Ex.No.: 6

Import a JASON file from the command line. Apply the following actions with the data present in the JASON file where, projection, aggregation, remove, count, limit, skip and sort

AIM:

To import a JASON file from the command line and apply the following actions with the data present in the JASON file where, projection, aggregation, remove, count, limit, skip and sort.

PROCEDURE:

1. **Required Packages Installation**
   - **Install Pandas**
     Pandas is required for manipulating and analyzing data.
     Installation:
       - pip install pandas
   - **Install HDFS**
     HDFS provides a Python interface to interact with Hadoop Distributed File System (HDFS).
     Installation:
       - pip install hdfs
   - **Optional Packages**
     These packages may help when working with large datasets or different formats:
     - **PyArrow** (for Apache Arrow support):
       - pip install pyarrow
     - **HDFS3** (alternative to HDFS):
       - pip install hdfs3

2. **Create a json file (for example: emp.json) with the following content:**

```
[
   {"name": "Alice", "salary": 60000, "department": "HR"},
   {"name": "Bob", "salary": 55000, "department": "Finance"},
   {"name": "Charlie", "salary": 70000, "department": "IT"},
   {"name": "David", "salary": 45000, "department": "Sales"},
   {"name": "Eve", "salary": 80000, "department": "IT"}
]
```

3. **Copy the json file to the hdfs directory using the command:**

```
$ hdfs dfs copyFromLocal  /path/to/emp.json /home/hadoop
```

Also give the necessary permissions if not already given using the command:

```
$ hdfs dfs -chmod 777 /home/hadoop
```

4. **Python Script: process_data.py**

The following script reads a JSON file from HDFS, processes it using Pandas, and performs several operations such as projection, aggregation, counting, limiting, skipping, and filtering.

```
#process_data.py
from hdfs import InsecureClient
import pandas as pd
import json
```

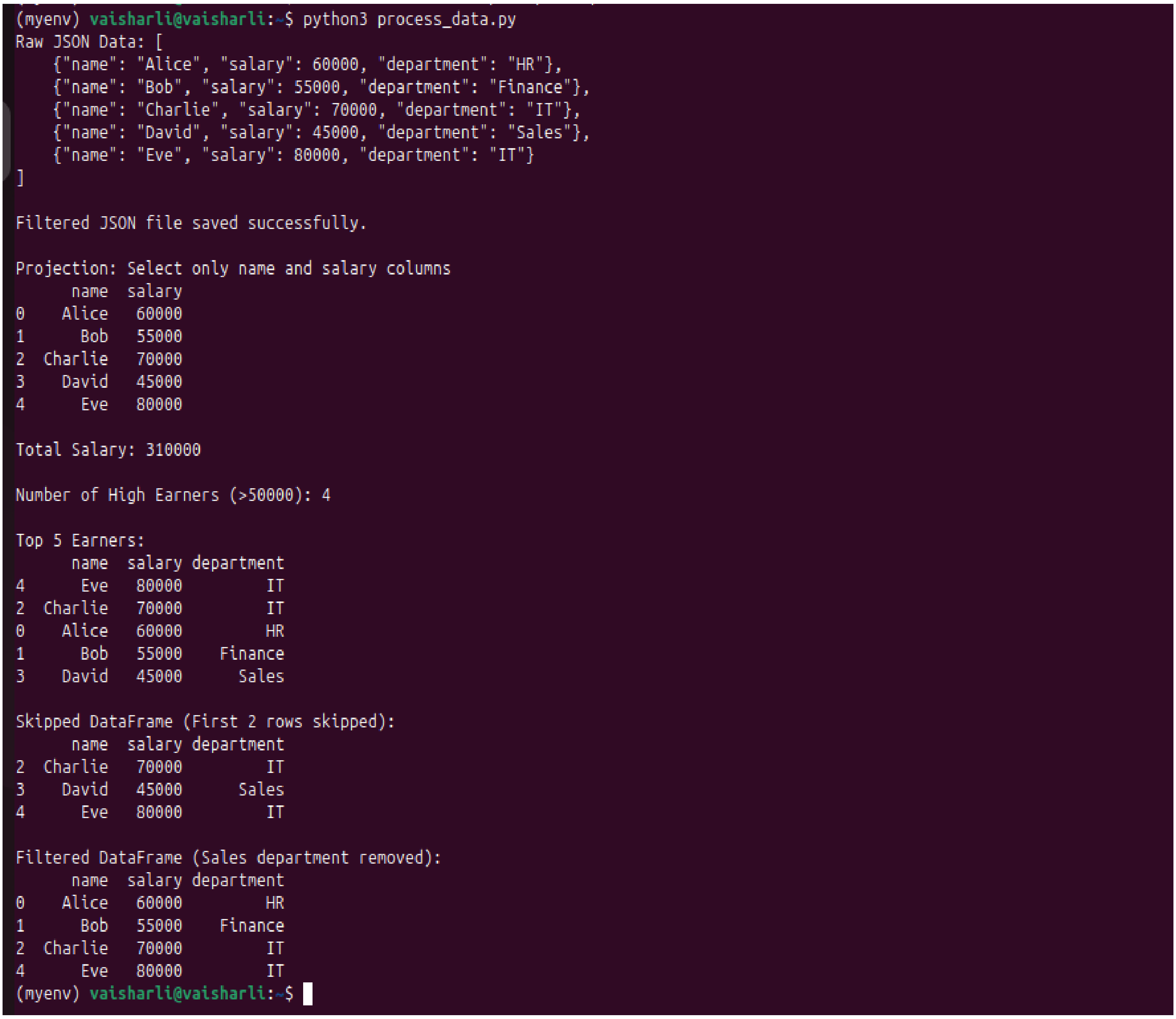
```
# Connect to HDFS
hdfs_client = InsecureClient('http://localhost:9870', user='hdfs')

# Read JSON data from HDFS
try:
    with hdfs_client.read('/home/hadoop/emp.json', encoding='utf-8') as reader:
        json_data = reader.read()  # Read the raw data as a string
        if not json_data.strip():  # Check if data is empty
            raise ValueError("The JSON file is empty.")
        print(f"Raw JSON Data: {json_data[:1000]}")  # Print first 1000 characters for debugging
        data = json.loads(json_data)  # Load the JSON data
except json.JSONDecodeError as e:
    print(f"JSON Decode Error: {e}")
    exit(1)
except Exception as e:
    print(f"Error reading or parsing JSON data: {e}")
    exit(1)

# Convert JSON data to DataFrame
try:
    df = pd.DataFrame(data)
except ValueError as e:
    print(f"Error converting JSON data to DataFrame: {e}")
    exit(1)

# Projection: Select only 'name' and 'salary' columns
projected_df = df[['name', 'salary']]

# Aggregation: Calculate total salary
total_salary = df['salary'].sum()

# Count: Number of employees earning more than 50000
high_earners_count = df[df['salary'] > 50000].shape[0]

# Limit: Get the top 5 highest earners
top_5_earners = df.nlargest(5, 'salary')

# Skip: Skip the first 2 employees
skipped_df = df.iloc[2:]

# Remove: Remove employees from a specific department (e.g., 'Sales')
filtered_df = df[df['department'] != 'IT']

# Save the filtered result back to HDFS
filtered_json = filtered_df.to_json(orient='records')
try:
    with hdfs_client.write('/home/hadoop/filtered_employees.json', encoding='utf-8', overwrite=True) as writer:
        writer.write(filtered_json)
    print("Filtered JSON file saved successfully.")
except Exception as e:
    print(f"Error saving filtered JSON data: {e}")
    exit(1)
# Print results
print(f"Projection: Select only name and salary columns\n{projected_df}")
print(f"Aggregation: Total Salary: {total_salary}")
print(f"Number of High Earners (>50000): {high_earners_count}")
print(f"Top 5 Earners: \n{top_5_earners}")
print(f"Skipped DataFrame (First 2 rows skipped): \n{skipped_df}")
print(f"Filtered DataFrame (IT department removed): \n{filtered_df}")
```

5. Run the Script

Execute the Python script by running the following command in your terminal:

```
python3 process_data.py
```

Output:



```
(myenv) vaisharli@vaisharli:~$ python3 process_data.py
Raw JSON Data: [
    {"name": "Alice", "salary": 60000, "department": "HR"},
    {"name": "Bob", "salary": 55000, "department": "Finance"},
    {"name": "Charlie", "salary": 70000, "department": "IT"},
    {"name": "David", "salary": 45000, "department": "Sales"},
    {"name": "Eve", "salary": 80000, "department": "IT"}
]

Filtered JSON file saved successfully.

Projection: Select only name and salary columns
      name  salary
0    Alice   60000
1      Bob   55000
2  Charlie   70000
3    David   45000
4      Eve   80000

Total Salary: 310000

Number of High Earners (>50000): 4

Top 5 Earners:
      name  salary department
4      Eve   80000         IT
2  Charlie   70000         IT
0    Alice   60000         HR
1      Bob   55000    Finance
3    David   45000      Sales

Skipped DataFrame (First 2 rows skipped):
      name  salary department
2  Charlie   70000         IT
3    David   45000      Sales
4      Eve   80000         IT

Filtered DataFrame (Sales department removed):
      name  salary department
0    Alice   60000         HR
1      Bob   55000    Finance
2  Charlie   70000         IT
4      Eve   80000         IT
(myenv) vaisharli@vaisharli:~$
```

Result:

Thus to import a JASON file from the command line and apply the following actions with the data present in the JASON file where, projection, aggregation, remove, count, limit, skip and sort have been executed and verified successfully.