Recommendations are mentioned at the end of file, after showing Key Learnings.
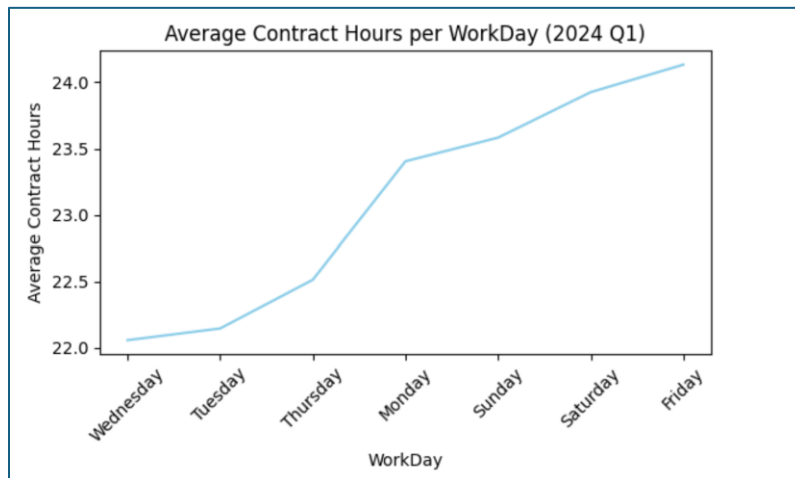
# Key Learnings from Project:

## A) Average Contract Hours per Workdays are as following :

Formula :

Average Contract Hours per WorkDays =
(Total Contract Hours of Corresponding WorkDay / Total Corresponding WorkDay)

Code :

```
# Total Hours Contract per WorkDay
avg_total_ctr_hours_weekDay = df1.groupby('WorkDay')['TotalHours_ctr'].mean()
avg_total_ctr_hours_weekDay.sort_values(inplace=True)
```
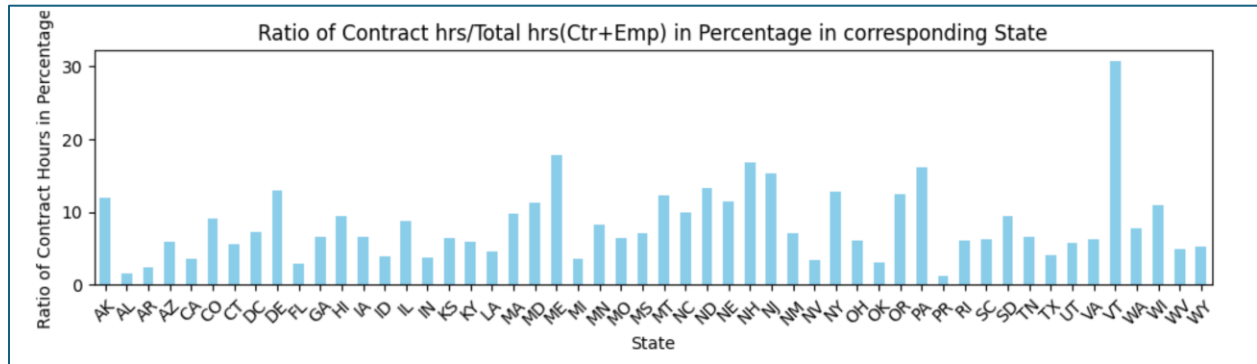


> Average Contract Hours per WorkDay available on Monday, Sunday, Saturday, Friday are 6.85 % more than mid weekdays Wednesday, Tuesday, Thursday.
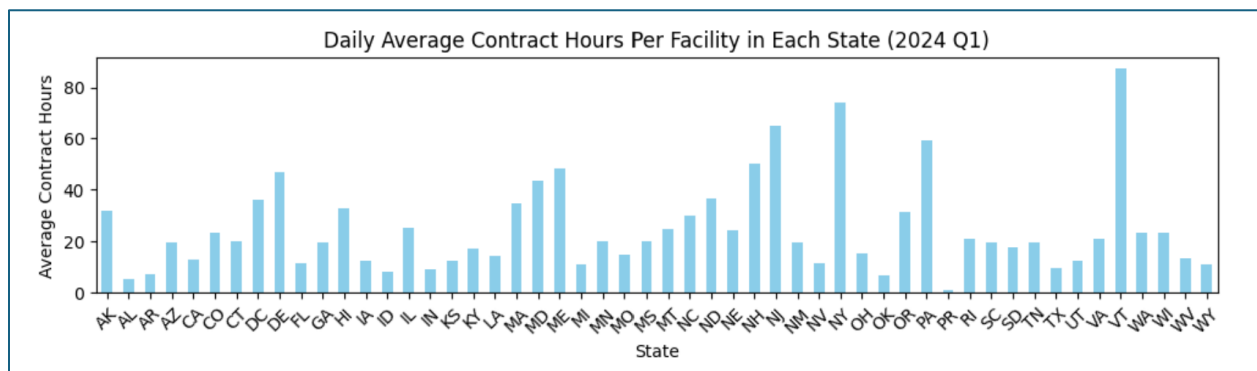
```
avg_total_ctr_hours_DaysGroup1_MonSunSatFri: 23.761231013789985
avg_total_ctr_hours_DaysGroup2_WedTueThur : 22.23762982675741
% of DaysGroup1_MonSunSatFri has more hours than DaysGroup2_WedTueThur : 6.85
```

## B) Ratio of Contract hrs/Total hrs(Ctr+Emp) in Percentage in corresponding State :

 - State i.e. Vermont, Maine, New Hampshire, Pennsylvania, New Jersey states have ratio(in %) of Contract hours out of Total hours(Ctr+Emp) in corresponding State, more than 15%.



## C) Daily Average Contract Hours Per facility in Each State as following :
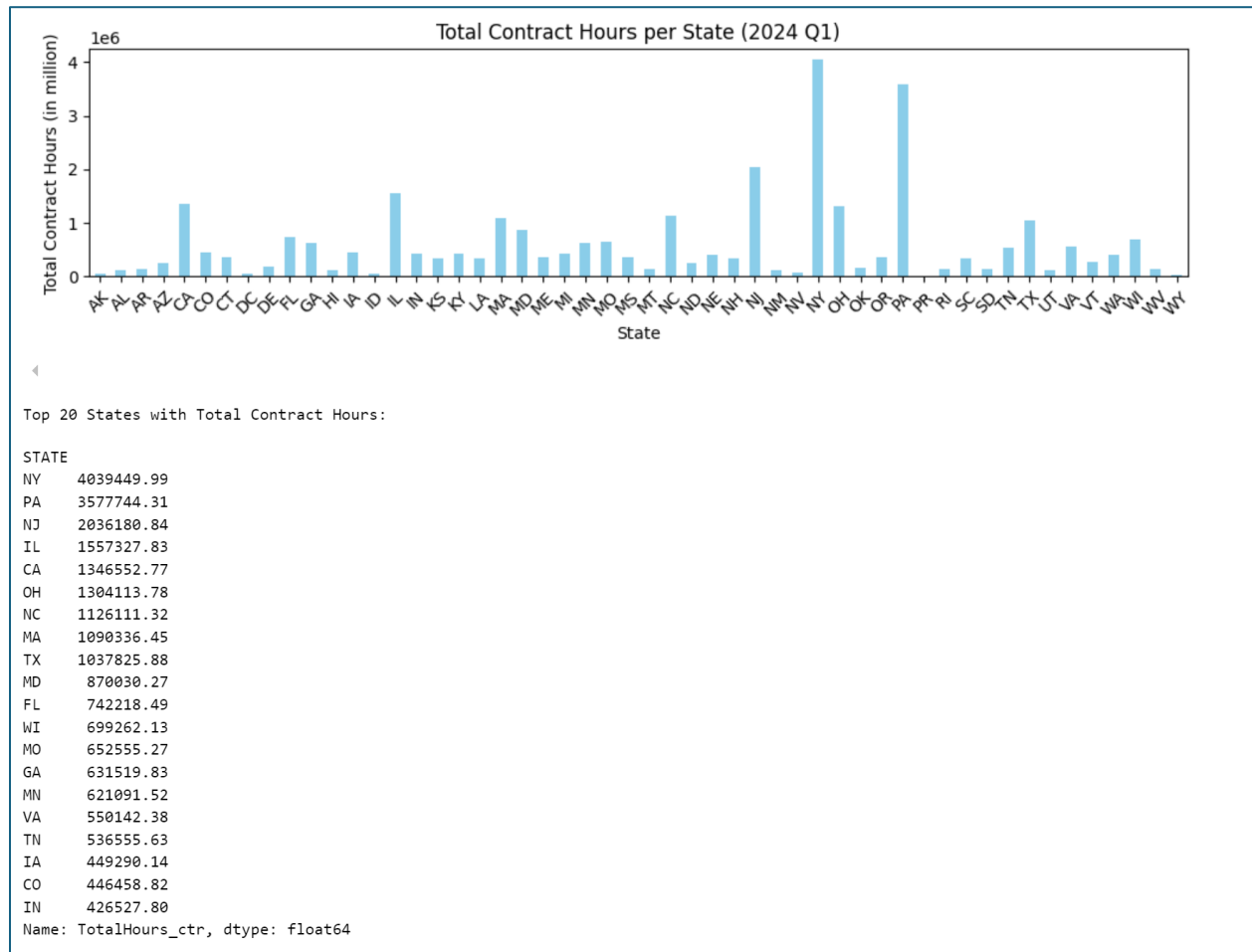


Top 5 states in average contract hours are Vermont, New York, New Jersey, Pennsylvania, New Hampshire.

```
    avg_hours_ctr_state.sort_values(ascending=False)
  ✓ 0.0s

STATE
VT    87.169722
NY    73.859501
NJ    64.856851
PA    59.121611
NH    50.153822
ME    48.450530
DE    46.753488
MD    43.458055
ND    37.027202
DC    36.168824
```

## D) Total Contract Hours by state :



```
Total Contract Hours per State (2024 Q1)

Top 20 States with Total Contract Hours:

STATE
NY    4039449.99
PA    3577744.31
NJ    2036180.84
IL    1557327.83
CA    1346552.77
OH    1304113.78
NC    1126111.32
MA    1090336.45
TX    1037825.88
MD     870030.27
FL     742218.49
WI     699262.13
MO     652555.27
GA     631519.83
MN     621091.52
VA     550142.38
TN     536555.63
IA     449290.14
CO     446458.82
IN     426527.80
Name: TotalHours_ctr, dtype: float64
```
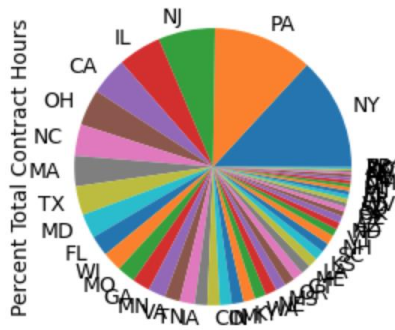
## E) Percentage of Total Contract Hours by state :

- Top 10 states' cumulative Percentage of Total Contract Hours is nearly 60%, while Top 20 states have nearly 80% of share in Total Contract Hours across the board in USA.

- Top 5 States are New York, Pennsylvania, New Jersey, Illinois, California with sum of share nearly 40%. Precise numbers are delineated in below image.

Percentage Total Contract Hours (2024 Q1)

Top 5 states:

```
STATE
NY    13.133729
PA    11.632555
NJ     6.620368
IL     5.063442
CA     4.378135
Name: Percent Total Contract Hours, dtype: float64
```
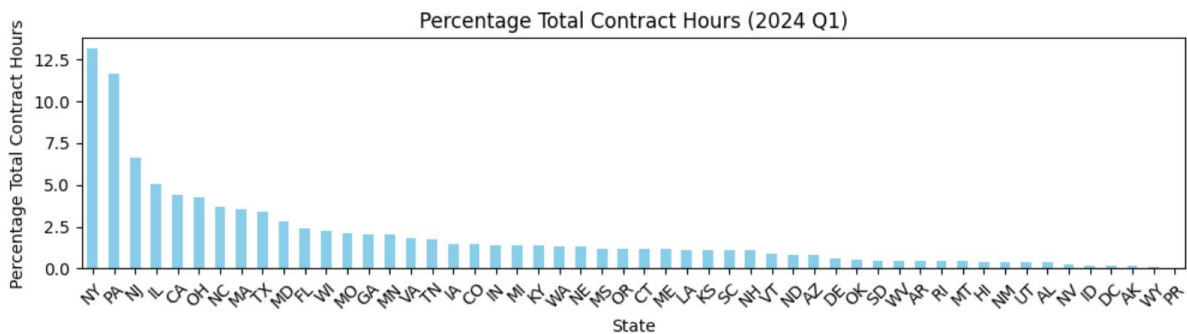
Top 10 states share: 58.48 %
Top 20 states share: 77.19 %



Percentage Total Contract Hours (2024 Q1)

> Per Capita Total Contract Hours Per state : (for fair comparison of States)
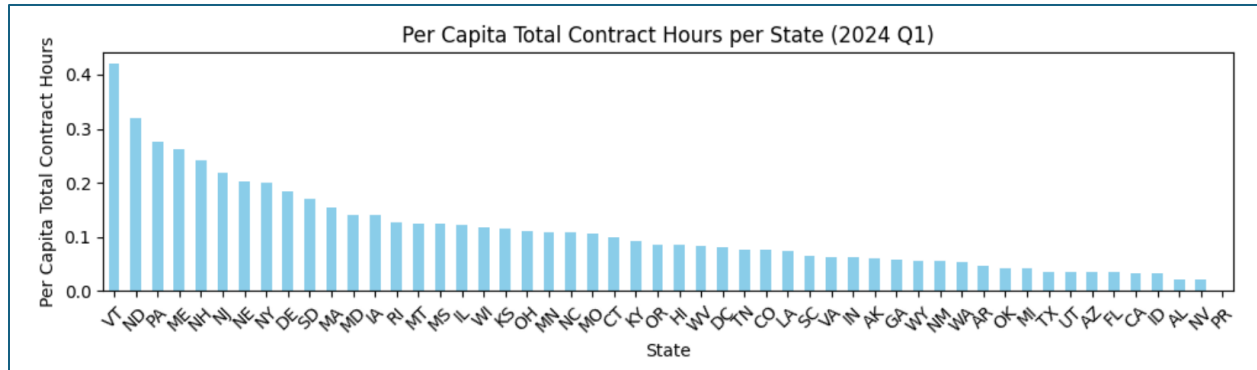
Formula :

        Per Capita Total Contract Hours Per state =

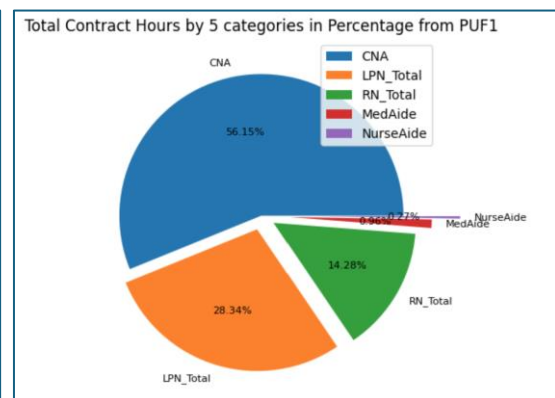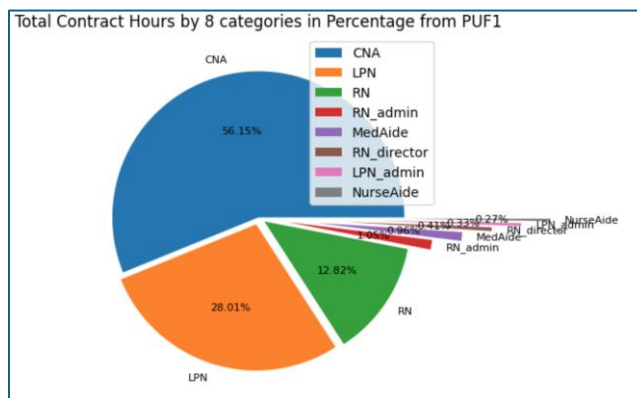        (Total Contract Hours of Corresponding State / Corresponding Population of State)

Code :

```python
percapita_total_hours_ctr_state =
total_hours_ctr_state_df.groupby('STATE')['PerCapitaTotalHours_ctr'].sum().sort_v
alues(ascending=False)
```
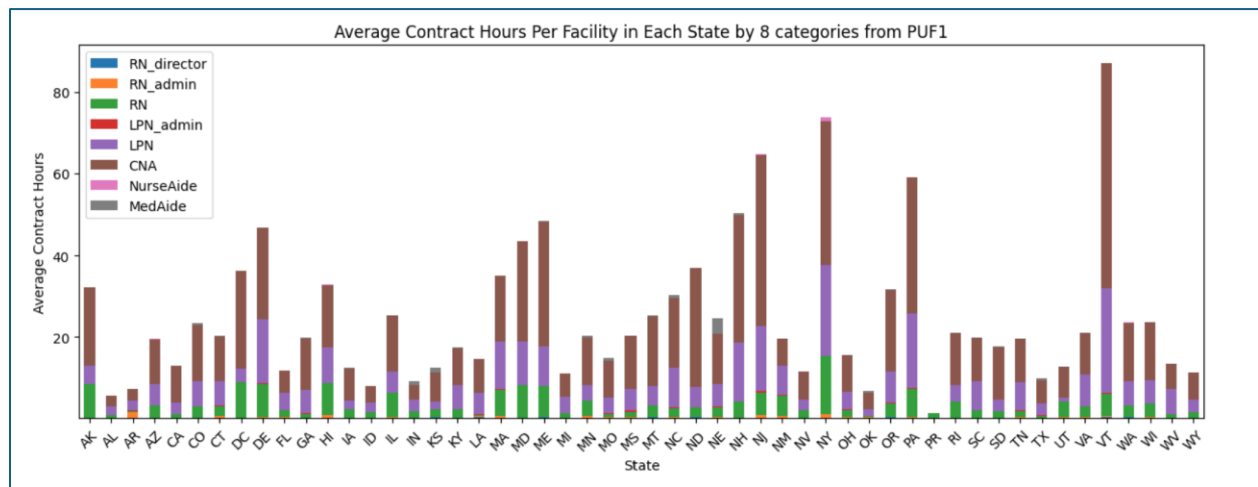
Per Capita Total Contract Hours per State (2024 Q1)

## F) Total Contract Hours among Categories :



Total Contract Hours by 8 categories in Percentage from PUF1



Total Contract Hours by 5 categories in Percentage from PUF1

| | Average Contract Hours |
|---|---|
| CNA | 12.974744 |
| LPN | 6.471522 |
| RN | 2.962977 |
| RN_admin | 0.243605 |
| MedAide | 0.222811 |
| RN_director | 0.093686 |
| LPN_admin | 0.076542 |
| NurseAide | 0.062373 |

| | Average Contract Hours in Percentage |
|---|---|
| CNA | 56.147646 |
| LPN | 28.005234 |
| RN | 12.822157 |
| RN_admin | 1.054191 |
| MedAide | 0.964204 |
| RN_director | 0.405420 |
| LPN_admin | 0.331234 |
| NurseAide | 0.269914 |

- CNA, LPN, RN categories have major share in Available Contract Hours, cumulative of them is more than 95%, to be precise is 96.97%, while NurseAide and MedAide's sum of share is less than 2%.

## G) Average Contract Hours Daily Per Facility in Each State :



Average Contract Hours Per Facility in Each State by 8 categories from PUF1
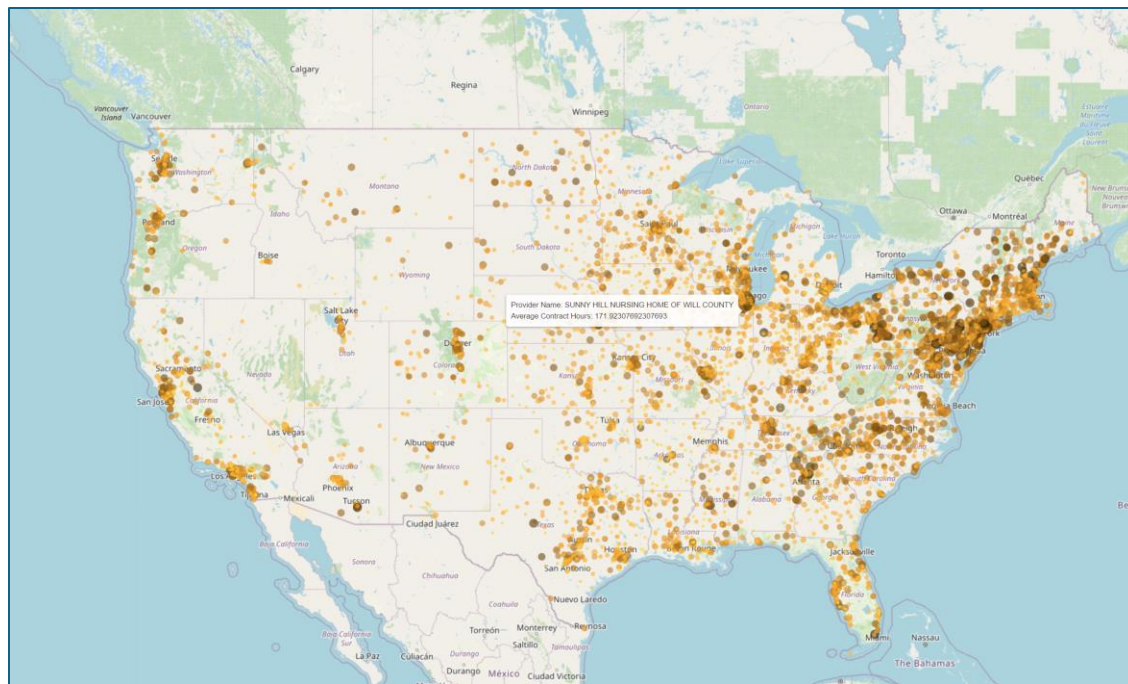
## H) Total Average Hours per Provider using Folium Map :

Created Average Contract Hours Per Facility Map using Latitude and Longitude of Each facility. For which, PBJ_Daily_Nurse_Staffing_Q1_2024 / df1 and ProviderInfo_Aug2024 / df2 , both dataframes were joined on Provider's Name as Keys. Using joined dataframe temp4_df, All Nursing Home Facilities with Average Contract Hours as radius intensity were plotted using Folium Library as shown below. Radius had to scaled down using np.log1p for adequate visibility of bubbles.
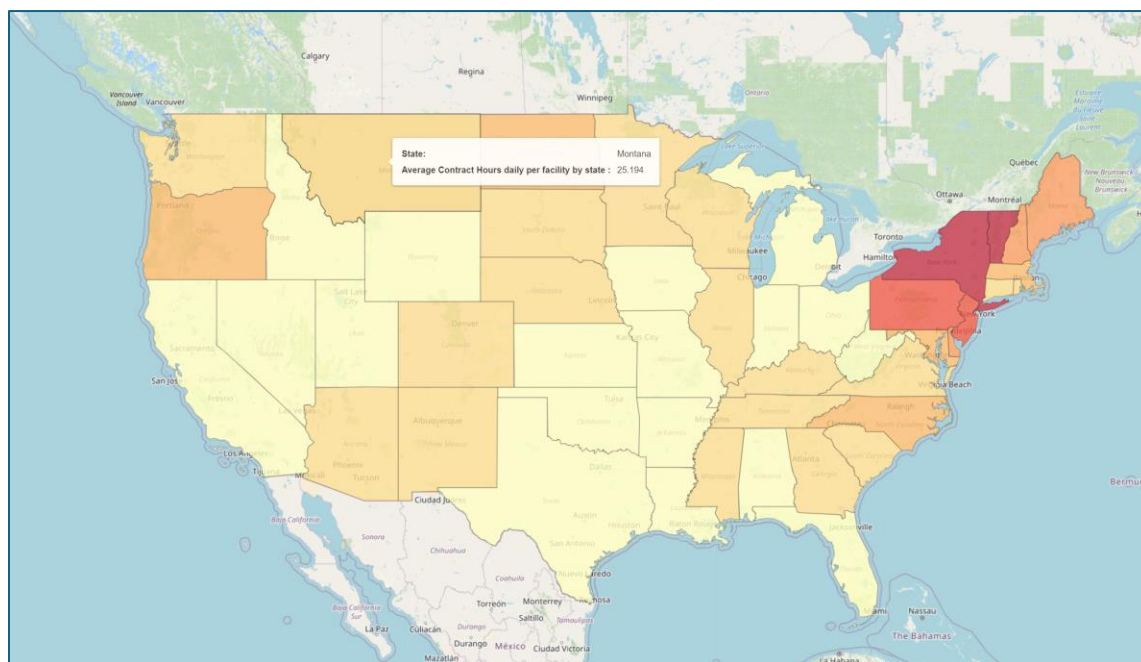
```
# Joining the tables/dataframes
temp3_df = df1.groupby('PROVNAME').agg({'TotalHours_ctr':'mean'}).reset_index()
temp4_df = pd.merge(left=temp3_df, right=df2, how= 'inner',
left_on='PROVNAME',right_on='Provider Name')
```

I)  US Average Contract Hours daily Per Facility by state Using Folium
Map :

- Top 5 states in average contract hours daily per facility by states, are Vermont, New York, New Jersey, Pennsylvania, New Hampshire from map.

| State | Average Contract Hours Per Facility by State |
|---|---|
| Vermont | 87.169722 |
| New York | 73.859501 |
| New Jersey | 64.856851 |
| Pennsylvania | 59.121611 |
| New Hampshire | 50.153822 |

# Key Recommendations to Sales Team of ABC Health, Using Learning Points:

**1)**
CNA (Certified Nursing Assistant), LPN (Licensed Practical Nurse) and RN (Registered Nurse) categories represent nearly 97% of paid Contract Hours in quarter 1, 2024. So, Our focus should be on those particular roles of Allied Health Force to bring them on board on our Platform and role wise our campaign resources should adjusted keeping in mind this ratio.
Backed by Learning point : (F) mentioned above in pdf

**2)**
Our Focus and resources should be adjusted and weighted accordingly to focus on Top 20 states out of 52 states, which have nearly 80% of paid Contract Hours Cumulatively in quarter 1, 2024 data.
Top 20 States in order of Total Contract Hours are as follows:

| State | Total Contract Hours by State |
| --- | --- |
| New York | 4039449.99 |
| Pennsylvania | 3577744.31 |
| New Jersey | 2036180.84 |
| Illinois | 1557327.83 |
| California | 1346552.77 |
| Ohio | 1304113.78 |
| North Carolina | 1126111.32 |
| Massachusetts | 1090336.45 |
| Texas | 1037825.88 |
| Maryland | 870030.27 |
| Florida | 742218.49 |
| Wisconsin | 699262.13 |
| Missouri | 652555.27 |
| Georgia | 631519.83 |
| Minnesota | 621091.52 |
| Virginia | 550142.38 |
| Tennessee | 536555.63 |
| Iowa | 449290.14 |
| Colorado | 446458.82 |
| Indiana | 426527.80 |

Backed by Learning point : (D) & (E) mentioned above in pdf

**3)**
Those Top 20 (states with Total Contract hours) should be in focus in order of (Daily Availability of Contract Hours Per Facility by State) ranking, so new order would be

'New York', 'New Jersey', 'Pennsylvania', 'Maryland', 'Massachusetts', 'North Carolina', 'Illinois', 'Wisconsin', 'Colorado', 'Virginia', 'Minnesota', 'Georgia', 'Tennessee', 'Ohio', 'Missouri', 'California', 'Iowa', 'Florida', 'Texas', 'Indiana'

Backed by Learning point : (C) & (D) mentioned above in pdf

**4)**
We can additionally also keep Focus on those Top 10 States which have Highest daily availability of

Contract hours per Facility, those states are as follows :

'Vermont', 'New York', 'New Jersey', 'Pennsylvania', 'New Hampshire', 'Maine', 'Delaware', 'Maryland', 'North Dakota', 'District of Columbia'

| State | Average Contract Hours Per Facility by State |
|---|---|
| Vermont | 87.169722 |
| New York | 73.859501 |
| New Jersey | 64.856851 |
| Pennsylvania | 59.121611 |
| New Hampshire | 50.153822 |
| Maine | 48.450530 |
| Delaware | 46.753488 |
| Maryland | 43.458055 |
| North Dakota | 37.027202 |
| District of Columbia | 36.168824 |

,

- This part would try to help have more work opportunities for Contract Workers. They will have a reason to return to platform, since there is more hours availability daily which in return will increase Our Contract Workforce, when we keep theses states in mind and resources adjusted for campaigns accordingly, keeping this point in mind.

Backed by Learning point : (C) mentioned above in pdf

**5)**
Within State, Sales Team can run campaigns of hiring Contract Workers, keeping in mind location proximity of facilities and its intensity as daily contract hours availability as shown in Learning Point (H). North East coast of US have more contract hours available in general than any other part of US.

Backed by Learning point : (H) mentioned above in pdf

**Tech Stack used :**
Python, JupyterNotebook on Vscode IDE, Venv as environment, Power BI (Preliminary assessment)

**Tech Stack could have been integrated if data gets bigger and/or if needs be from team :**
Pyspark, Spark SQL, SQL, Snowflake, Data Bricks, Azure Synapse Analytics.