Coding Assesment:

1. Implement Processing JSON and CSV data with PySpark

Syntax

Importing the csv files by using below commands

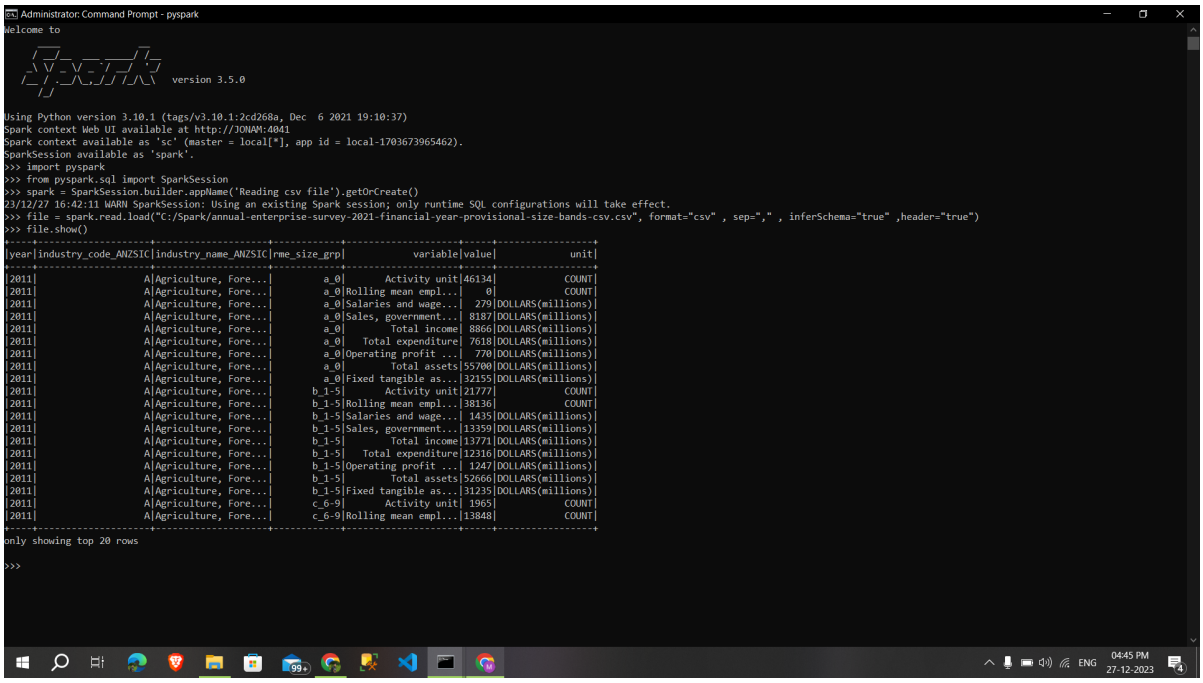
import pyspark

from pyspark.sql import SparkSession

spark = SparkSession.builder.appName('Reading csv file').getOrCreate()

file=spark.read.load("path.csv", format="csv"") (using the **absolute file path to avoid error**)

file.show() - to show the **top 20 rows** of csv files.



Using **withColumnRenamed():**

Used to change the column name

Syntax:

file = file.withColumnRenamed("rme_size_grp","Grp_size")

file.show()

```
Administrator: Command Prompt - pyspark
|2011|                    A|Agriculture, Fore...|       c_6-9|       Activity unit| 1965|           COUNT|
|2011|                    A|Agriculture, Fore...|       c_6-9|Rolling mean empl...|13848|           COUNT|
+----+--------------------+--------------------+------------+--------------------+-----+----------------+
only showing top 20 rows

>>> file = file.withColumnRename("rme_size_grp","Grp_size")
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
  File "C:\Spark\spark-3.5.0-bin-hadoop3\python\pyspark\sql\dataframe.py", line 3123, in __getattr__
    raise AttributeError(
AttributeError: 'DataFrame' object has no attribute 'withColumnRename'. Did you mean: 'withColumnRenamed'?
>>> file = file.withColumnRenamed("rme_size_grp","Grp_size")
>>> file.show()
+----+--------------------+--------------------+--------+--------------------+-----+----------------+
|year|industry_code_ANZSIC|industry_name_ANZSIC|Grp_size|            variable|value|            unit|
+----+--------------------+--------------------+--------+--------------------+-----+----------------+
|2011|                    A|Agriculture, Fore...|     a_0|       Activity unit|46134|           COUNT|
|2011|                    A|Agriculture, Fore...|     a_0|Rolling mean empl...|    0|           COUNT|
|2011|                    A|Agriculture, Fore...|     a_0|Salaries and wage...|  279|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|     a_0|Sales, government...| 8187|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|     a_0|        Total income| 8866|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|     a_0|   Total expenditure| 7618|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|     a_0|Operating profit ...|  770|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|     a_0|        Total assets|55700|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|     a_0|Fixed tangible as...|32155|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|   b_1-5|       Activity unit|21777|           COUNT|
|2011|                    A|Agriculture, Fore...|   b_1-5|Rolling mean empl...|38136|           COUNT|
|2011|                    A|Agriculture, Fore...|   b_1-5|Salaries and wage...| 1435|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|   b_1-5|Sales, government...|13359|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|   b_1-5|        Total income|13771|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|   b_1-5|   Total expenditure|12316|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|   b_1-5|Operating profit ...| 1247|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|   b_1-5|        Total assets|52666|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|   b_1-5|Fixed tangible as...|31235|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|   c_6-9|       Activity unit| 1965|           COUNT|
|2011|                    A|Agriculture, Fore...|   c_6-9|Rolling mean empl...|13848|           COUNT|
+----+--------------------+--------------------+--------+--------------------+-----+----------------+
only showing top 20 rows

>>>
```

Using **select -**Selecting the particular column

Syntax:

file = file.select('year','Grp_size','unit')

file.show()

```
Administrator: Command Prompt - pyspark
|2011|                    A|Agriculture, Fore...|   b_1-5|Operating profit ...| 1247|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|   b_1-5|        Total assets|52666|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|   b_1-5|Fixed tangible as...|31235|DOLLARS(millions)|
|2011|                    A|Agriculture, Fore...|   c_6-9|       Activity unit| 1965|           COUNT|
|2011|                    A|Agriculture, Fore...|   c_6-9|Rolling mean empl...|13848|           COUNT|
+----+--------------------+--------------------+--------+--------------------+-----+----------------+
only showing top 20 rows

>>> file = file.select('year','Grp_size','unit')
>>> file.show()
+----+--------+----------------+
|year|Grp_size|            unit|
+----+--------+----------------+
|2011|     a_0|           COUNT|
|2011|     a_0|           COUNT|
|2011|     a_0|DOLLARS(millions)|
|2011|     a_0|DOLLARS(millions)|
|2011|     a_0|DOLLARS(millions)|
|2011|     a_0|DOLLARS(millions)|
|2011|     a_0|DOLLARS(millions)|
|2011|     a_0|DOLLARS(millions)|
|2011|     a_0|DOLLARS(millions)|
|2011|   b_1-5|           COUNT|
|2011|   b_1-5|           COUNT|
|2011|   b_1-5|DOLLARS(millions)|
|2011|   b_1-5|DOLLARS(millions)|
|2011|   b_1-5|DOLLARS(millions)|
|2011|   b_1-5|DOLLARS(millions)|
|2011|   b_1-5|DOLLARS(millions)|
|2011|   b_1-5|DOLLARS(millions)|
|2011|   b_1-5|DOLLARS(millions)|
|2011|   c_6-9|           COUNT|
|2011|   c_6-9|           COUNT|
+----+--------+----------------+
only showing top 20 rows

>>>
```

2.Explain ETL (Extract, Transform, Load) with PySpark

PySpark for **ETL**:

ETL (Extract, Transform, Load) is a common data processing pattern used in the field of data engineering and analytics. PySpark, being a powerful distributed data processing library, is well-suited for ETL tasks

- Performance
- Ease of Use
- Scalability
- Rich Ecosystem

The PySpark ETL **Workflow:**

Extract: Retrieve data from various sources like databases, files, or APIs.

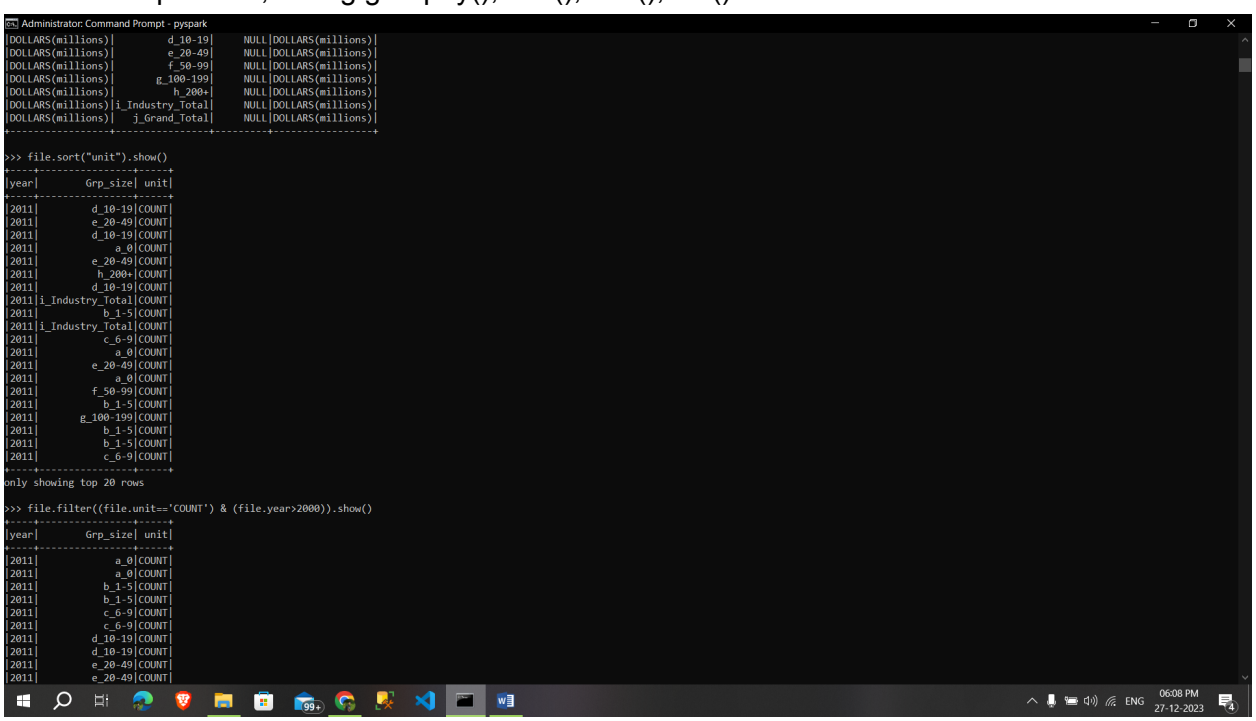
- Initialize a Spark session.
- Define the external source and target paths.
- Extract: Read data from an CSV file

  df = spark.read.csv(source_path, header=True,schema = ‘column names’).

Transform: Clean, aggregate, and manipulate data to fit your analysis needs.

- Using concat(),filter(),adding a column,group by ,avg(),orderby(),floor()
- map(),sortby(),union(),intersection()
- coalesc(),zip(),subtract(),partitionby()

Some examples are, -using groupby(),filter(),max(),min()



Load: Store the transformed data into a database or data warehouse for analysis.

- Save the transformed data to an CSV file

  df.write.csv(target_path, mode=”overwrite”, header=True)

4.Using Spark SQL - Transformations such as Filter, Join, Simple Aggregations, GroupBy.

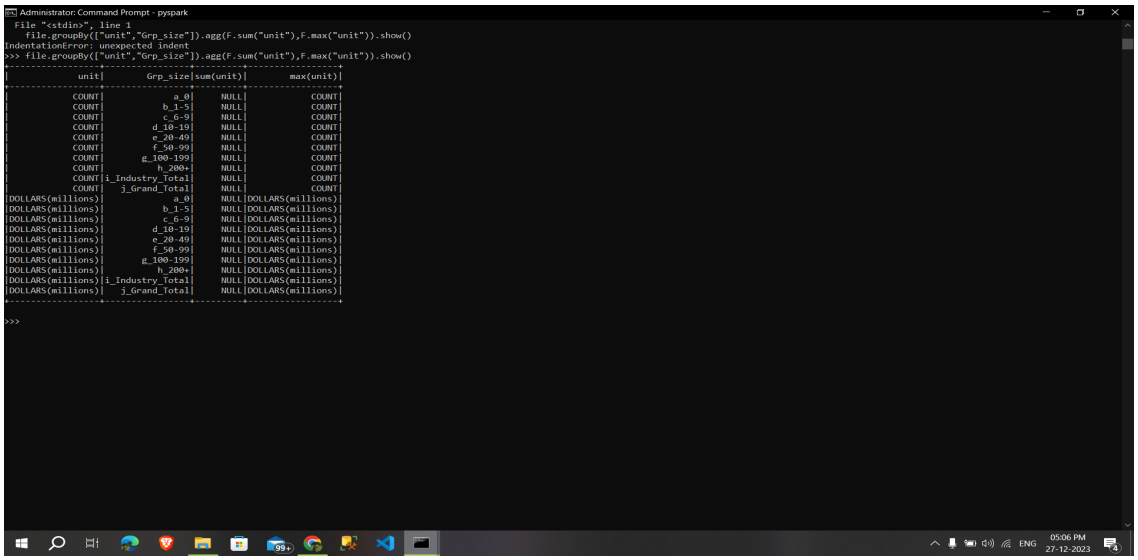
Group by()

To group data in a DataFrame based on one or more columns, and then perform aggregate functions on each group.

Syntax :

from pyspark.sql import functions as F

file.groupBy(["unit","Grp_size"]).agg(F.sum("unit"),F.max("unit")).show()

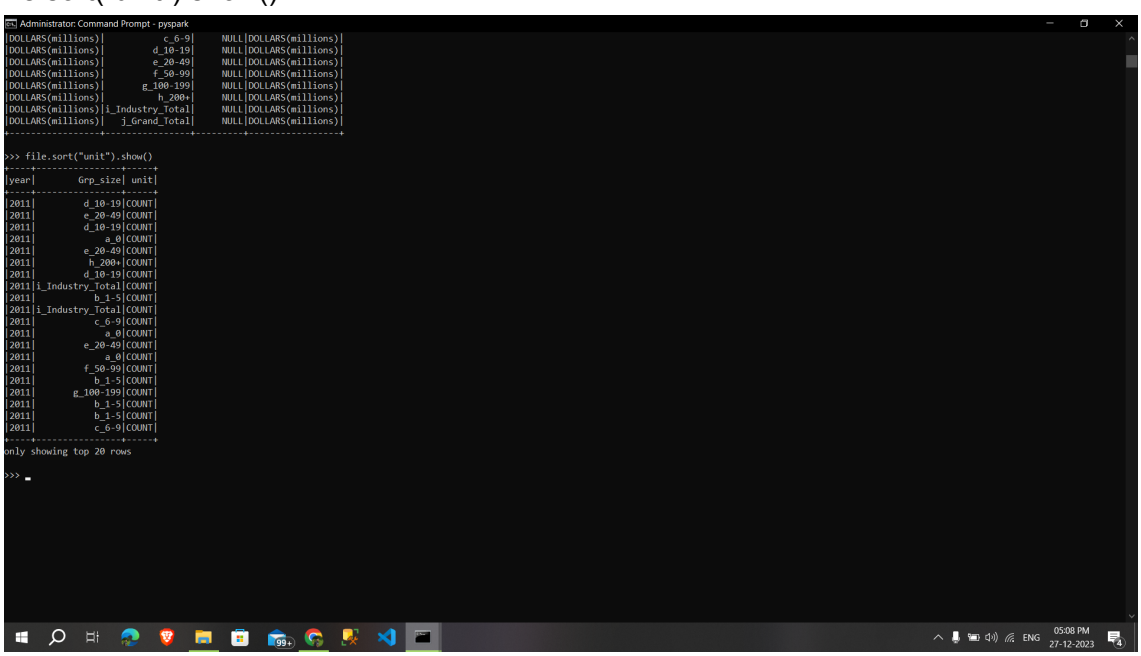


Sorting()

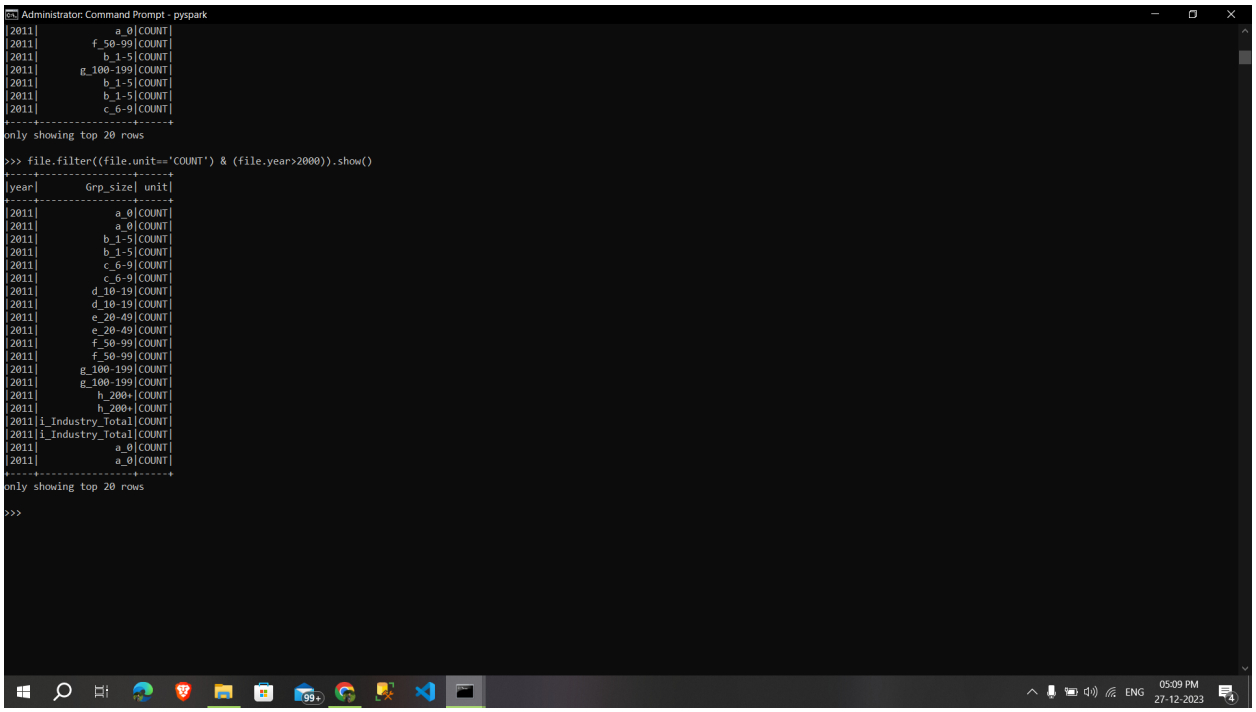
To sort the rows in a DataFrame based on one or more columns.

syntax:

file.sort("unit").show()



Filter-To filter rows in a DataFrame based on a specified condition.
syntax-file.filter((file.unit=='COUNT') & (file.year>2000)).show()

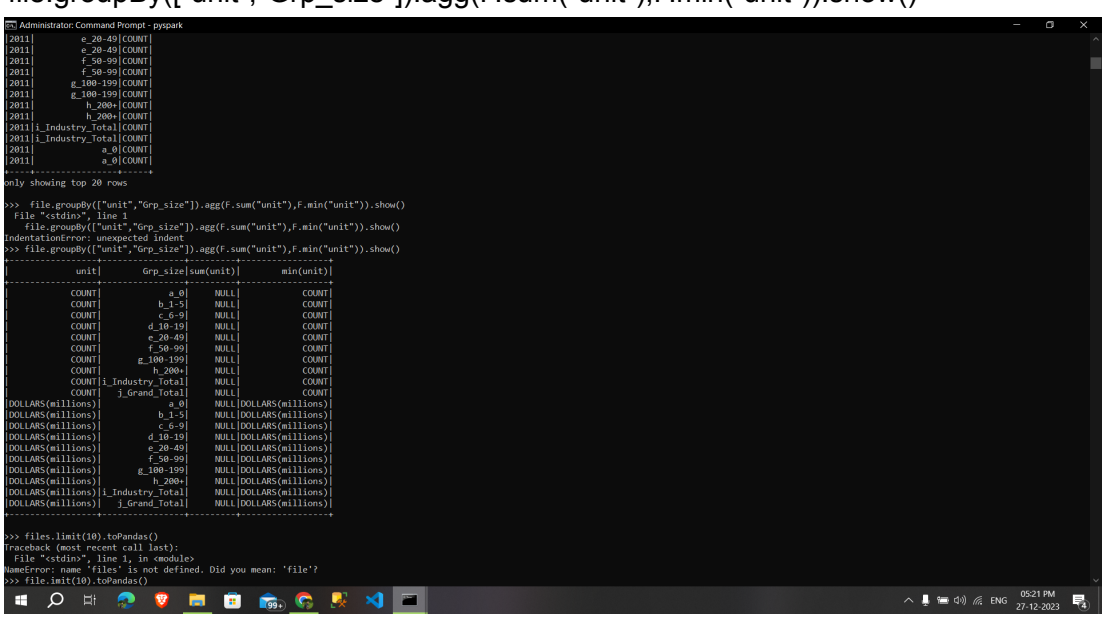


Aggregation

aggregation operations on a DataFrame to summarize or compute statistics on the data. Min,max,count,avg

syntax

file.groupBy(["unit","Grp_size"]).agg(F.sum("unit"),F.min("unit")).show()

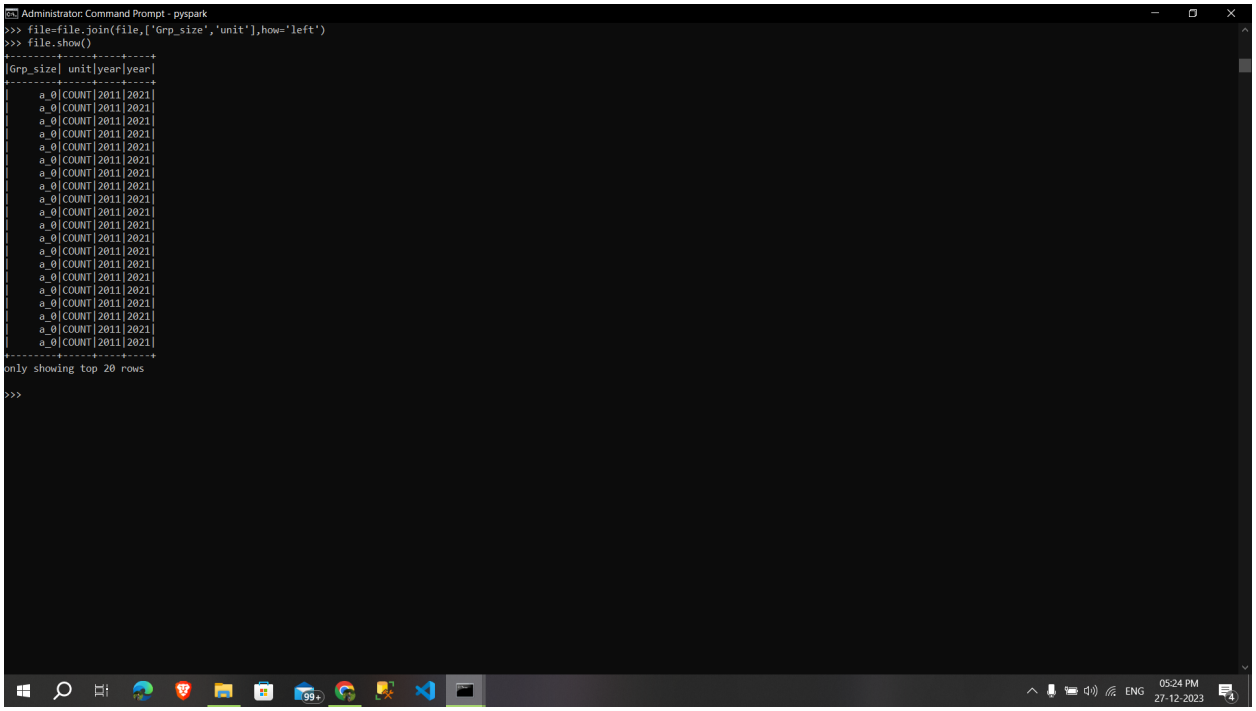


Joins - DataFrames to combine data from different sources based on common columns.

Syntax

file=file.join(file,['Grp_size','unit'],how='left')

file.show()



3.Using Spark SQL - Creating databases, tables

Database:

A database in Spark is a namespace for tables. It helps organize and categorize tables based on their purpose or data domain.

Table:

- In Spark, tables are representations of structured data. They are organized into databases, providing a logical structure for querying and analyzing data.
- Tables can be created from DataFrames, existing RDDs, or external data sources.

Using RDD:

- By using **parallelize()** function
- By using **createDataFrame( )** function:
- By using **read and load** functions:
    1. Read dataset from **.csv file**
    2. Read dataset from **DataBase**
    3. Read dataset from **HDFS**

The PySpark library to create databases and tables. PySpark provides a SQL API that allows you to interact with Spark using SQL-like syntax.

```
from pyspark.sql import SparkSession
# Create a Spark session
spark = SparkSession.builder.appName("SparkPythonExample") .getOrCreate()
# Sample data
data = [("Manoj", 25), ("karan", 30), ("hari", 22)]
# Define schema for the DataFrame
columns = ["name", "age"]
# Create a DataFrame
df = spark.createDataFrame(data, columns)
# Show the DataFrame
df.show()
# Save the DataFrame as a table
table_name = "people"
df.write.saveAsTable(table_name)
# Query the table
result = spark.sql(f"SELECT * FROM {table_name}")
# Show the result
result.show()
```

Explanation:

- We create a Spark session.
- We define some sample data in the form of a list of tuples.
- We create a PySpark DataFrame (df) from the sample data with specified column names.
- We display the DataFrame using df.show().
- We save the DataFrame as a table using df.write.saveAsTable(table_name).
- We execute a SQL query using spark.sql to select all data from the table.
- Finally, we display the result of the SQL query using result.show().