Experiment 8

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Aim: To study and implement sparkQL using PySpark.

Theory: SparkQL is a query language for RDF data. It is used retrieve and manipulate stored data in RDF format. Spark QL stands for 'SparkQL Protocol and RDF Query language. It was developed by World wide web consortium (W3C) and is a standard for querying RDF data. RDF stands for Resource description framework. It is a standard for describing resources on the web. RDF Data is stored in triplets which consist of a subject, a predicate and an object sparkQL Query's used to retrieve data from an RDF dataset. It consists of a set of patterns are written in a syntax similar to SQL, but with some difference.

Pyspark provides an easy-to-use interface to sparkQL, allowing users to perform complex data processing tasks with few lines of code with Pyspark users can create spark Dataframes, which is similar to Pandas Dataframes and can be queried using Spark SQL.

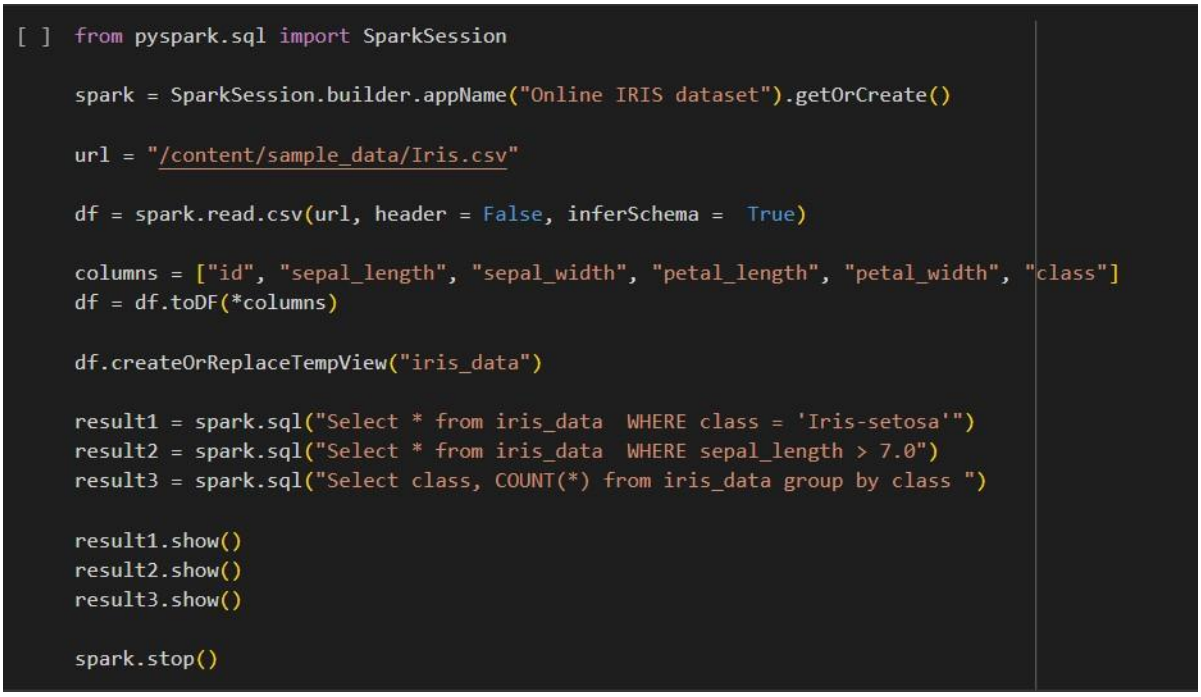
Conclusion: By studying and implementing Spark SQL using Pyspark, we leverage the power of SQL queries to efficiently analyze and process big data within spark enhancing data processing capabilities

Experiment No.: 8

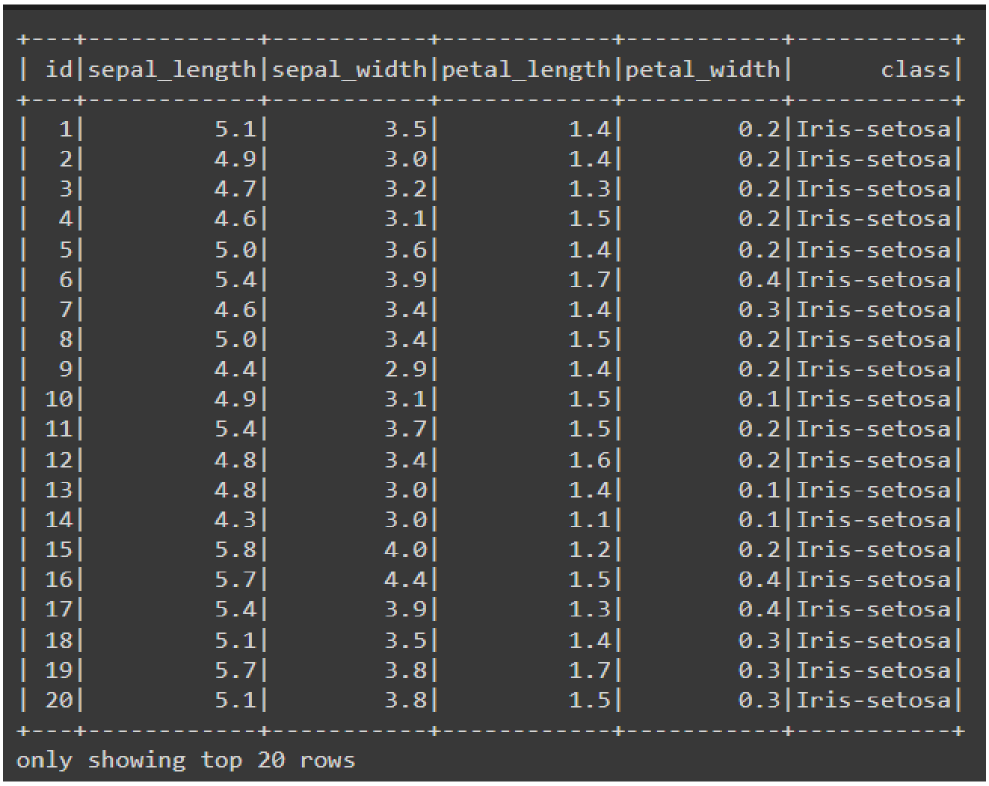
Aim: To study and Implement SparkQL using PySpark**.**

Code & Output:

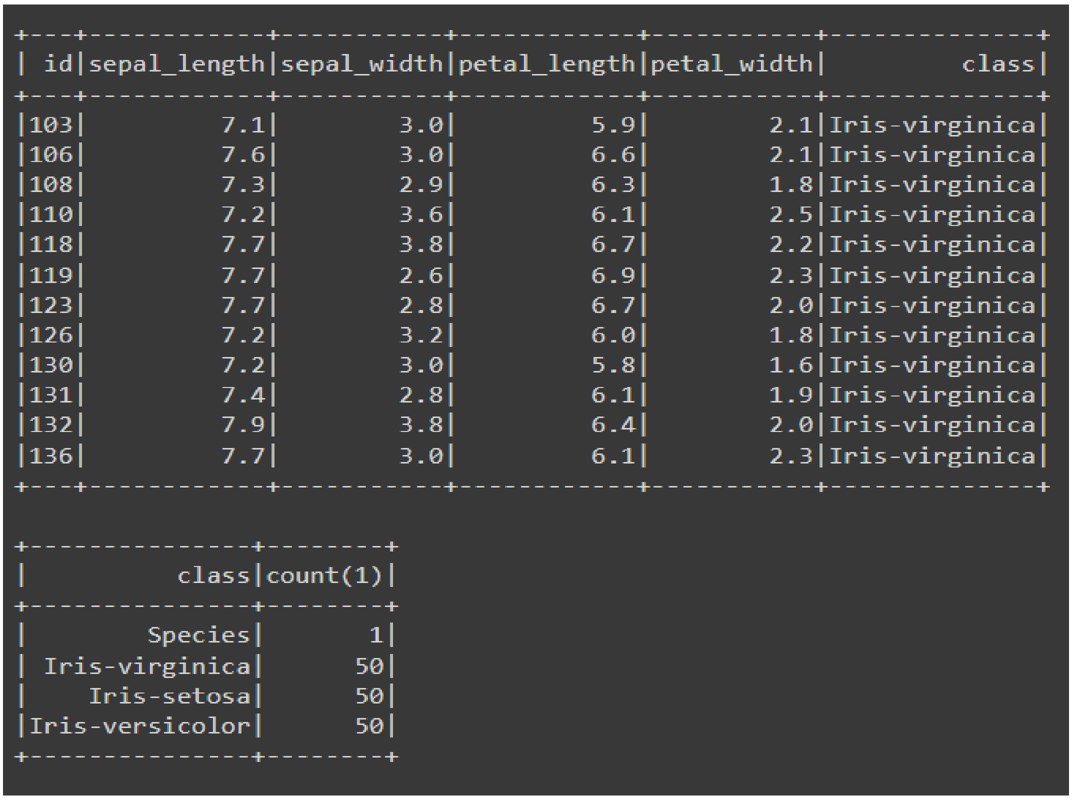
IRIS DATASET:



```
[ ]  from pyspark.sql import SparkSession

     spark = SparkSession.builder.appName("Online IRIS dataset").getOrCreate()

     url = "/content/sample_data/Iris.csv"

     df = spark.read.csv(url, header = False, inferSchema =  True)

     columns = ["id", "sepal_length", "sepal_width", "petal_length", "petal_width", "class"]
     df = df.toDF(*columns)

     df.createOrReplaceTempView("iris_data")

     result1 = spark.sql("Select * from iris_data  WHERE class = 'Iris-setosa'")
     result2 = spark.sql("Select * from iris_data  WHERE sepal_length > 7.0")
     result3 = spark.sql("Select class, COUNT(*) from iris_data group by class ")

     result1.show()
     result2.show()
     result3.show()

     spark.stop()
```



```
+---+------------+-----------+------------+-----------+-----------+
| id|sepal_length|sepal_width|petal_length|petal_width|      class|
+---+------------+-----------+------------+-----------+-----------+
|  1|         5.1|        3.5|         1.4|        0.2|Iris-setosa|
|  2|         4.9|        3.0|         1.4|        0.2|Iris-setosa|
|  3|         4.7|        3.2|         1.3|        0.2|Iris-setosa|
|  4|         4.6|        3.1|         1.5|        0.2|Iris-setosa|
|  5|         5.0|        3.6|         1.4|        0.2|Iris-setosa|
|  6|         5.4|        3.9|         1.7|        0.4|Iris-setosa|
|  7|         4.6|        3.4|         1.4|        0.3|Iris-setosa|
|  8|         5.0|        3.4|         1.5|        0.2|Iris-setosa|
|  9|         4.4|        2.9|         1.4|        0.2|Iris-setosa|
| 10|         4.9|        3.1|         1.5|        0.1|Iris-setosa|
| 11|         5.4|        3.7|         1.5|        0.2|Iris-setosa|
| 12|         4.8|        3.4|         1.6|        0.2|Iris-setosa|
| 13|         4.8|        3.0|         1.4|        0.1|Iris-setosa|
| 14|         4.3|        3.0|         1.1|        0.1|Iris-setosa|
| 15|         5.8|        4.0|         1.2|        0.2|Iris-setosa|
| 16|         5.7|        4.4|         1.5|        0.4|Iris-setosa|
| 17|         5.4|        3.9|         1.3|        0.4|Iris-setosa|
| 18|         5.1|        3.5|         1.4|        0.3|Iris-setosa|
| 19|         5.7|        3.8|         1.7|        0.3|Iris-setosa|
| 20|         5.1|        3.8|         1.5|        0.3|Iris-setosa|
+---+------------+-----------+------------+-----------+-----------+
only showing top 20 rows
```



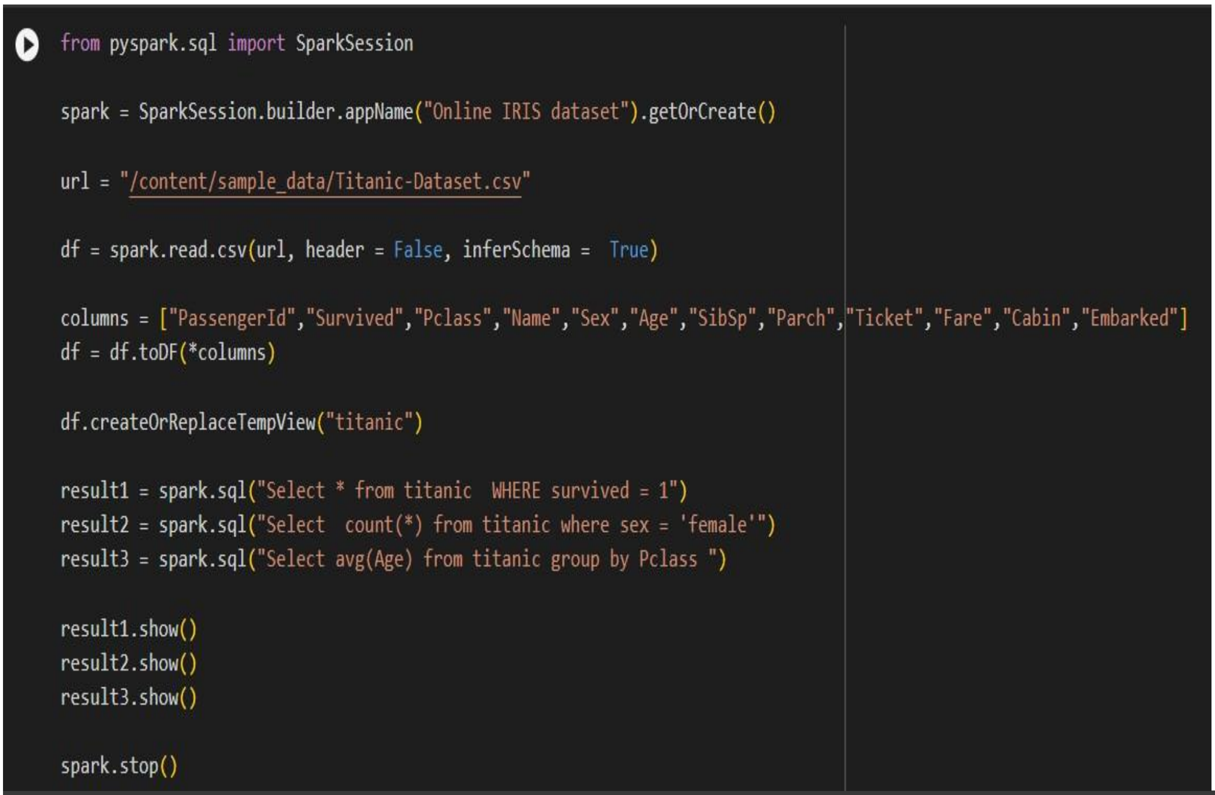
```
+---+------------+-----------+------------+-----------+--------------+
| id|sepal_length|sepal_width|petal_length|petal_width|         class|
+---+------------+-----------+------------+-----------+--------------+
|103|         7.1|        3.0|         5.9|        2.1|Iris-virginica|
|106|         7.6|        3.0|         6.6|        2.1|Iris-virginica|
|108|         7.3|        2.9|         6.3|        1.8|Iris-virginica|
|110|         7.2|        3.6|         6.1|        2.5|Iris-virginica|
|118|         7.7|        3.8|         6.7|        2.2|Iris-virginica|
|119|         7.7|        2.6|         6.9|        2.3|Iris-virginica|
|123|         7.7|        2.8|         6.7|        2.0|Iris-virginica|
|126|         7.2|        3.2|         6.0|        1.8|Iris-virginica|
|130|         7.2|        3.0|         5.8|        1.6|Iris-virginica|
|131|         7.4|        2.8|         6.1|        1.9|Iris-virginica|
|132|         7.9|        3.8|         6.4|        2.0|Iris-virginica|
|136|         7.7|        3.0|         6.1|        2.3|Iris-virginica|
+---+------------+-----------+------------+-----------+--------------+

+---------------+--------+
|          class|count(1)|
+---------------+--------+
|        Species|       1|
| Iris-virginica|      50|
|    Iris-setosa|      50|
|Iris-versicolor|      50|
+---------------+--------+
```

Titanic Dataset - Perform SQL Queries to find:

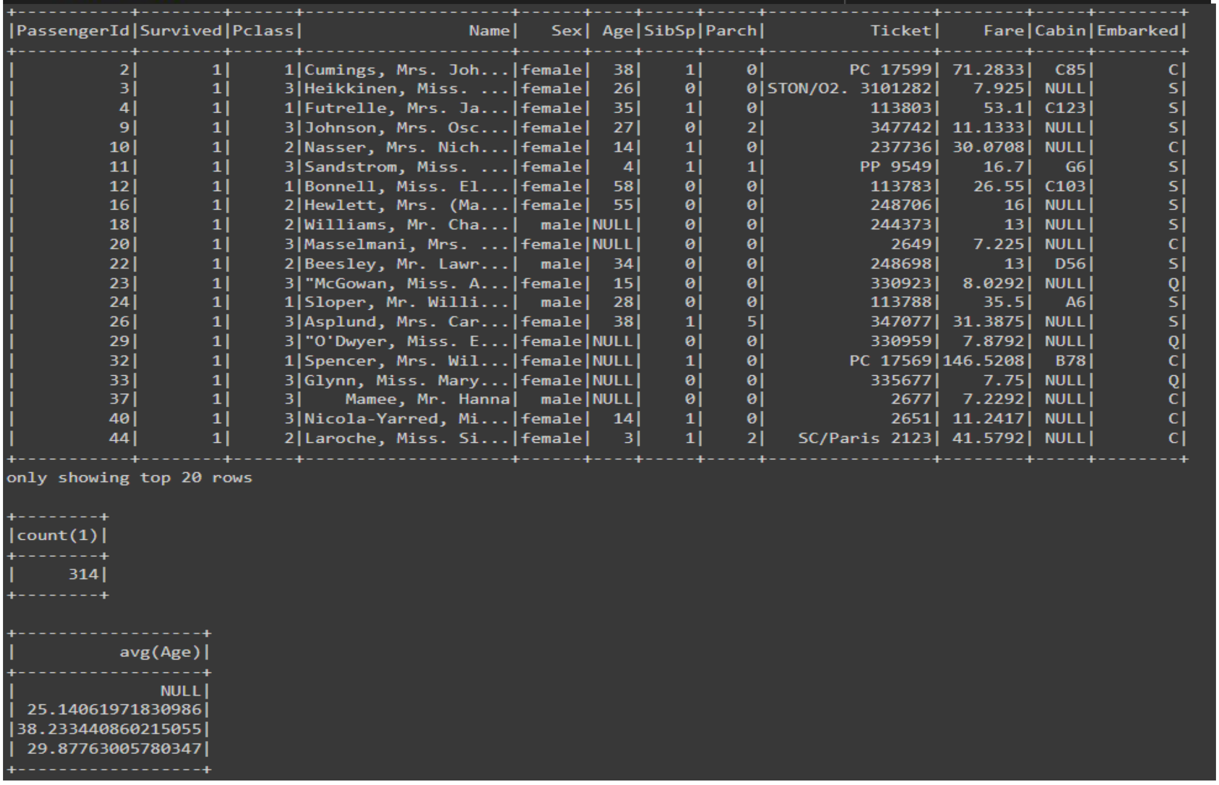
a. What is the number of passengers who survived the Titanic Disaster?

b. How many female passengers were on board the Titanic?

c. What is the average age of passengers in each passenger class?



```
from pyspark.sql import SparkSession

spark = SparkSession.builder.appName("Online IRIS dataset").getOrCreate()

url = "/content/sample_data/Titanic-Dataset.csv"

df = spark.read.csv(url, header = False, inferSchema =  True)

columns = ["PassengerId","Survived","Pclass","Name","Sex","Age","SibSp","Parch","Ticket","Fare","Cabin","Embarked"]
df = df.toDF(*columns)

df.createOrReplaceTempView("titanic")

result1 = spark.sql("Select * from titanic  WHERE survived = 1")
result2 = spark.sql("Select  count(*) from titanic where sex = 'female'")
result3 = spark.sql("Select avg(Age) from titanic group by Pclass ")

result1.show()
result2.show()
result3.show()

spark.stop()
```

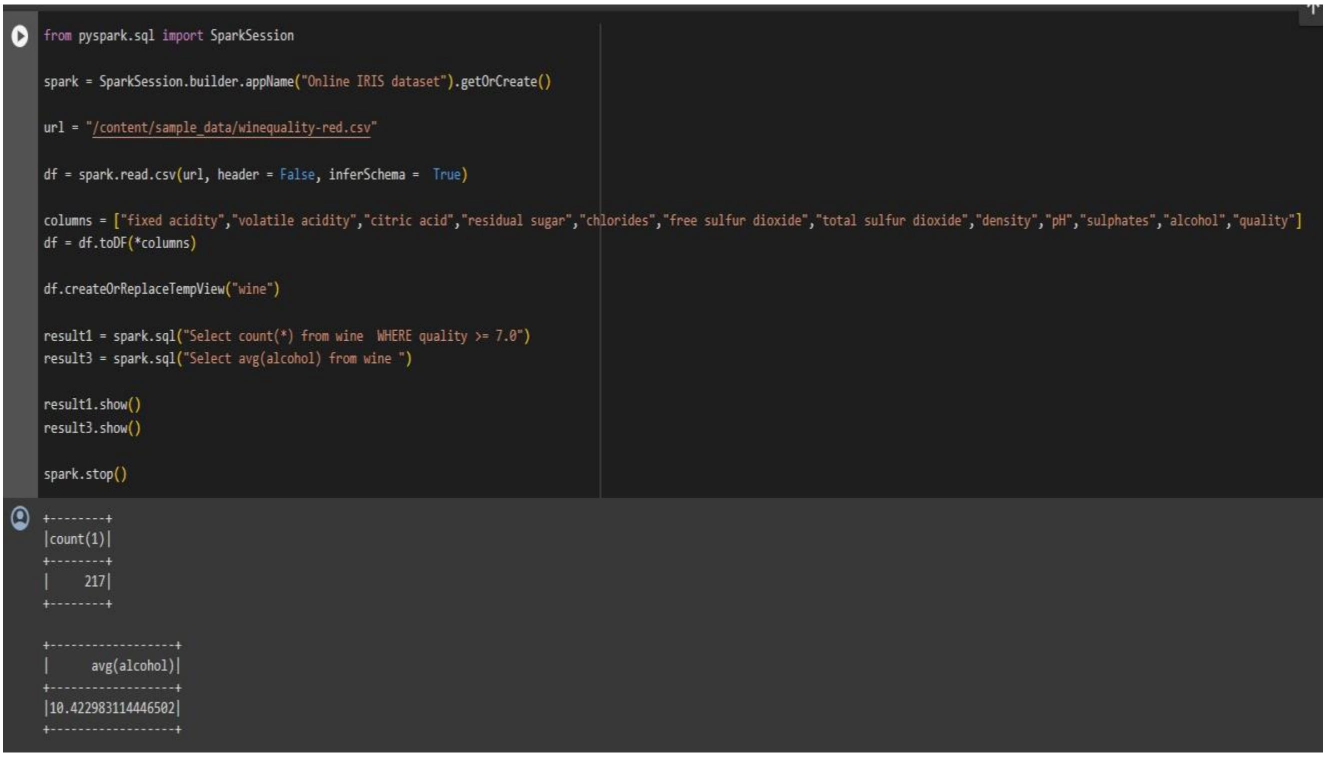


```
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+--------+-----+--------+
|PassengerId|Survived|Pclass|                Name|   Sex| Age|SibSp|Parch|          Ticket|    Fare|Cabin|Embarked|
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+--------+-----+--------+
|          2|       1|     1|Cumings, Mrs. Joh...|female|  38|    1|    0|        PC 17599| 71.2833|  C85|       C|
|          3|       1|     3|Heikkinen, Miss. ...|female|  26|    0|    0|STON/O2. 3101282|   7.925| NULL|       S|
|          4|       1|     1|Futrelle, Mrs. Ja...|female|  35|    1|    0|          113803|    53.1| C123|       S|
|          9|       1|     3|Johnson, Mrs. Osc...|female|  27|    0|    2|          347742| 11.1333| NULL|       S|
|         10|       1|     2|Nasser, Mrs. Nich...|female|  14|    1|    0|          237736| 30.0708| NULL|       C|
|         11|       1|     3|Sandstrom, Miss. ...|female|   4|    1|    1|         PP 9549|    16.7|   G6|       S|
|         12|       1|     1|Bonnell, Miss. El...|female|  58|    0|    0|          113783|   26.55| C103|       S|
|         16|       1|     2|Hewlett, Mrs. (Ma...|female|  55|    0|    0|          248706|      16| NULL|       S|
|         18|       1|     2|Williams, Mr. Cha...|  male|NULL|    0|    0|          244373|      13| NULL|       S|
|         20|       1|     3|Masselmani, Mrs. ...|female|NULL|    0|    0|            2649|   7.225| NULL|       C|
|         22|       1|     2|Beesley, Mr. Lawr...|  male|  34|    0|    0|          248698|      13|  D56|       S|
|         23|       1|     3|"McGowan, Miss. A...|female|  15|    0|    0|          330923|  8.0292| NULL|       Q|
|         24|       1|     1|Sloper, Mr. Willi...|  male|  28|    0|    0|          113788|    35.5|   A6|       S|
|         26|       1|     3|Asplund, Mrs. Car...|female|  38|    1|    5|          347077| 31.3875| NULL|       S|
|         29|       1|     3|"O'Dwyer, Miss. E...|female|NULL|    0|    0|          330959|  7.8792| NULL|       Q|
|         32|       1|     1|Spencer, Mrs. Wil...|female|NULL|    1|    0|        PC 17569|146.5208|  B78|       C|
|         33|       1|     3|Glynn, Miss. Mary...|female|NULL|    0|    0|          335677|    7.75| NULL|       Q|
|         37|       1|     3|    Mamee, Mr. Hanna|  male|NULL|    0|    0|            2677|  7.2292| NULL|       C|
|         40|       1|     3|Nicola-Yarred, Mi...|female|  14|    1|    0|            2651| 11.2417| NULL|       C|
|         44|       1|     2|Laroche, Miss. Si...|female|   3|    1|    2|   SC/Paris 2123| 41.5792| NULL|       C|
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+--------+-----+--------+
only showing top 20 rows

+--------+
|count(1)|
+--------+
|     314|
+--------+

+------------------+
|          avg(Age)|
+------------------+
|              NULL|
| 25.14061971830986|
|38.233440860215055|
| 29.87763005780347|
+------------------+
```

Wine Quality Dataset Example

a. How many wines are considered high quality (quality score of 7 or higher)

b. What is the average alcohol content of the wines in the dataset



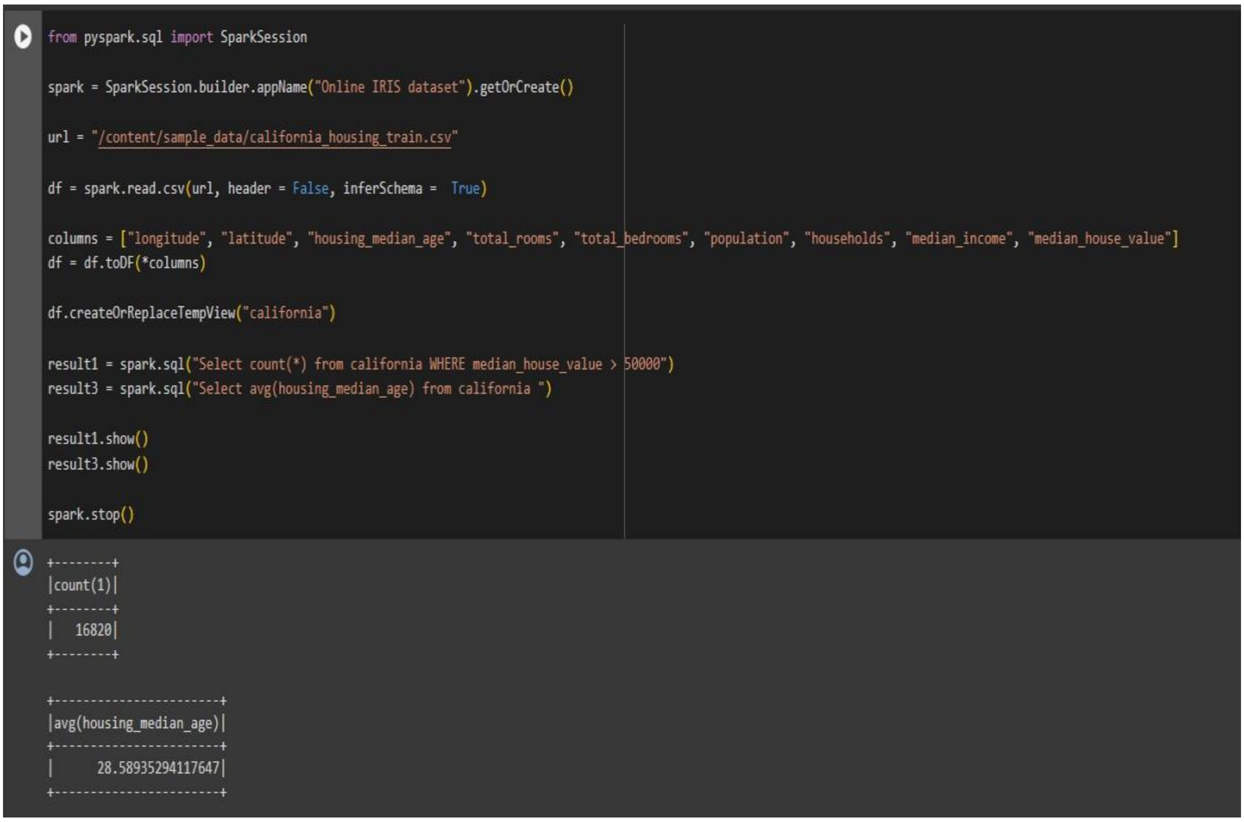
```
from pyspark.sql import SparkSession

spark = SparkSession.builder.appName("Online IRIS dataset").getOrCreate()

url = "/content/sample_data/winequality-red.csv"

df = spark.read.csv(url, header = False, inferSchema =  True)

columns = ["fixed acidity","volatile acidity","citric acid","residual sugar","chlorides","free sulfur dioxide","total sulfur dioxide","density","pH","sulphates","alcohol","quality"]
df = df.toDF(*columns)

df.createOrReplaceTempView("wine")

result1 = spark.sql("Select count(*) from wine  WHERE quality >= 7.0")
result3 = spark.sql("Select avg(alcohol) from wine ")

result1.show()
result3.show()

spark.stop()
```

```
+--------+
|count(1)|
+--------+
|     217|
+--------+

+-----------------+
|     avg(alcohol)|
+-----------------+
|10.422983114446502|
+-----------------+
```

California Housing Dataset Example:

a. How many houses have a median value above $5000,000 in California

b. What is the average age of the houses in the dataset



```
from pyspark.sql import SparkSession

spark = SparkSession.builder.appName("Online IRIS dataset").getOrCreate()

url = "/content/sample_data/california_housing_train.csv"

df = spark.read.csv(url, header = False, inferSchema =  True)

columns = ["longitude", "latitude", "housing_median_age", "total_rooms", "total_bedrooms", "population", "households", "median_income", "median_house_value"]
df = df.toDF(*columns)

df.createOrReplaceTempView("california")

result1 = spark.sql("Select count(*) from california WHERE median_house_value > 50000")
result3 = spark.sql("Select avg(housing_median_age) from california ")

result1.show()
result3.show()

spark.stop()
```

```
+--------+
|count(1)|
+--------+
|   16820|
+--------+

+-----------------------+
|avg(housing_median_age)|
+-----------------------+
|      28.58935294117647|
+-----------------------+
```