Services sbt shell Build
Successfully shared project on GitHub: CSYE7200-Spark-Assignment-2-Hrshikesh (22 minutes ago)
124:3 CRLF UTF-8 2 spaces master
5°C Cloudy 01:11 06-04-2023
```

```
142 val ageGroupIndexer = new StringIndexer()
143   .setInputCol("AgeGroup")
144   .setOutputCol("AgeGroupIndex")
145   .setHandleInvalid("skip")
146
147 // Create a VectorAssembler to combine the features into a single vector
148
149 val assembler = new VectorAssembler()
150   .setInputCols(Array("Fare", "Pclass", "FamSize", "FarePerPerson"))
151   .setOutputCol("features")
152
153 // Create a RandomForest model
154 val rf = new RandomForestClassifier()
155   .setLabelCol("Survived")
156   .setFeaturesCol("features")
157
158 // Create a Pipeline to string together the stages
159 val pipeline = new Pipeline()
160   .setStages(Array(sexIndexer, embarkedIndexer, ageGroupIndexer, assembler, rf))
161
162 SparkAssignment2
```

```
File Edit View Navigate Code Refactor Build Run Tools Git Window Help CSE7200-Spark-Assignment-2-Hrshikesh
CSE7200-Spark-Assignment-2-Hrshikesh src main scala SparkAssignment2.scala
Project SparkAssignment2.scala
Project CSE7200-Spark-Assignment-2-Hrshikesh
  .bsp
  .idea
  project [CSE7200-Spark-Assignment-2-Hrshikesh]
    target
      build.properties
      src
        main
          resources
            scala
              SparkAssignment2
        test
      target
      build.sbt
  External Libraries
  Scratches and Consoles
Run: SparkAssignment2
Run: SparkAssignment2
  male 3 0.13544668587896252
Git Run TODO Problems Terminal Services sbt shell Build
Successfully shared project on GitHub: CSE7200-Spark-Assignment-2-Hrshikesh (22 minutes ago)
124:3 CRLF UTF-8 2 spaces master
5°C Cloudy 01:11 06-04-2023
```

```
160 .setStages(Array(sexIndexer, embarkedIndexer, ageGroupIndexer, assembler, rf))
161
162 // Split the data into training and validation sets
163 val Array(trainingData, validationData) = train_final.randomSplit(Array(0.8, 0.2))
164
165 // Fit the model to the training data
166 val model = pipeline.fit(trainingData)
167
168 // Make predictions on the validation data
169 val predictions = model.transform(validationData)
170
171 // Evaluate the model using the area under the ROC curve
172 val evaluator = new MulticlassClassificationEvaluator()
173   .setLabelCol("Survived")
174   .setPredictionCol("prediction")
175   .setMetricName("accuracy")
176
177 val accuracy = evaluator.evaluate(predictions)
178
179 // Print the accuracy
```

```
File Edit View Navigate Code Refactor Build Run Tools Git Window Help CSE7200-Spark-Assignment-2-Hrshikesh
CSE7200-Spark-Assignment-2-Hrshikesh src main scala SparkAssignment2.scala
Project SparkAssignment2.scala
Project CSE7200-Spark-Assignment-2-Hrshikesh
  .bsp
  .idea
  project [CSE7200-Spark-Assignment-2-Hrshikesh]
    target
      build.properties
      src
        main
          resources
            scala
              SparkAssignment2
        test
      target
      build.sbt
  External Libraries
  Scratches and Consoles
Run: SparkAssignment2
Run: SparkAssignment2
  male 3 0.13544668587896252
Git Run TODO Problems Terminal Services sbt shell Build
Successfully shared project on GitHub: CSE7200-Spark-Assignment-2-Hrshikesh (22 minutes ago)
124:3 CRLF UTF-8 2 spaces master
5°C Cloudy 01:11 06-04-2023
```

```
175   .setMetricName("accuracy")
176
177 val accuracy = evaluator.evaluate(predictions)
178
179 // Print the accuracy
180 println(s"Accuracy: $accuracy")
181
182 // Use the trained model to make predictions on the test data
183 val predictions_test = model.transform(test_final)
184
185 // Show the predicted survival probabilities for each passenger
186 predictions_test.select(col="PassengerId", cols="prediction", "probability").show()
187
188 }
```



## - Result

The top screenshot shows the execution of a Spark application. The output includes a table of passenger data and a summary of the accuracy.

```
2023-04-06 00:37:07,114 INFO o.a.s.scheduler.TaskSchedulerImpl - Killing all running tasks in stage 4: Stage finished
2023-04-06 00:37:07,114 INFO o.a.spark.scheduler.DAGScheduler - Job 4 finished: show at SparkAssignment2.scala:49, took 0.094658 s
2023-04-06 00:37:07,159 INFO o.a.s.s.c.e.codegen.CodeGenerator - Code generated in 27.6534 ms
```

PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Cabin	Embarked
1	0	3	Braund, Mr. Owen ...	male	22.0	1	0	A/5 21171	7.25	null	S
2	1	1	Cumings, Mrs. Joh...	female	38.0	1	0	PC 17599/71.2833	53.1	C123	S
3	1	3	Heikkinen, Miss. ...	female	26.0	0	0	STON/O2. 3101282	7.925	null	S
4	1	1	Futrelle, Mrs. Ja...	female	35.0	1	0	113803	53.1	C123	S
5	0	3	Allen, Mr. Willia...	male	35.0	0	0	373450	8.05	null	S

only showing top 5 rows

```
root
|-- PassengerId: integer (nullable = true)
|-- Survived: integer (nullable = true)
|-- Pclass: integer (nullable = true)
```

The bottom screenshot shows the same application with a different output, including a list of filters.

```
only showing top 5 rows

root
|-- PassengerId: integer (nullable = true)
|-- Survived: integer (nullable = true)
|-- Pclass: integer (nullable = true)
|-- Name: string (nullable = true)
|-- Sex: string (nullable = true)
|-- Age: double (nullable = true)
|-- SibSp: integer (nullable = true)
|-- Parch: integer (nullable = true)
|-- Ticket: string (nullable = true)
|-- Fare: double (nullable = true)
|-- Cabin: string (nullable = true)
|-- Embarked: string (nullable = true)

2023-04-06 00:37:07,316 INFO o.a.s.s.e.d.FileSourceStrategy - Pushed Filters:
2023-04-06 00:37:07,316 INFO o.a.s.s.e.d.FileSourceStrategy - Post-Scan Filters:
```

```
File Edit View Navigate Code Refactor Build Run Tools Git Window Help CSYE7200-Spark-Assignment-2-Hrishikesh
CSYE7200-Spark-Assignment-2-Hrishikesh (src / main / scala) SparkAssignment2.scala
Project: CSYE7200-Spark-Assignment-2-Hrishikesh
  > .bsp
  > .idea
  > project [CSYE7200-Spark-Assignment-2-Hrishikesh]
  > target
  > build.properties
  > SparkAssignment2
    175 .setMetricName("accuracy")
    176
    177 val accuracy = evaluator.evaluate(predictions)
    178
    179 // Print the accuracy
    180
Run: SparkAssignment2
2023-04-06 00:37:08,094 INFO o.a.s.scheduler.TaskSchedulerImpl - Killing all running tasks in stage 7: Stage finished
2023-04-06 00:37:08,094 INFO o.a.spark.scheduler.DAGScheduler - Job 6 finished: describe at SparkAssignment2.scala:55, took 0.095703 s
2023-04-06 00:37:08,173 INFO o.a.s.s.c.e.codegen.CodeGenerator - Code generated in 11.3474 ms
2023-04-06 00:37:08,173 INFO o.a.s.s.c.e.codegen.CodeGenerator - Code generated in 9.2682 ms
+-----+
|summary|      Age|      SibSp|      Parch|      Fare|
+-----+
| count|      714|          891|          891|          891|
| mean| 29.69911764705882| 0.5230078563411896| 0.38159371492704824| 32.2042079685746|
| stddev| 14.526497332334035| 1.1027434322934315| 0.8060572211299488| 49.69342859718089|
| min|      0.42|          0|          0|          0.0|
| max|      80.0|          8|          6|         512.3292|
+-----+

2023-04-06 00:37:08,220 INFO o.a.s.s.e.d.FileSourceStrategy - Pushed Filters:
2023-04-06 00:37:08,220 INFO o.a.s.s.e.d.FileSourceStrategy - Post-Scan Filters:
2023-04-06 00:37:08,220 INFO o.a.s.s.e.d.FileSourceStrategy - Output Data Schema: struct<Sex: string>
2023-04-06 00:37:08,316 INFO o.a.s.s.c.e.codegen.CodeGenerator - Code generated in 45.9435 ms
Git Run TODO Problems Terminal Services sbt shell Build
Successfully shared project on GitHub: CSYE7200-Spark-Assignment-2-Hrishikesh (23 minutes ago)
5°C Cloudy 01:12 06-04-2023
```

```
File Edit View Navigate Code Refactor Build Run Tools Git Window Help CSYE7200-Spark-Assignment-2-Hrishikesh
CSYE7200-Spark-Assignment-2-Hrishikesh (src / main / scala) SparkAssignment2.scala
Project: CSYE7200-Spark-Assignment-2-Hrishikesh
  > .bsp
  > .idea
  > project [CSYE7200-Spark-Assignment-2-Hrishikesh]
  > target
  > build.properties
  > SparkAssignment2
    175 .setMetricName("accuracy")
    176
    177 val accuracy = evaluator.evaluate(predictions)
    178
    179 // Print the accuracy
    180
Run: SparkAssignment2
2023-04-06 00:37:08,707 INFO o.a.spark.scheduler.DAGScheduler - Job 8 is finished. Cancelling potential speculative or zombie tasks for this job
2023-04-06 00:37:08,707 INFO o.a.s.scheduler.TaskSchedulerImpl - Killing all running tasks in stage 10: Stage finished
2023-04-06 00:37:08,707 INFO o.a.spark.scheduler.DAGScheduler - Job 8 finished: show at SparkAssignment2.scala:58, took 0.036479 s
2023-04-06 00:37:08,716 INFO o.a.s.s.c.e.codegen.CodeGenerator - Code generated in 7.0194 ms
+-----+
| Sex|count|
+-----+
|female| 314|
| male| 577|
+-----+

2023-04-06 00:37:08,739 INFO o.a.s.s.e.d.FileSourceStrategy - Pushed Filters:
2023-04-06 00:37:08,739 INFO o.a.s.s.e.d.FileSourceStrategy - Post-Scan Filters:
2023-04-06 00:37:08,739 INFO o.a.s.s.e.d.FileSourceStrategy - Output Data Schema: struct<Pclass: int>
2023-04-06 00:37:08,786 INFO o.a.s.s.c.e.codegen.CodeGenerator - Code generated in 28.595 ms
2023-04-06 00:37:08,801 INFO o.a.spark.storage.memory.MemoryStore - Block broadcast_16 stored as values in memory (estimated size 189.5 KiB, free 1.1 GiB)
2023-04-06 00:37:08,801 INFO o.a.spark.storage.memory.MemoryStore - Block broadcast_16_piece0 stored as bytes in memory (estimated size 32.8 KiB, free 1.1 GiB)
2023-04-06 00:37:08,801 INFO o.a.spark.storage.BlockManagerInfo - Added broadcast_16_piece0 in memory on DESKTOP-S60FP07.ht.home:59230 (size: 32 KiB)
Git Run TODO Problems Terminal Services sbt shell Build
Successfully shared project on GitHub: CSYE7200-Spark-Assignment-2-Hrishikesh (23 minutes ago)
5°C Cloudy 01:12 06-04-2023
```

```
File Edit View Navigate Code Refactor Build Run Tools Git Window Help CSYE7200-Spark-Assignment-2-Hrishikesh
CSYE7200-Spark-Assignment-2-Hrishikesh src main scala SparkAssignment2.scala
Project
  CSYE7200-Spark-Assignment-2-Hrishikesh
    .bsp
    .idea
    project [CSYE7200-Spark-Assignment-2-Hrishikesh]
    target
    build.properties
    SparkAssignment2
      SparkAssignment2.scala
        175 .setMetricName("accuracy")
        176
        177 val accuracy = evaluator.evaluate(predictions)
        178
        179 // Print the accuracy
Run: SparkAssignment2
2023-04-06 00:37:09,085 INFO o.a.s.scheduler.TaskSchedulerImpl - Removed TaskSet 13.0, whose tasks have all completed, from pool
2023-04-06 00:37:09,085 INFO o.a.spark.scheduler.DAGScheduler - ResultStage 13 (show at SparkAssignment2.scala:61) finished in 0.031 s
2023-04-06 00:37:09,085 INFO o.a.spark.scheduler.DAGScheduler - Job 10 is finished. Cancelling potential speculative or zombie tasks for this job
2023-04-06 00:37:09,085 INFO o.a.s.scheduler.TaskSchedulerImpl - Killing all running tasks in stage 13: Stage finished
2023-04-06 00:37:09,085 INFO o.a.spark.scheduler.DAGScheduler - Job 10 finished: show at SparkAssignment2.scala:61, took 0.032413 s
+-----+
|Pclass|count|
+-----+
| 1 | 216 |
| 3 | 491 |
| 2 | 184 |
+-----+
2023-04-06 00:37:09,117 INFO o.a.s.s.e.d.FileSourceStrategy - Pushed Filters:
2023-04-06 00:37:09,117 INFO o.a.s.s.e.d.FileSourceStrategy - Post-Scan Filters:
2023-04-06 00:37:09,117 INFO o.a.s.s.e.d.FileSourceStrategy - Output Data Schema: struct<Embarked: string>
2023-04-06 00:37:09,148 INFO o.a.spark.storage.memory.MemoryStore - Block broadcast_19 stored as values in memory (estimated size 189.5 KiB, free 32.8 KiB)
2023-04-06 00:37:09,163 INFO o.a.spark.storage.memory.MemoryStore - Block broadcast_19_piece0 stored as bytes in memory (estimated size 32.8 KiB, free 32.8 KiB)
Git Run TODO Problems Terminal Services sbt shell Build
Successfully shared project on GitHub: CSYE7200-Spark-Assignment-2-Hrishikesh (23 minutes ago)
5°C Cloudy 1:1 CRLF UTF-8 2 spaces master 01:12 06-04-2023
```

```
File Edit View Navigate Code Refactor Build Run Tools Git Window Help CSYE7200-Spark-Assignment-2-Hrishikesh
CSYE7200-Spark-Assignment-2-Hrishikesh src main scala SparkAssignment2.scala
Project
  CSYE7200-Spark-Assignment-2-Hrishikesh
    .bsp
    .idea
    project [CSYE7200-Spark-Assignment-2-Hrishikesh]
    target
    build.properties
    SparkAssignment2
      SparkAssignment2.scala
        175 .setMetricName("accuracy")
        176
        177 val accuracy = evaluator.evaluate(predictions)
        178
        179 // Print the accuracy
Run: SparkAssignment2
2023-04-06 00:37:09,383 INFO o.a.spark.scheduler.DAGScheduler - Job 12 is finished. Cancelling potential speculative or zombie tasks for this job
2023-04-06 00:37:09,383 INFO o.a.s.scheduler.TaskSchedulerImpl - Killing all running tasks in stage 16: Stage finished
2023-04-06 00:37:09,383 INFO o.a.spark.scheduler.DAGScheduler - Job 12 finished: show at SparkAssignment2.scala:64, took 0.028416 s
+-----+
|Embarked|count|
+-----+
| Q | 77 |
| null | 2 |
| C | 168 |
| S | 644 |
+-----+
2023-04-06 00:37:09,414 INFO o.a.s.s.e.d.FileSourceStrategy - Pushed Filters:
2023-04-06 00:37:09,414 INFO o.a.s.s.e.d.FileSourceStrategy - Post-Scan Filters:
2023-04-06 00:37:09,414 INFO o.a.s.s.e.d.FileSourceStrategy - Output Data Schema: struct<Pclass: int, Sex: string, Age: double ... 1 more fields>
2023-04-06 00:37:09,458 INFO o.a.s.s.c.e.codegen.CodeGenerator - Code generated in 28.1833 ms
2023-04-06 00:37:09,458 INFO o.a.spark.storage.memory.MemoryStore - Block broadcast_22 stored as values in memory (estimated size 189.5 KiB, free 32.8 KiB)
2023-04-06 00:37:09,474 INFO o.a.spark.storage.memory.MemoryStore - Block broadcast_22_piece0 stored as bytes in memory (estimated size 32.8 KiB, free 32.8 KiB)
Git Run TODO Problems Terminal Services sbt shell Build
Successfully shared project on GitHub: CSYE7200-Spark-Assignment-2-Hrishikesh (23 minutes ago)
5°C Cloudy 1:1 CRLF UTF-8 2 spaces master 01:12 06-04-2023
```

```
File Edit View Navigate Code Refactor Build Run Tools Git Window Help CSYE7200-Spark-Assignment-2-Hrshikesh
CSYE7200-Spark-Assignment-2-Hrshikesh src main scala SparkAssignment2.scala
Project CSYE7200-Spark-Assignment-2-Hrshikesh
  .bsp
  .idea
  project [CSYE7200-Spark-Assignment-2-Hrshikesh]
  target
  build.properties
  SparkAssignment2
    .setMetricName("accuracy")
    val accuracy = evaluator.evaluate(predictions)
    // Print the accuracy

Run: SparkAssignment2
2023-04-06 00:37:09,759 INFO o.a.s.s.c.e.codegen.CodeGenerator - Code generated in 6.5381 ms
+-----+
| Sex|Pclass|      mean_age|
+-----+
| male|    3|26.507588932806325|
|female|    3|      21.75|
|female|    1|34.61176470588235|
|female|    2|28.722972972972972|
| male|    2|30.74070707070707|
| male|    1|41.28138613861386|
+-----+

2023-04-06 00:37:09,838 INFO o.a.s.s.e.d.FileSourceStrategy - Pushed Filters:
2023-04-06 00:37:09,838 INFO o.a.s.s.e.d.FileSourceStrategy - Post-Scan Filters:
2023-04-06 00:37:09,838 INFO o.a.s.s.e.d.FileSourceStrategy - Output Data Schema: struct<Survived: int, Pclass: int, Sex: string ... 1 more field>
2023-04-06 00:37:09,917 INFO o.a.s.s.c.e.codegen.CodeGenerator - Code generated in 43.7192 ms
2023-04-06 00:37:09,917 INFO o.a.spark.storage.memory.MemoryStore - Block broadcast_25 stored as values in memory (estimated size 189.5 KiB, free 1.0 GiB)
2023-04-06 00:37:09,947 INFO o.a.spark.storage.memory.MemoryStore - Block broadcast_25_piece0 stored as bytes in memory (estimated size 32.8 KiB, free 1.0 GiB)

Successfully shared project on GitHub: CSYE7200-Spark-Assignment-2-Hrshikesh (23 minutes ago)
5°C Cloudy
```

```
File Edit View Navigate Code Refactor Build Run Tools Git Window Help CSYE7200-Spark-Assignment-2-Hrshikesh
CSYE7200-Spark-Assignment-2-Hrshikesh src main scala SparkAssignment2.scala
Project CSYE7200-Spark-Assignment-2-Hrshikesh
  .bsp
  .idea
  project [CSYE7200-Spark-Assignment-2-Hrshikesh]
  target
  build.properties
  SparkAssignment2
    .setMetricName("accuracy")
    val accuracy = evaluator.evaluate(predictions)
    // Print the accuracy

Run: SparkAssignment2
2023-04-06 00:37:10,220 INFO o.a.spark.scheduler.DAGScheduler - ResultStage 22 (show at SparkAssignment2.scala:73) finished in 0.031 s
2023-04-06 00:37:10,220 INFO o.a.spark.scheduler.DAGScheduler - Job 16 is finished. Cancelling potential speculative or zombie tasks for this job
2023-04-06 00:37:10,220 INFO o.a.s.scheduler.TaskSchedulerImpl - Killing all running tasks in stage 22: Stage finished
2023-04-06 00:37:10,220 INFO o.a.spark.scheduler.DAGScheduler - Job 16 finished: show at SparkAssignment2.scala:73, took 0.029975 s
+-----+
| Sex|Pclass|      survival_rate|
+-----+
| male|    3|0.13544668587896252|
|female|    3|      0.5|
|female|    1|0.9680851063829787|
|female|    2|0.9210526315789473|
| male|    2|0.1574074074074074|
| male|    1|0.36885245901639346|
+-----+

2023-04-06 00:37:10,636 INFO o.a.s.s.e.d.FileSourceStrategy - Pushed Filters:
2023-04-06 00:37:10,636 INFO o.a.s.s.e.d.FileSourceStrategy - Post-Scan Filters:
2023-04-06 00:37:10,636 INFO o.a.s.s.e.d.FileSourceStrategy - Output Data Schema: struct<PassengerId: int, Survived: int, Pclass: int, Name: string ... 1 more field>

Successfully shared project on GitHub: CSYE7200-Spark-Assignment-2-Hrshikesh (24 minutes ago)
5°C Cloudy
```

The first screenshot shows the Spark job execution logs. The code in the editor defines a metric named 'accuracy'. The logs show the job completion and the final accuracy value: 0.7778708636942674.

The second screenshot shows the final output of the job, a table with three columns: PassengerId, prediction, and probability. The table contains 10 rows of data.

PassengerId	prediction	probability
892	0.0	[0.70698352435595...
893	0.0	[0.74858996249608...
894	0.0	[0.68535015676418...
895	0.0	[0.80386761570836...
896	1.0	[0.48848605133612...
897	0.0	[0.79968394223897...
898	0.0	[0.76251414891737...
899	1.0	[0.31473889968568...
900	0.0	[0.78616783574421...
901	0.0	[0.67216975498279...
902	0.0	[0.80976505160580...
903	0.0	[0.57659612887552...
904	1.0	[0.29230350200088...

-GitHub link

<https://github.com/hrishikesh-pawar/CSYE7200-Spark-Assignment-2-Hrshikesh>