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Assignment 5.3

Read data from source to DataFrame in local Spark setup and display DataFrame schema.

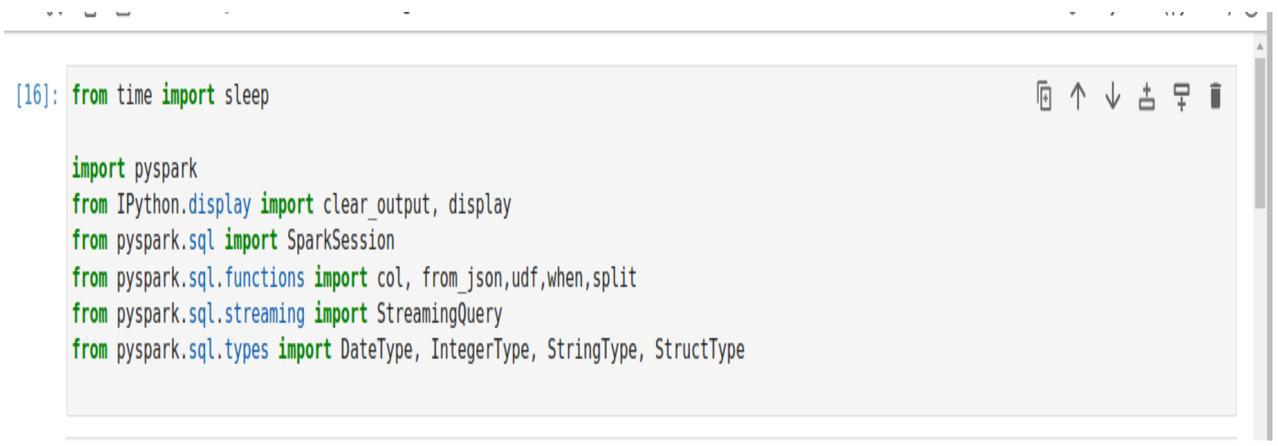
`tasks/5_data_pipelines/day_3_spark/data_assignment`

For numerical columns, calculate minimum, maximum and average values.

For categorical columns, create and apply UDF that will change the last letter of every word to "1".

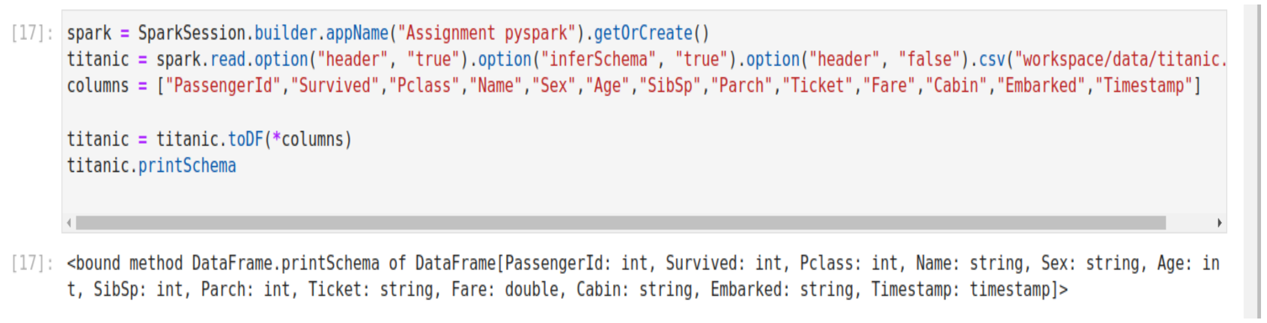
Sort DataFrame by the first column and save the results to the Parquet file.

First, we import these libraries that we are used in this assignment.



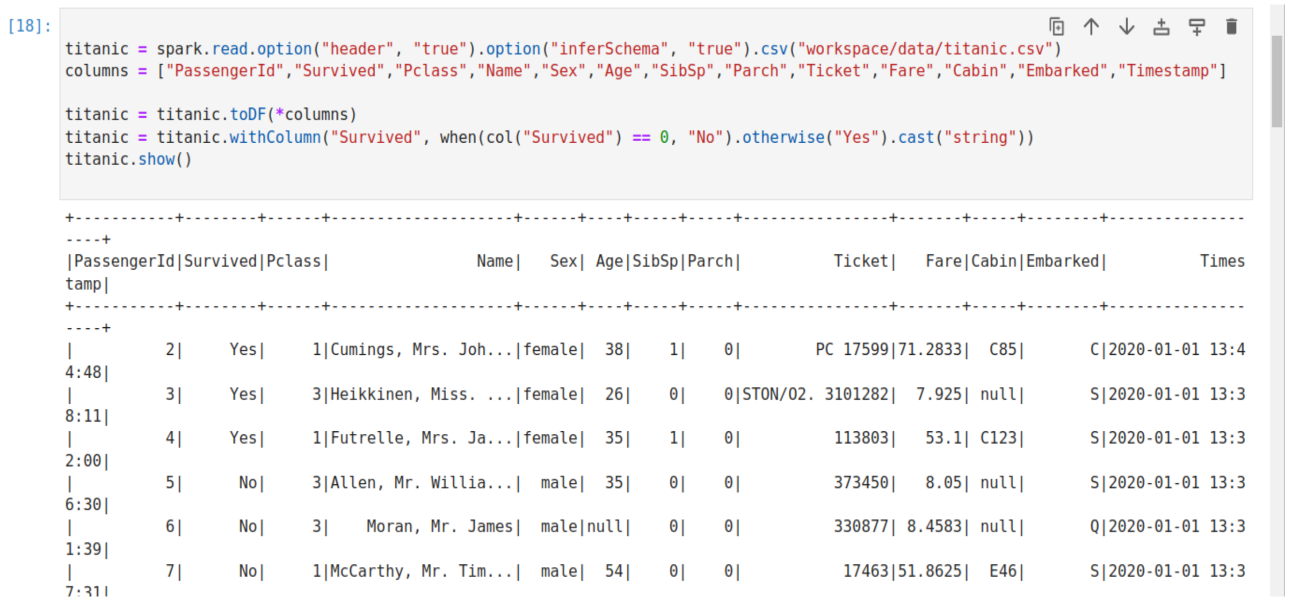
```
[16]: from time import sleep

import pyspark
from IPython.display import clear_output, display
from pyspark.sql import SparkSession
from pyspark.sql.functions import col, from_json,udf,when,split
from pyspark.sql.streaming import StreamingQuery
from pyspark.sql.types import DateType, IntegerType, StringType, StructType
```

Then we import dataset and naming the columns according to dataset.



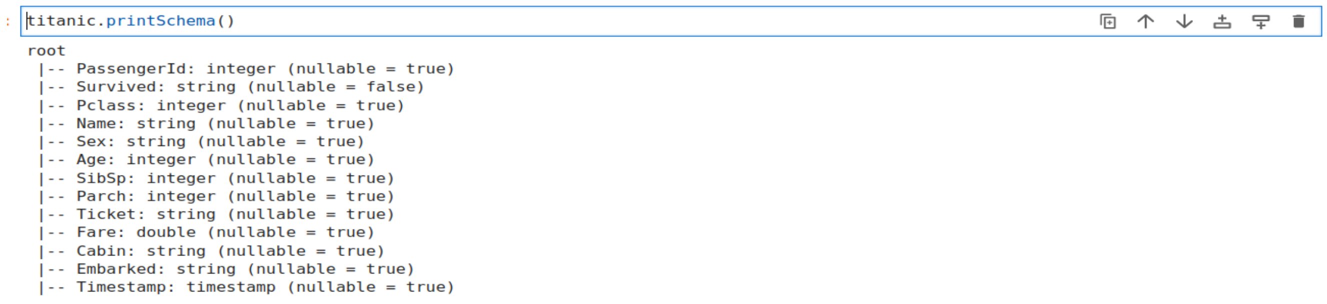
```
[17]: spark = SparkSession.builder.appName("Assignment pyspark").getOrCreate()
      titanic = spark.read.option("header", "true").option("inferSchema", "true").option("header", "false").csv("workspace/data/titanic.
      columns = ["PassengerId","Survived","Pclass","Name","Sex","Age","SibSp","Parch","Ticket","Fare","Cabin","Embarked","Timestamp"]

      titanic = titanic.toDF(*columns)
      titanic.printSchema

[17]: <bound method DataFrame.printSchema of DataFrame[PassengerId: int, Survived: int, Pclass: int, Name: string, Sex: string, Age: in
      t, SibSp: int, Parch: int, Ticket: string, Fare: double, Cabin: string, Embarked: string, Timestamp: timestamp]>
```

Then we modifying the schema and changing the data type of survived to string and converting the binary values into string so that we can categorize it.

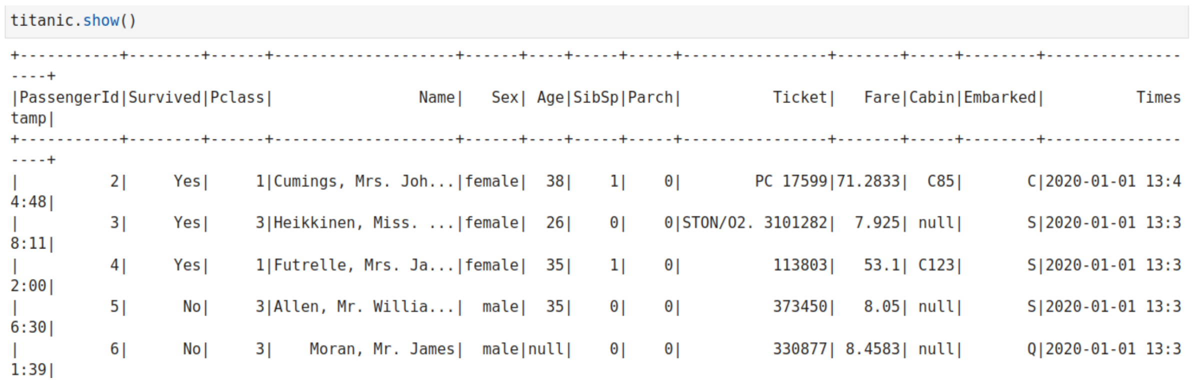


```
[18]: titanic = spark.read.option("header", "true").option("inferSchema", "true").csv("workspace/data/titanic.csv")
      columns = ["PassengerId","Survived","Pclass","Name","Sex","Age","SibSp","Parch","Ticket","Fare","Cabin","Embarked","Timestamp"]

      titanic = titanic.toDF(*columns)
      titanic = titanic.withColumn("Survived", when(col("Survived") == 0, "No").otherwise("Yes").cast("string"))
      titanic.show()

      +-----------+--------+------+--------------------+------+----+-----+-----+----------------+-------+-----+--------+---------------
      ----+
      |PassengerId|Survived|Pclass|                Name|   Sex| Age|SibSp|Parch|          Ticket|   Fare|Cabin|Embarked|          Times
      tamp|
      +-----------+--------+------+--------------------+------+----+-----+-----+----------------+-------+-----+--------+---------------
      ----+
      |          2|     Yes|     1|Cumings, Mrs. Joh...|female|  38|    1|    0|        PC 17599|71.2833|  C85|       C|2020-01-01 13:4
      4:48|
      |          3|     Yes|     3|Heikkinen, Miss. ...|female|  26|    0|    0|STON/O2. 3101282|  7.925| null|       S|2020-01-01 13:3
      8:11|
      |          4|     Yes|     1|Futrelle, Mrs. Ja...|female|  35|    1|    0|          113803|   53.1| C123|       S|2020-01-01 13:3
      2:00|
      |          5|      No|     3|Allen, Mr. Willia...|  male|  35|    0|    0|          373450|   8.05| null|       S|2020-01-01 13:3
      6:30|
      |          6|      No|     3|    Moran, Mr. James|  male|null|    0|    0|          330877| 8.4583| null|       Q|2020-01-01 13:3
      1:39|
      |          7|      No|     1|McCarthy, Mr. Tim...|  male|  54|    0|    0|           17463|51.8625|  E46|       S|2020-01-01 13:3
      7:31|
```

This is our updated schema



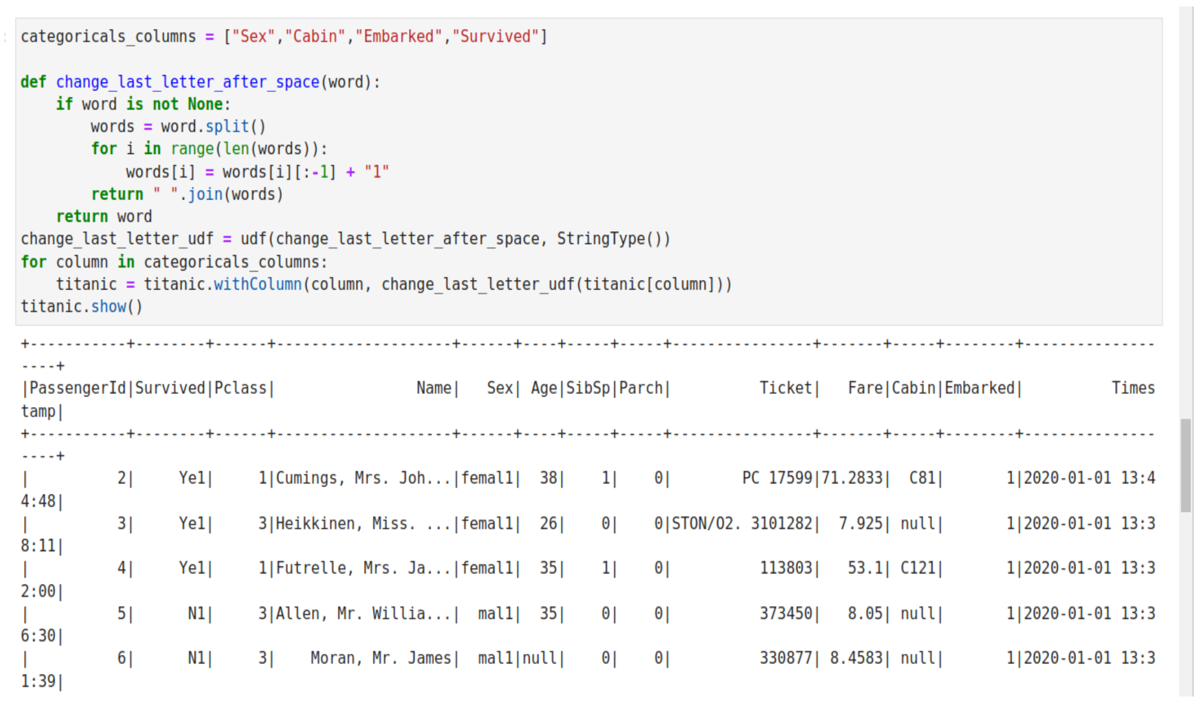
```
titanic.printSchema()

root
 |-- PassengerId: integer (nullable = true)
 |-- Survived: string (nullable = false)
 |-- Pclass: integer (nullable = true)
 |-- Name: string (nullable = true)
 |-- Sex: string (nullable = true)
 |-- Age: integer (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)
 |-- Timestamp: timestamp (nullable = true)
```



```
titanic.show()
```

```
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+-------+-----+--------+---------------
----+
|PassengerId|Survived|Pclass|                Name|   Sex| Age|SibSp|Parch|          Ticket|   Fare|Cabin|Embarked|          Times
tamp|
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+-------+-----+--------+---------------
----+
|          2|     Yes|     1|Cumings, Mrs. Joh...|female|  38|    1|    0|        PC 17599|71.2833|  C85|       C|2020-01-01 13:4
4:48|
|          3|     Yes|     3|Heikkinen, Miss. ...|female|  26|    0|    0|STON/O2. 3101282|  7.925| null|       S|2020-01-01 13:3
8:11|
|          4|     Yes|     1|Futrelle, Mrs. Ja...|female|  35|    1|    0|          113803|   53.1| C123|       S|2020-01-01 13:3
2:00|
|          5|      No|     3|Allen, Mr. Willia...|  male|  35|    0|    0|          373450|   8.05| null|       S|2020-01-01 13:3
6:30|
|          6|      No|     3|    Moran, Mr. James|  male|null|    0|    0|          330877| 8.4583| null|       Q|2020-01-01 13:3
1:39|
```

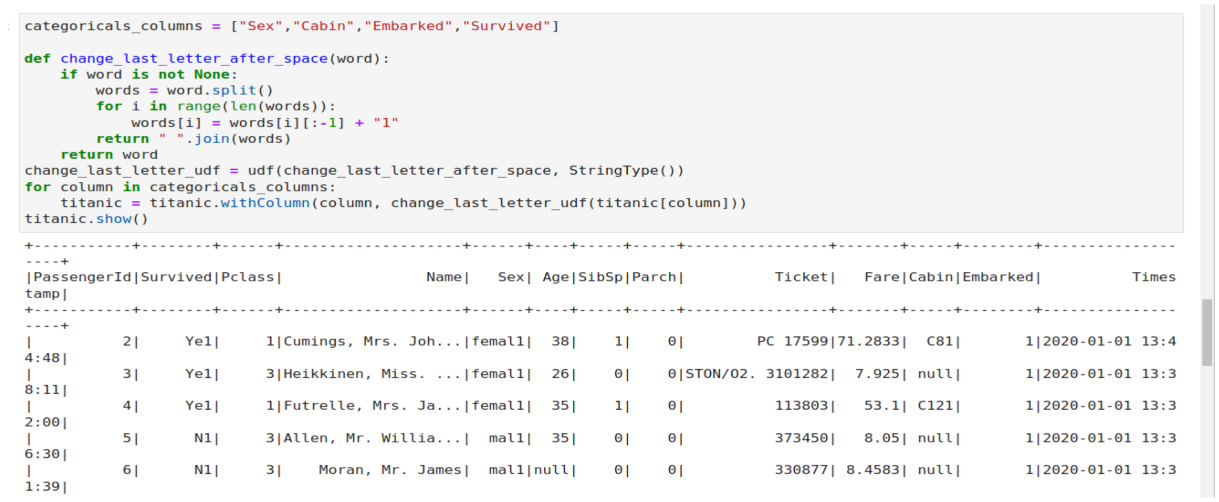
Then we are checking the minimum, maximum and average value of the numerical data



```
categoricals_columns = ["Sex","Cabin","Embarked","Survived"]

def change_last_letter_after_space(word):
    if word is not None:
        words = word.split()
        for i in range(len(words)):
            words[i] = words[i][:-1] + "1"
        return " ".join(words)
    return word
change_last_letter_udf = udf(change_last_letter_after_space, StringType())
for column in categoricals_columns:
    titanic = titanic.withColumn(column, change_last_letter_udf(titanic[column]))
titanic.show()
```

```
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+-------+-----+--------+---------------
----+
|PassengerId|Survived|Pclass|                Name|   Sex| Age|SibSp|Parch|          Ticket|   Fare|Cabin|Embarked|          Times
tamp|
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+-------+-----+--------+---------------
----+
|          2|     Ye1|     1|Cumings, Mrs. Joh...|femal1|  38|    1|    0|        PC 17599|71.2833|  C81|       1|2020-01-01 13:4
4:48|
|          3|     Ye1|     3|Heikkinen, Miss. ...|femal1|  26|    0|    0|STON/O2. 3101282|  7.925| null|       1|2020-01-01 13:3
8:11|
|          4|     Ye1|     1|Futrelle, Mrs. Ja...|femal1|  35|    1|    0|          113803|   53.1| C121|       1|2020-01-01 13:3
2:00|
|          5|      N1|     3|Allen, Mr. Willia...|  mal1|  35|    0|    0|          373450|   8.05| null|       1|2020-01-01 13:3
6:30|
|          6|      N1|     3|    Moran, Mr. James|  mal1|null|    0|    0|          330877| 8.4583| null|       1|2020-01-01 13:3
1:39|
```

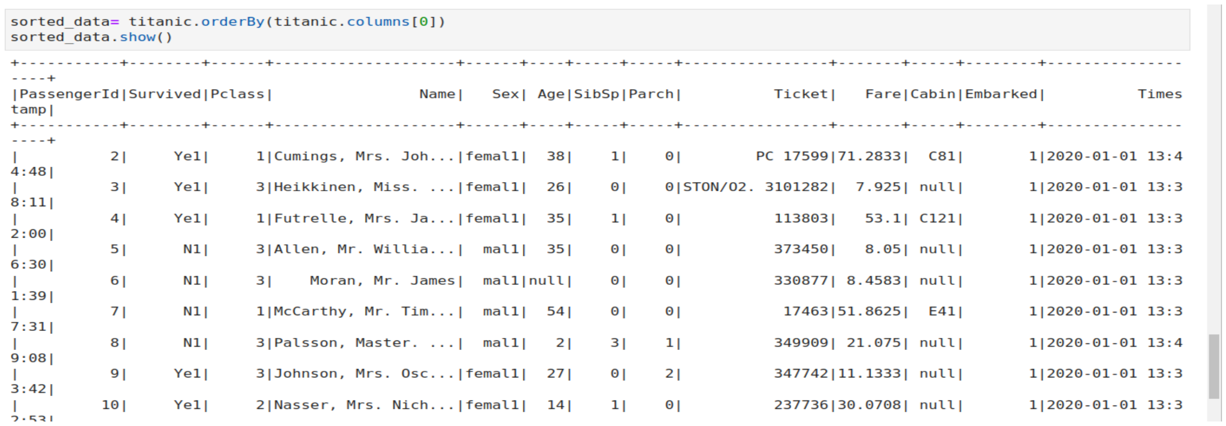
Then we apply udf function to change the last letter of categorical data to 1 and here is the result.



```
categoricals_columns = ["Sex","Cabin","Embarked","Survived"]

def change_last_letter_after_space(word):
    if word is not None:
        words = word.split()
        for i in range(len(words)):
            words[i] = words[i][:-1] + "1"
        return " ".join(words)
    return word
change_last_letter_udf = udf(change_last_letter_after_space, StringType())
for column in categoricals_columns:
    titanic = titanic.withColumn(column, change_last_letter_udf(titanic[column]))
titanic.show()
```

```
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+-------+-----+--------+---------------
----+
|PassengerId|Survived|Pclass|                Name|   Sex| Age|SibSp|Parch|          Ticket|   Fare|Cabin|Embarked|          Times
tamp|
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+-------+-----+--------+---------------
----+
|          2|     Ye1|     1|Cumings, Mrs. Joh...|femal1|  38|    1|    0|        PC 17599|71.2833|  C81|       1|2020-01-01 13:4
4:48|
|          3|     Ye1|     3|Heikkinen, Miss. ...|femal1|  26|    0|    0|STON/O2. 3101282|  7.925| null|       1|2020-01-01 13:3
8:11|
|          4|     Ye1|     1|Futrelle, Mrs. Ja...|femal1|  35|    1|    0|          113803|   53.1| C121|       1|2020-01-01 13:3
2:00|
|          5|      N1|     3|Allen, Mr. Willia...|  mal1|  35|    0|    0|          373450|   8.05| null|       1|2020-01-01 13:3
6:30|
|          6|      N1|     3|    Moran, Mr. James|  mal1|null|    0|    0|          330877| 8.4583| null|       1|2020-01-01 13:3
1:39|
```

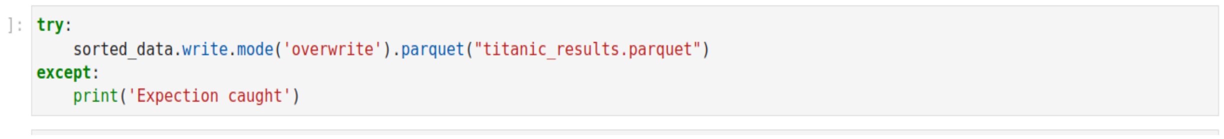
Then we sorting the data by its first column



```
sorted_data= titanic.orderBy(titanic.columns[0])
sorted_data.show()
```

```
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+-------+-----+--------+---------------
----+
|PassengerId|Survived|Pclass|                Name|   Sex| Age|SibSp|Parch|          Ticket|   Fare|Cabin|Embarked|          Times
tamp|
+-----------+--------+------+--------------------+------+----+-----+-----+----------------+-------+-----+--------+---------------
----+
|          2|     Ye1|     1|Cumings, Mrs. Joh...|femal1|  38|    1|    0|        PC 17599|71.2833|  C81|       1|2020-01-01 13:4
4:48|
|          3|     Ye1|     3|Heikkinen, Miss. ...|femal1|  26|    0|    0|STON/O2. 3101282|  7.925| null|       1|2020-01-01 13:3
8:11|
|          4|     Ye1|     1|Futrelle, Mrs. Ja...|femal1|  35|    1|    0|          113803|   53.1| C121|       1|2020-01-01 13:3
2:00|
|          5|      N1|     3|Allen, Mr. Willia...|  mal1|  35|    0|    0|          373450|   8.05| null|       1|2020-01-01 13:3
6:30|
|          6|      N1|     3|    Moran, Mr. James|  mal1|null|    0|    0|          330877| 8.4583| null|       1|2020-01-01 13:3
1:39|
|          7|      N1|     1|McCarthy, Mr. Tim...|  mal1|  54|    0|    0|           17463|51.8625|  E41|       1|2020-01-01 13:3
7:31|
|          8|      N1|     3|Palsson, Master. ...|  mal1|   2|    3|    1|          349909| 21.075| null|       1|2020-01-01 13:4
9:08|
|          9|     Ye1|     3|Johnson, Mrs. Osc...|femal1|  27|    0|    2|          347742|11.1333| null|       1|2020-01-01 13:3
3:42|
|         10|     Ye1|     2|Nasser, Mrs. Nich...|femal1|  14|    1|    0|          237736|30.0708| null|       1|2020-01-01 13:3
2:53|
```

Then we saving the resultant dataset in parquet.



```
]: try:
       sorted_data.write.mode('overwrite').parquet("titanic_results.parquet")
   except:
       print('Expection caught')
```