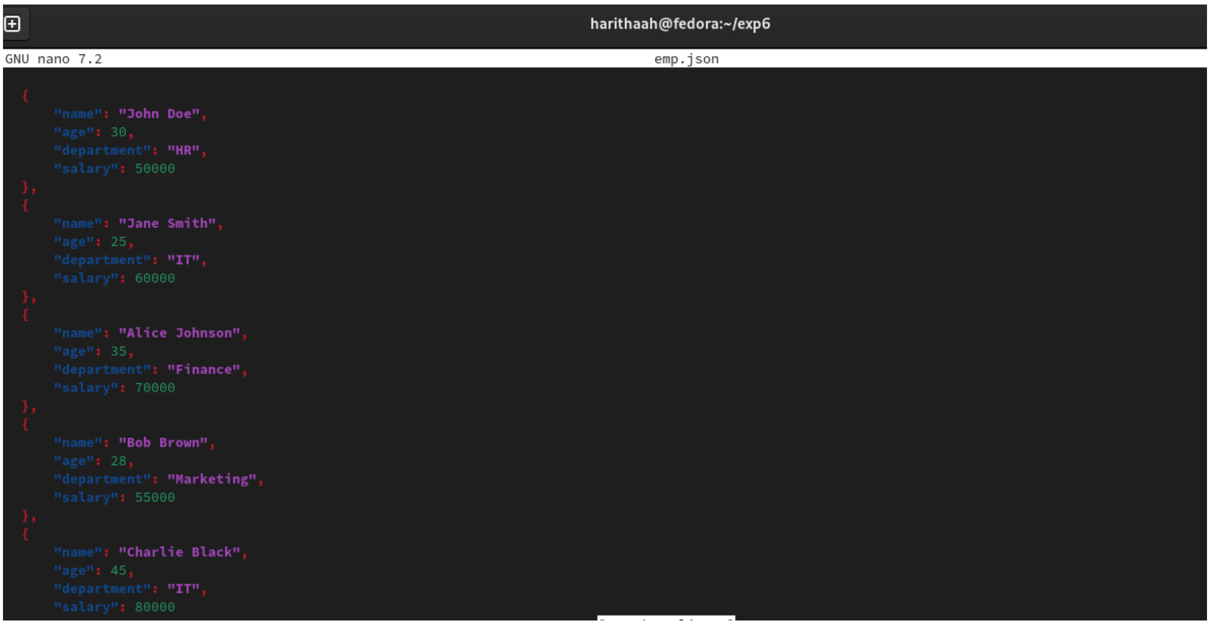
Exp. No : 6

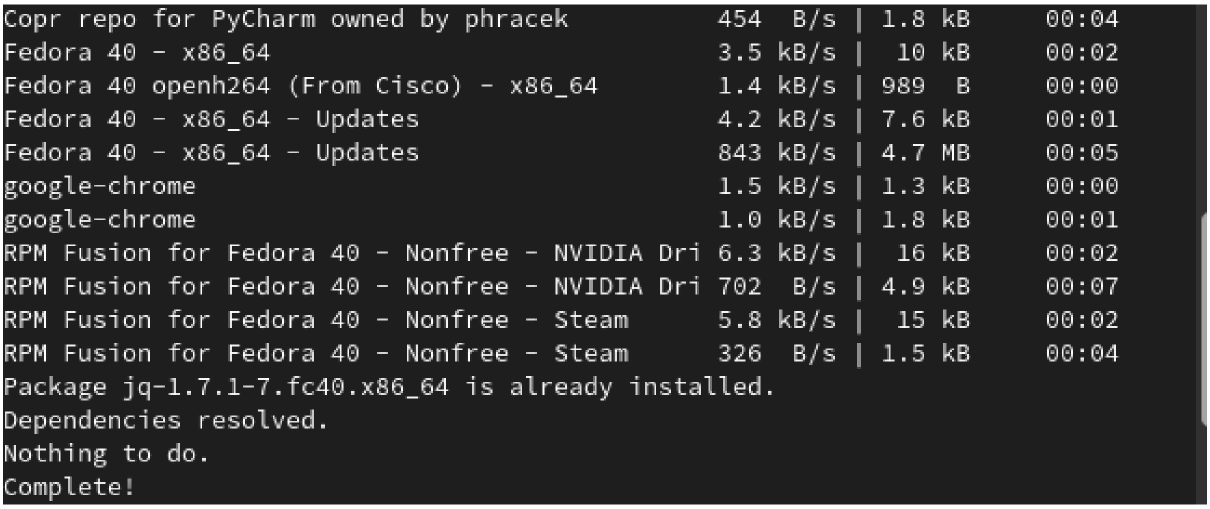
Handling JSON data using HDFS and Python

1. Create emp.json file



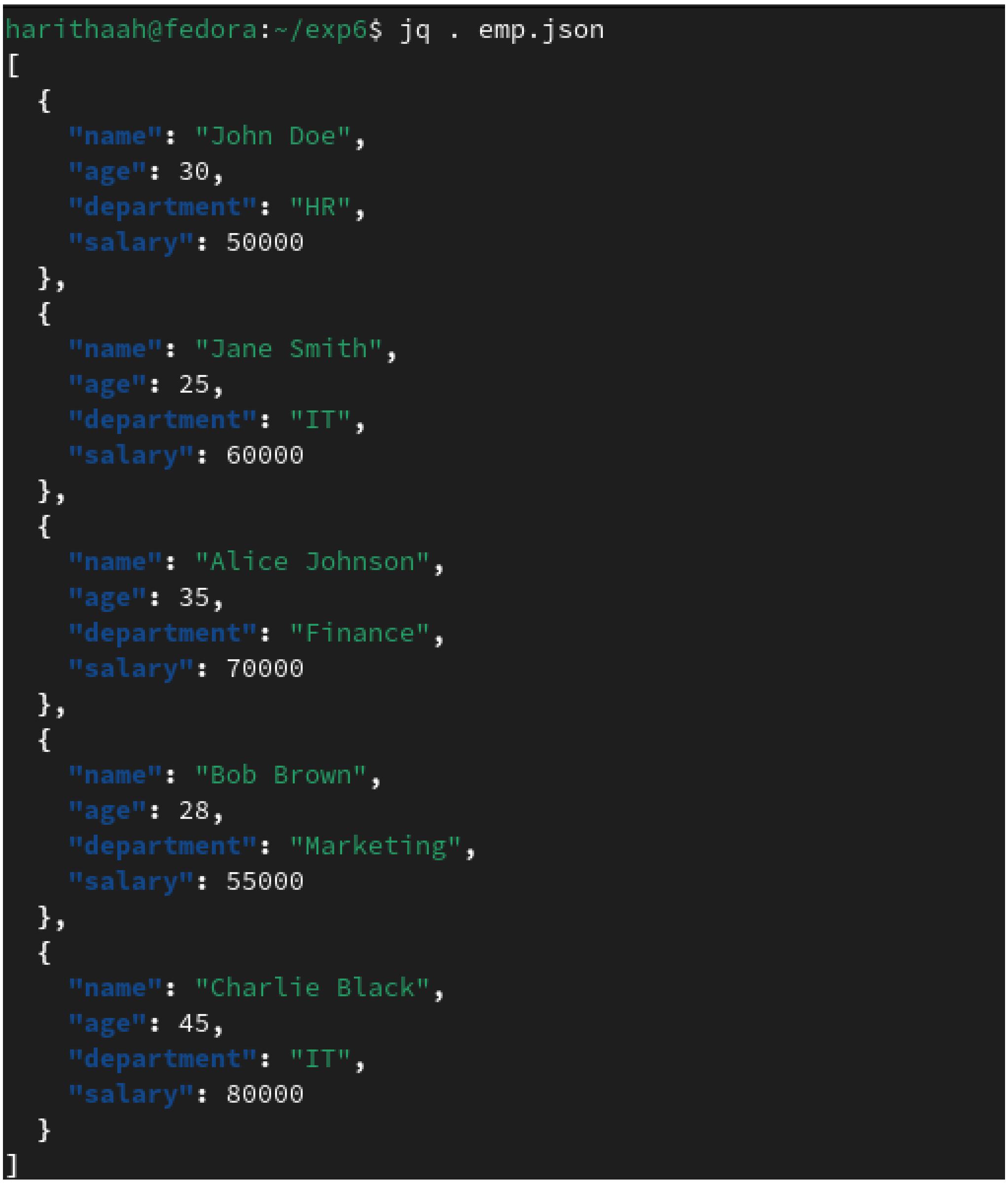
```
GNU nano 7.2                                                                                  emp.json
  {
      "name": "John Doe",
      "age": 30,
      "department": "HR",
      "salary": 50000
  },
  {
      "name": "Jane Smith",
      "age": 25,
      "department": "IT",
      "salary": 60000
  },
  {
      "name": "Alice Johnson",
      "age": 35,
      "department": "Finance",
      "salary": 70000
  },
  {
      "name": "Bob Brown",
      "age": 28,
      "department": "Marketing",
      "salary": 55000
  },
  {
      "name": "Charlie Black",
      "age": 45,
      "department": "IT",
      "salary": 80000
```

2. Install jq package



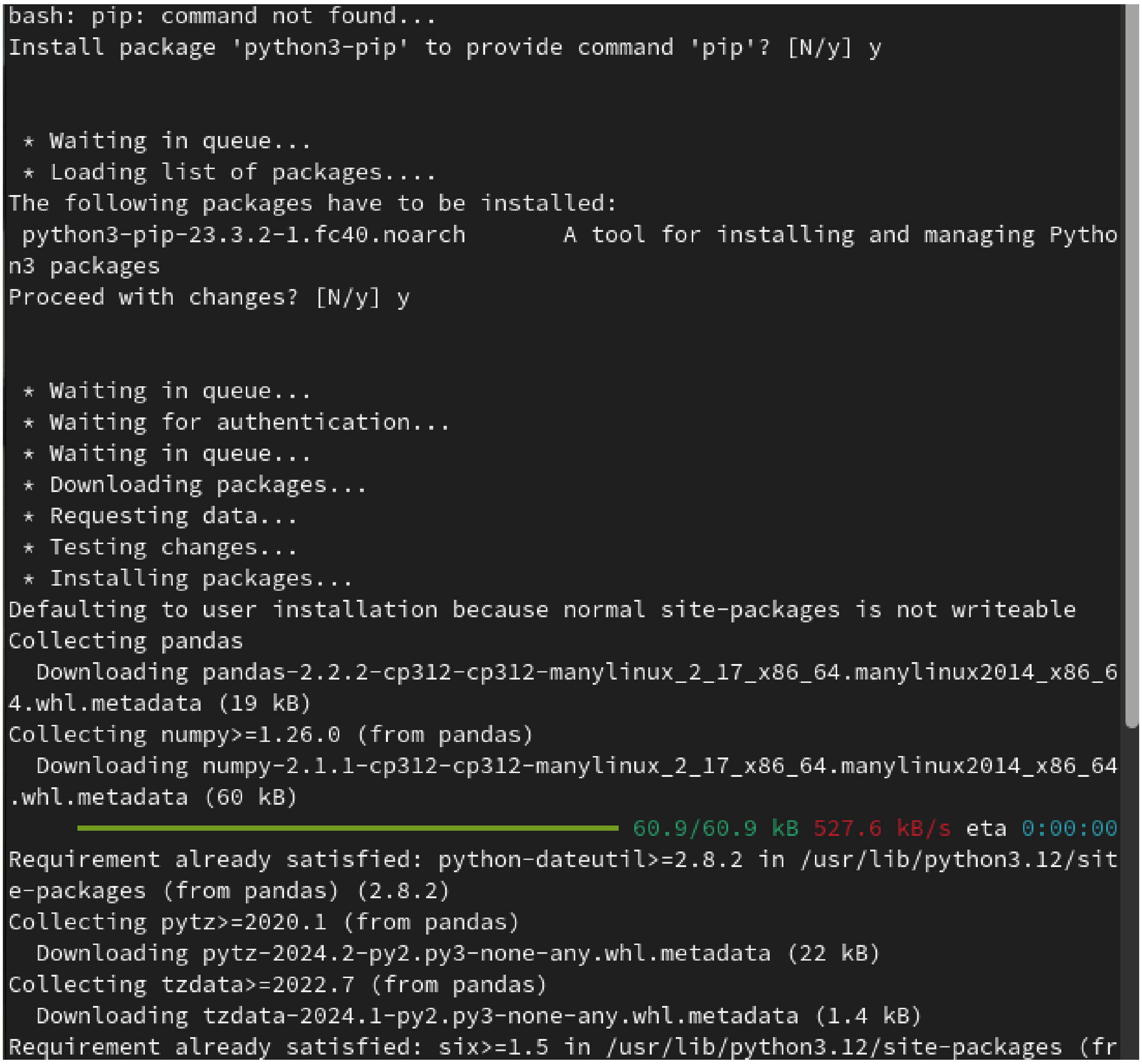
```
Copr repo for PyCharm owned by phracek         454  B/s | 1.8 kB     00:04
Fedora 40 - x86_64                             3.5 kB/s |  10 kB     00:02
Fedora 40 openh264 (From Cisco) - x86_64       1.4 kB/s | 989  B     00:00
Fedora 40 - x86_64 - Updates                   4.2 kB/s | 7.6 kB     00:01
Fedora 40 - x86_64 - Updates                   843 kB/s | 4.7 MB     00:05
google-chrome                                  1.5 kB/s | 1.3 kB     00:00
google-chrome                                  1.0 kB/s | 1.8 kB     00:01
RPM Fusion for Fedora 40 - Nonfree - NVIDIA Dri 6.3 kB/s |  16 kB     00:02
RPM Fusion for Fedora 40 - Nonfree - NVIDIA Dri 702  B/s | 4.9 kB     00:07
RPM Fusion for Fedora 40 - Nonfree - Steam      5.8 kB/s |  15 kB     00:02
RPM Fusion for Fedora 40 - Nonfree - Steam      326  B/s | 1.5 kB     00:04
Package jq-1.7.1-7.fc40.x86_64 is already installed.
Dependencies resolved.
Nothing to do.
Complete!
```

3. Execute jq . emp.json command



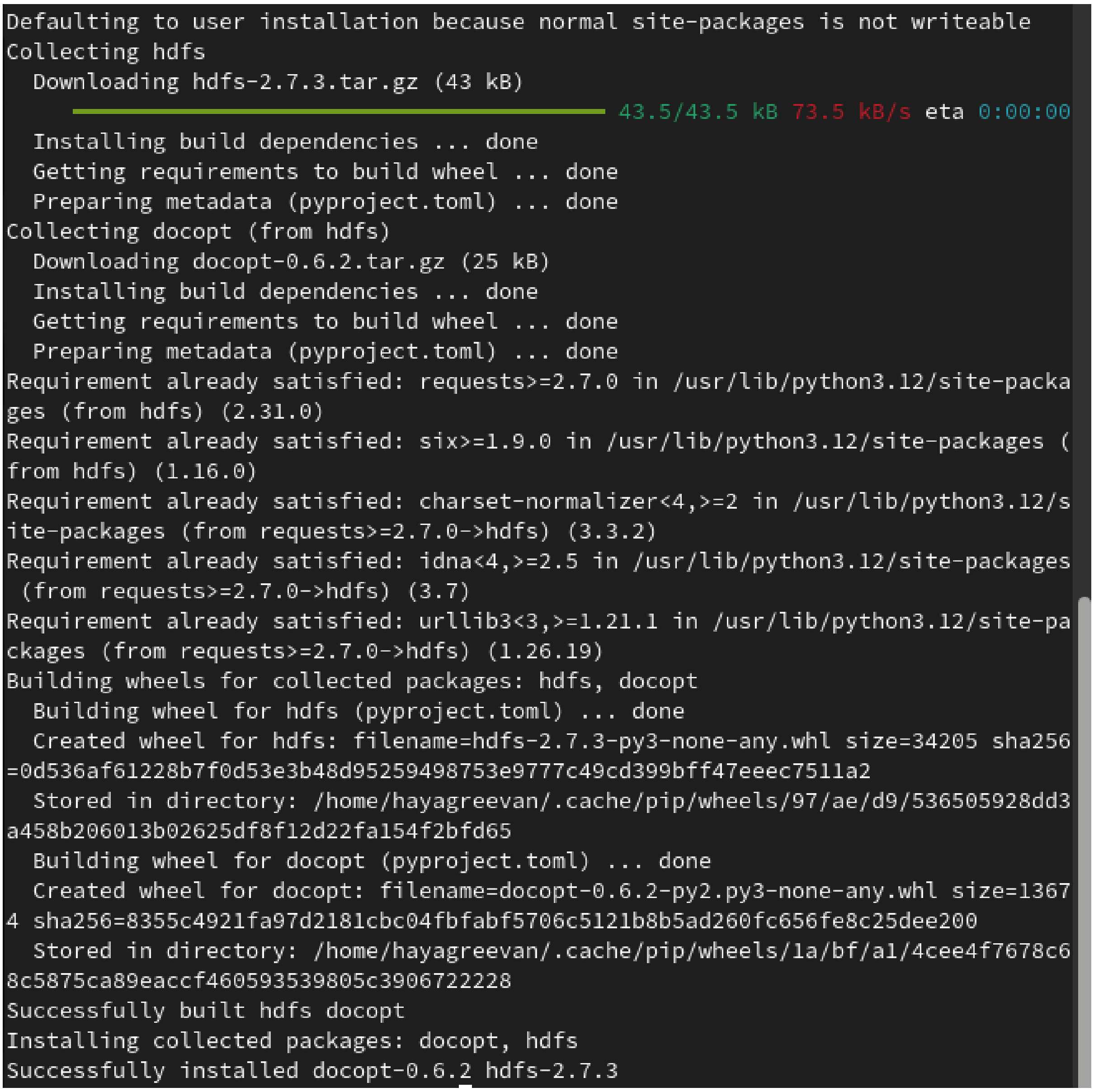
```
harithaah@fedora:~/exp6$ jq . emp.json
[
  {
    "name": "John Doe",
    "age": 30,
    "department": "HR",
    "salary": 50000
  },
  {
    "name": "Jane Smith",
    "age": 25,
    "department": "IT",
    "salary": 60000
  },
  {
    "name": "Alice Johnson",
    "age": 35,
    "department": "Finance",
    "salary": 70000
  },
  {
    "name": "Bob Brown",
    "age": 28,
    "department": "Marketing",
    "salary": 55000
  },
  {
    "name": "Charlie Black",
    "age": 45,
    "department": "IT",
    "salary": 80000
  }
]
```

4. pip install pandas



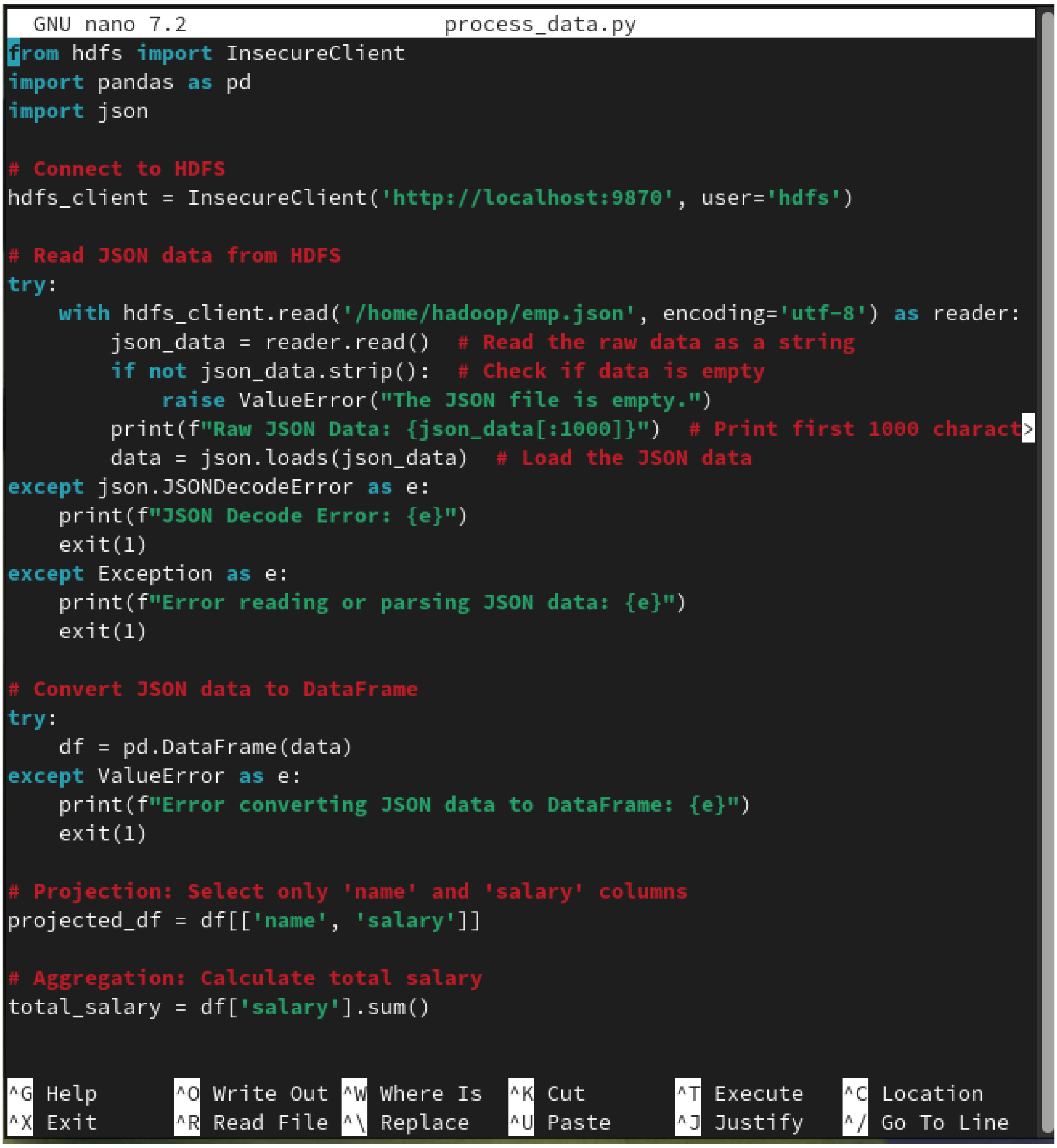
```
bash: pip: command not found...
Install package 'python3-pip' to provide command 'pip'? [N/y] y


 * Waiting in queue...
 * Loading list of packages....
The following packages have to be installed:
 python3-pip-23.3.2-1.fc40.noarch       A tool for installing and managing Pytho
n3 packages
Proceed with changes? [N/y] y


 * Waiting in queue...
 * Waiting for authentication...
 * Waiting in queue...
 * Downloading packages...
 * Requesting data...
 * Testing changes...
 * Installing packages...
Defaulting to user installation because normal site-packages is not writeable
Collecting pandas
  Downloading pandas-2.2.2-cp312-cp312-manylinux_2_17_x86_64.manylinux2014_x86_6
4.whl.metadata (19 kB)
Collecting numpy>=1.26.0 (from pandas)
  Downloading numpy-2.1.1-cp312-cp312-manylinux_2_17_x86_64.manylinux2014_x86_64
.whl.metadata (60 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 60.9/60.9 kB 527.6 kB/s eta 0:00:00
Requirement already satisfied: python-dateutil>=2.8.2 in /usr/lib/python3.12/sit
e-packages (from pandas) (2.8.2)
Collecting pytz>=2020.1 (from pandas)
  Downloading pytz-2024.2-py2.py3-none-any.whl.metadata (22 kB)
Collecting tzdata>=2022.7 (from pandas)
  Downloading tzdata-2024.1-py2.py3-none-any.whl.metadata (1.4 kB)
Requirement already satisfied: six>=1.5 in /usr/lib/python3.12/site-packages (fr
```

5. pip install hdfs

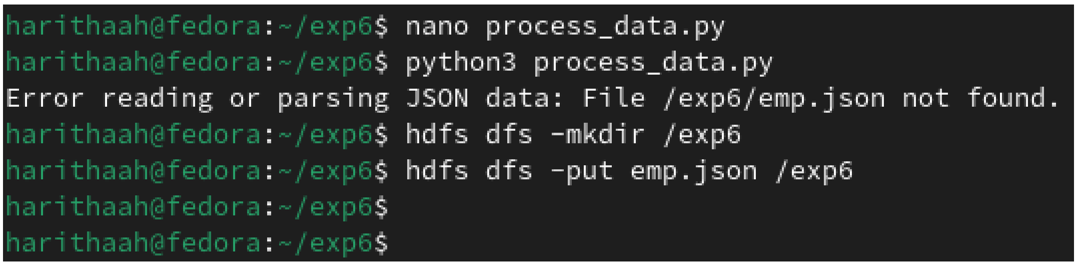


```
Defaulting to user installation because normal site-packages is not writeable
Collecting hdfs
  Downloading hdfs-2.7.3.tar.gz (43 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 43.5/43.5 kB 73.5 kB/s eta 0:00:00
  Installing build dependencies ... done
  Getting requirements to build wheel ... done
  Preparing metadata (pyproject.toml) ... done
Collecting docopt (from hdfs)
  Downloading docopt-0.6.2.tar.gz (25 kB)
  Installing build dependencies ... done
  Getting requirements to build wheel ... done
  Preparing metadata (pyproject.toml) ... done
Requirement already satisfied: requests>=2.7.0 in /usr/lib/python3.12/site-packa
ges (from hdfs) (2.31.0)
Requirement already satisfied: six>=1.9.0 in /usr/lib/python3.12/site-packages (
from hdfs) (1.16.0)
Requirement already satisfied: charset-normalizer<4,>=2 in /usr/lib/python3.12/s
ite-packages (from requests>=2.7.0->hdfs) (3.3.2)
Requirement already satisfied: idna<4,>=2.5 in /usr/lib/python3.12/site-packages
 (from requests>=2.7.0->hdfs) (3.7)
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/lib/python3.12/site-pa
ckages (from requests>=2.7.0->hdfs) (1.26.19)
Building wheels for collected packages: hdfs, docopt
  Building wheel for hdfs (pyproject.toml) ... done
  Created wheel for hdfs: filename=hdfs-2.7.3-py3-none-any.whl size=34205 sha256
=0d536af61228b7f0d53e3b48d95259498753e9777c49cd399bff47eeec7511a2
  Stored in directory: /home/hayagreevan/.cache/pip/wheels/97/ae/d9/536505928dd3
a458b206013b02625df8f12d22fa154f2bfd65
  Building wheel for docopt (pyproject.toml) ... done
  Created wheel for docopt: filename=docopt-0.6.2-py2.py3-none-any.whl size=1367
4 sha256=8355c4921fa97d2181cbc04fbfabf5706c5121b8b5ad260fc656fe8c25dee200
  Stored in directory: /home/hayagreevan/.cache/pip/wheels/1a/bf/a1/4cee4f7678c6
8c5875ca89eaccf460593539805c3906722228
Successfully built hdfs docopt
Installing collected packages: docopt, hdfs
Successfully installed docopt-0.6.2 hdfs-2.7.3
```

6. Create process_data.py

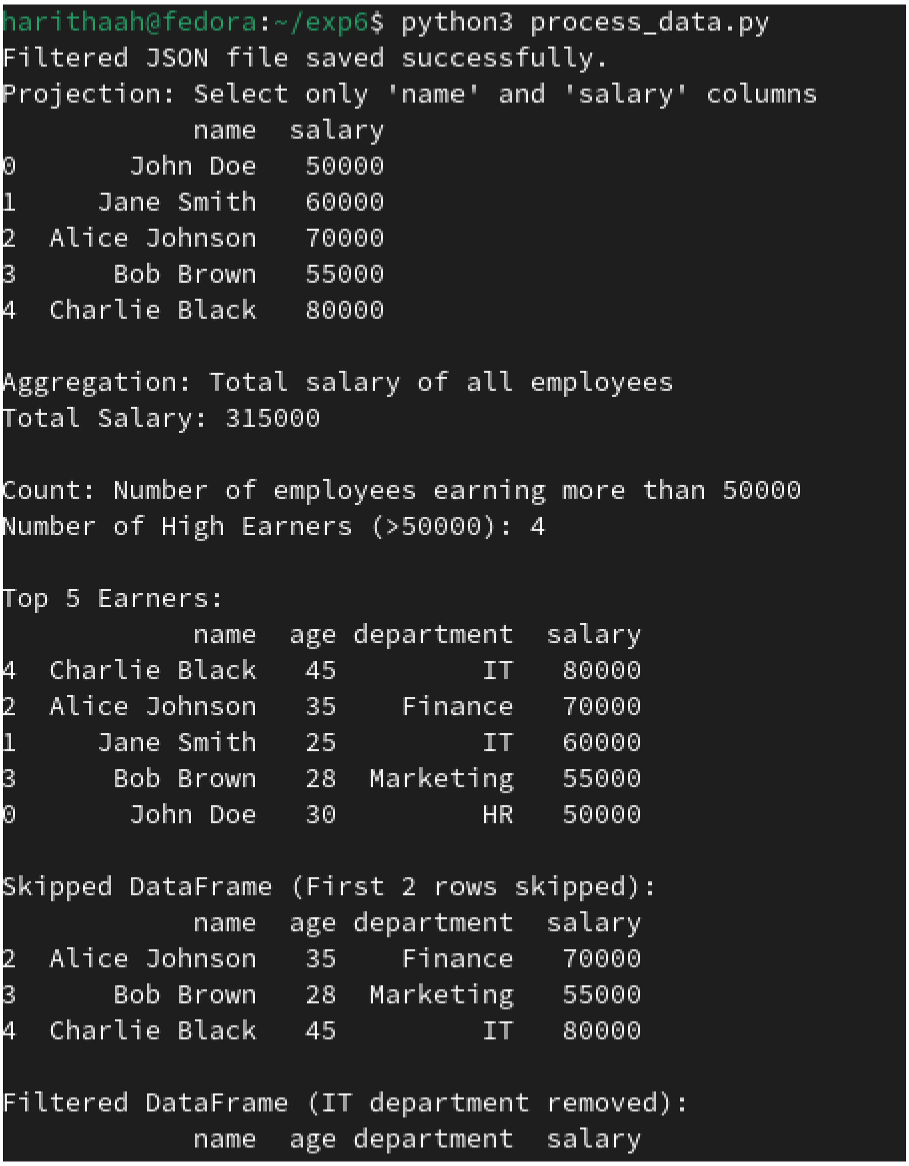


```
from hdfs import InsecureClient
import pandas as pd
import json

# 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 charact>
        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()
```



```
harithaah@fedora:~/exp6$ nano process_data.py
harithaah@fedora:~/exp6$ python3 process_data.py
Error reading or parsing JSON data: File /exp6/emp.json not found.
harithaah@fedora:~/exp6$ hdfs dfs -mkdir /exp6
harithaah@fedora:~/exp6$ hdfs dfs -put emp.json /exp6
harithaah@fedora:~/exp6$
harithaah@fedora:~/exp6$
```

Output:



```
harithaah@fedora:~/exp6$ python3 process_data.py
Filtered JSON file saved successfully.
Projection: Select only 'name' and 'salary' columns
            name  salary
0       John Doe   50000
1     Jane Smith   60000
2  Alice Johnson   70000
3      Bob Brown   55000
4  Charlie Black   80000

Aggregation: Total salary of all employees
Total Salary: 315000

Count: Number of employees earning more than 50000
Number of High Earners (>50000): 4

Top 5 Earners:
            name  age department  salary
4  Charlie Black   45         IT   80000
2  Alice Johnson   35    Finance   70000
1     Jane Smith   25         IT   60000
3      Bob Brown   28  Marketing   55000
0       John Doe   30         HR   50000

Skipped DataFrame (First 2 rows skipped):
            name  age department  salary
2  Alice Johnson   35    Finance   70000
3      Bob Brown   28  Marketing   55000
4  Charlie Black   45         IT   80000

Filtered DataFrame (IT department removed):
            name  age department  salary
```