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**"Project on Analysis of Unemployment in India in Last Five Years from 14th May 2022 to 13th May 2022".**

**"This dataset contains the unemployment rate of all the states in India".**

- States = states in India
- Date = date which the unemployment rate observed
- Frequency = measuring frequency (Monthly)
- Estimated Unemployment Rate (%) = percentage of people unemployed in each States of India
- Estimated Employed = Number of people employed
- Estimated Labour Participation Rate (%) = The labour force participation rate is the portion of the working population in the 16-64 years' age group in the economy currently in employment or seeking employment.

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**'Import data and Neccessary Libraries for further use'.**

```
In [1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
import calendar
from datetime import datetime as dt
start_time=dt.now()

import plotly.io as pio
import warnings
warnings.filterwarnings('ignore')
```

```
In [2]: pio.templates
```

Out[2]: Templates configuration

```
-----
```

```
Default template: 'plotly'
Available templates:
['ggplot2', 'seaborn', 'simple_white', 'plotly',
'plotly_white', 'plotly_dark', 'presentation', 'xgridoff',
'ygridoff', 'gridon', 'none']
```

## "Getting the data from the source".

```
In [3]: data = pd.read_csv("D:/CSV Files/Unemployment/Unemployment Data.csv")
data.head()
```

Out[3]:

|   | States         | Country | Date       | Frequency | Estimated Unemployment Rate | Estimated Employed | Estimated Labour Participation Rate | Region        | Area  |
|---|----------------|---------|------------|-----------|-----------------------------|--------------------|-------------------------------------|---------------|-------|
| 0 | Andhra Pradesh | India   | 30-06-2017 | M         | 3.36                        | 5116921            | 40.82                               | South Eastern | Urban |
| 1 | Andhra Pradesh | India   | 31-07-2017 | M         | 3.04                        | 4980708            | 39.51                               | South Eastern | Urban |
| 2 | Andhra Pradesh | India   | 31-08-2017 | M         | 5.73                        | 5025117            | 40.92                               | South Eastern | Urban |
| 3 | Andhra Pradesh | India   | 30-09-2017 | M         | 8.44                        | 4911744            | 41.09                               | South Eastern | Urban |
| 4 | Andhra Pradesh | India   | 31-10-2017 | M         | 4.81                        | 5102145            | 40.97                               | South Eastern | Urban |

## "Show data and see how many rows and columns are there".

In [4]: data

Out[4]:

|      | States         | Country | Date       | Frequency | Estimated Unemployment Rate | Estimated Employed | Estimated Labour Participation Rate | Region        | Area  |
|------|----------------|---------|------------|-----------|-----------------------------|--------------------|-------------------------------------|---------------|-------|
| 0    | Andhra Pradesh | India   | 30-06-2017 | M         | 3.36                        | 5116921            | 40.82                               | South Eastern | Urban |
| 1    | Andhra Pradesh | India   | 31-07-2017 | M         | 3.04                        | 4980708            | 39.51                               | South Eastern | Urban |
| 2    | Andhra Pradesh | India   | 31-08-2017 | M         | 5.73                        | 5025117            | 40.92                               | South Eastern | Urban |
| 3    | Andhra Pradesh | India   | 30-09-2017 | M         | 8.44                        | 4911744            | 41.09                               | South Eastern | Urban |
| 4    | Andhra Pradesh | India   | 31-10-2017 | M         | 4.81                        | 5102145            | 40.97                               | South Eastern | Urban |
| ...  | ...            | ...     | ...        | ...       | ...                         | ...                | ...                                 | ...           | ...   |
| 4920 | India          | India   | 31-01-2022 | M         | 6.56                        | 402616049          | 39.84                               | All           | Total |
| 4921 | India          | India   | 28-02-2022 | M         | 8.11                        | 397057157          | 39.89                               | All           | Total |
| 4922 | India          | India   | 31-03-2022 | M         | 7.57                        | 395969754          | 39.46                               | All           | Total |
| 4923 | India          | India   | 30-04-2022 | M         | 7.83                        | 402949020          | 40.19                               | All           | Total |
| 4924 | India          | India   | 31-05-2022 | M         | 7.12                        | 403981241          | 39.91                               | All           | Total |

4925 rows × 9 columns

**"Checking is there any null values in the columns or not".**

In [5]: print(data.isnull().sum())

```

States          0
Country        0
Date           0
Frequency      0
Estimated Unemployment Rate  0
Estimated Employed    0
Estimated Labour Participation Rate  0
Region          0
Area            0
dtype: int64

```

**"Renaming the columns for simplicity".**

```
In [6]: data.columns= ["States", "Country", "Date", "Frequency",
                     "Estimated_Unemployment_Rate",
                     "Estimated_Employed",
                     "Estimated_Labour_Participation_Rate",
                     "Region", "Area"]
```

```
data
```

Out[6]:

|      | States         | Country | Date       | Frequency | Estimated_Unemployment_Rate | Estimated_Employed | Estimated_Labour_Participation_Rate |
|------|----------------|---------|------------|-----------|-----------------------------|--------------------|-------------------------------------|
| 0    | Andhra Pradesh | India   | 30-06-2017 | M         | 3.36                        | 5116921            |                                     |
| 1    | Andhra Pradesh | India   | 31-07-2017 | M         | 3.04                        | 4980708            |                                     |
| 2    | Andhra Pradesh | India   | 31-08-2017 | M         | 5.73                        | 5025117            |                                     |
| 3    | Andhra Pradesh | India   | 30-09-2017 | M         | 8.44                        | 4911744            |                                     |
| 4    | Andhra Pradesh | India   | 31-10-2017 | M         | 4.81                        | 5102145            |                                     |
| ...  | ...            | ...     | ...        | ...       | ...                         | ...                | ...                                 |
| 4920 | India          | India   | 31-01-2022 | M         | 6.56                        | 402616049          |                                     |
| 4921 | India          | India   | 28-02-2022 | M         | 8.11                        | 397057157          |                                     |
| 4922 | India          | India   | 31-03-2022 | M         | 7.57                        | 395969754          |                                     |
| 4923 | India          | India   | 30-04-2022 | M         | 7.83                        | 402949020          |                                     |
| 4924 | India          | India   | 31-05-2022 | M         | 7.12                        | 403981241          |                                     |

4925 rows × 9 columns



```
In [7]: data['Date'] = pd.to_datetime(data['Date'], dayfirst=True)
```

```
In [8]: data['Frequency']= data['Frequency'].astype('category')
```

## "Adding Month Column in the data".

```
In [9]: data['Month'] = data['Date'].dt.month
```

```
In [10]: data['Month_int'] = data['Month'].apply(lambda x : int(x))
```

```
In [11]: data['Month_name'] = data['Month_int'].apply(lambda x: calendar.month_abbr[x])
```

```
In [12]: data['Year'] = pd.DatetimeIndex(data['Date']).year
```

```
In [13]: data['Region'] = data['Region'].astype('category')
```

In [14]: `data.drop(columns='Month', inplace=True)`  
`data.head(3)`

Out[14]:

|   | States         | Country | Date       | Frequency | Estimated_Unemployment_Rate | Estimated_Employed | Estimated_Labour_Participat |
|---|----------------|---------|------------|-----------|-----------------------------|--------------------|-----------------------------|
| 0 | Andhra Pradesh | India   | 2017-06-30 | M         | 3.36                        | 5116921            |                             |
| 1 | Andhra Pradesh | India   | 2017-07-31 | M         | 3.04                        | 4980708            |                             |
| 2 | Andhra Pradesh | India   | 2017-08-31 | M         | 5.73                        | 5025117            |                             |

## 'Perform Statistics process on data'.

And get the mean, min, max and standard deviation of Estimated Unemployment Rate, Estimated Employed, Estimated Labour Participation Rate.

In [15]: `data_stats = data[['Estimated_Unemployment_Rate', 'Estimated_Employed', 'Estimated_Labour_Participation_Rate']]`  
`round(data_stats.describe().T, 2)`

Out[15]:

|                                     | count  | mean        | std         | min      | 25%        | 50%        | 75%         |
|-------------------------------------|--------|-------------|-------------|----------|------------|------------|-------------|
| Estimated_Unemployment_Rate         | 4925.0 | 8.90        | 7.93        | 0.00     | 3.68       | 6.56       | 11.69       |
| Estimated_Employed                  | 4925.0 | 19230703.97 | 53474104.46 | 49420.00 | 2045761.00 | 6757814.00 | 15128954.00 |
| Estimated_Labour_Participation_Rate | 4925.0 | 42.32       | 7.10        | 13.33    | 38.05      | 41.18      | 45.34       |

## 'Statewise Estimated Unemployment Rate in Last Five Year'.

```
In [16]: R = data.groupby(['States'])['Estimated_Unemployment_Rate'].mean().reset_index()
R = round(R,2)
R
```

Out[16]:

|    | States           | Estimated_Unemployment_Rate |
|----|------------------|-----------------------------|
| 0  | Andhra Pradesh   | 6.08                        |
| 1  | Assam            | 6.19                        |
| 2  | Bihar            | 12.93                       |
| 3  | Chandigarh       | 11.55                       |
| 4  | Chhattisgarh     | 5.44                        |
| 5  | Delhi            | 11.53                       |
| 6  | Goa              | 10.36                       |
| 7  | Gujarat          | 4.14                        |
| 8  | Haryana          | 23.01                       |
| 9  | Himachal Pradesh | 13.99                       |
| 10 | India            | 7.62                        |
| 11 | Jammu & Kashmir  | 14.85                       |
| 12 | Jharkhand        | 13.38                       |
| 13 | Karnataka        | 3.25                        |
| 14 | Kerala           | 7.85                        |
| 15 | Madhya Pradesh   | 4.36                        |
| 16 | Maharashtra      | 4.96                        |
| 17 | Meghalaya        | 4.39                        |
| 18 | Odisha           | 4.22                        |
| 19 | Puducherry       | 6.68                        |
| 20 | Punjab           | 8.82                        |
| 21 | Rajasthan        | 15.78                       |
| 22 | Sikkim           | 6.01                        |
| 23 | Tamil Nadu       | 5.13                        |
| 24 | Telangana        | 4.42                        |
| 25 | Tripura          | 21.70                       |
| 26 | Uttar Pradesh    | 7.41                        |
| 27 | Uttarakhand      | 4.73                        |
| 28 | West Bengal      | 7.82                        |

**'groupby data by region wise'.**

```
In [17]: region_stats = data.groupby(['Region'])[['Estimated_Unemployment_Rate', 'Estimated_Employed', 'Esti  
region_stats = round(region_stats,2)  
  
region_stats
```

Out[17]:

|    | Region        | Estimated_Unemployment_Rate | Estimated_Employed | Estimated_Labour_Participation_Rate |
|----|---------------|-----------------------------|--------------------|-------------------------------------|
| 0  | All           | 7.62                        | 2.645661e+08       | 41.32                               |
| 1  | Central       | 4.90                        | 1.052812e+07       | 40.77                               |
| 2  | Eastern       | 9.59                        | 1.399730e+07       | 41.27                               |
| 3  | North Central | 11.53                       | 3.484741e+06       | 37.16                               |
| 4  | North Eastern | 10.24                       | 2.748583e+06       | 52.32                               |
| 5  | North Western | 12.19                       | 8.439884e+06       | 40.47                               |
| 6  | Northern      | 12.82                       | 9.687442e+06       | 38.89                               |
| 7  | South Eastern | 5.25                        | 1.082523e+07       | 46.21                               |
| 8  | South Western | 9.07                        | 3.341098e+06       | 38.84                               |
| 9  | Southern      | 5.90                        | 8.841074e+06       | 40.48                               |
| 10 | Western       | 4.12                        | 1.973446e+07       | 44.19                               |

**"Cheking data size, how many rows and columns are there and unique values".**

```
In [18]: data.size
```

Out[18]: 59100

```
In [19]: data.shape
```

Out[19]: (4925, 12)

In [20]: `data.nunique`

```
Out[20]: <bound method DataFrame.nunique of
   States Country Date Frequency \
0 Andhra Pradesh India 2017-06-30 M
1 Andhra Pradesh India 2017-07-31 M
2 Andhra Pradesh India 2017-08-31 M
3 Andhra Pradesh India 2017-09-30 M
4 Andhra Pradesh India 2017-10-31 M
...
4920 ... India 2022-01-31 M
4921 India 2022-02-28 M
4922 India 2022-03-31 M
4923 India 2022-04-30 M
4924 India 2022-05-31 M

   Estimated_Unemployment_Rate Estimated_Employed \
0 3.36 5116921
1 3.04 4980708
2 5.73 5025117
3 8.44 4911744
4 4.81 5102145
...
4920 6.56 402616049
4921 8.11 397057157
4922 7.57 395969754
4923 7.83 402949020
4924 7.12 403981241

   Estimated_Labour_Participation_Rate Region Area Month_int \
0 40.82 South Eastern Urban 6
1 39.51 South Eastern Urban 7
2 40.92 South Eastern Urban 8
3 41.09 South Eastern Urban 9
4 40.97 South Eastern Urban 10
...
4920 39.84 All Total 1
4921 39.89 All Total 2
4922 39.46 All Total 3
4923 40.19 All Total 4
4924 39.91 All Total 5

   Month_name Year
0 Jun 2017
1 Jul 2017
2 Aug 2017
3 Sep 2017
4 Oct 2017
...
4920 Jan 2022
4921 Feb 2022
4922 Mar 2022
4923 Apr 2022
4924 May 2022

[4925 rows x 12 columns]>
```

**"checking not null values, data types of the data and axes in the data".**

In [21]: `data.notnull`

```
Out[21]: <bound method DataFrame.notnull of
   States Country      Date Frequency \
0    Andhra Pradesh    India 2017-06-30      M
1    Andhra Pradesh    India 2017-07-31      M
2    Andhra Pradesh    India 2017-08-31      M
3    Andhra Pradesh    India 2017-09-30      M
4    Andhra Pradesh    India 2017-10-31      M
...
4920           ...     ... 2022-01-31      M
4921           ...     ... 2022-02-28      M
4922           ...     ... 2022-03-31      M
4923           ...     ... 2022-04-30      M
4924           ...     ... 2022-05-31      M

   Estimated_Unemployment_Rate  Estimated_Employed \
0                  3.36          5116921
1                  3.04          4980708
2                  5.73          5025117
3                  8.44          4911744
4                  4.81          5102145
...
4920                 6.56          402616049
4921                 8.11          397057157
4922                 7.57          395969754
4923                 7.83          402949020
4924                 7.12          403981241

   Estimated_Labour_Participation_Rate      Region  Area Month_int \
0                      40.82  South Eastern  Urban       6
1                      39.51  South Eastern  Urban       7
2                      40.92  South Eastern  Urban       8
3                      41.09  South Eastern  Urban       9
4                      40.97  South Eastern  Urban      10
...
4920                 ...        ...     ...      ...
4921                 ...        ...     ...      ...
4922                 ...        ...     ...      ...
4923                 ...        ...     ...      ...
4924                 ...        ...     ...      ...

   Month_name  Year
0       Jun 2017
1       Jul 2017
2       Aug 2017
3       Sep 2017
4       Oct 2017
...
4920      Jan 2022
4921      Feb 2022
4922      Mar 2022
4923      Apr 2022
4924      May 2022

[4925 rows x 12 columns]>
```

In [22]: `data.dtypes`

```
Out[22]: States                object
Country               object
Date                 datetime64[ns]
Frequency            category
Estimated_Unemployment_Rate float64
Estimated_Employed      int64
Estimated_Labour_Participation_Rate float64
Region                category
Area                  object
Month_int              int64
Month_name             object
Year                  int64
dtype: object
```

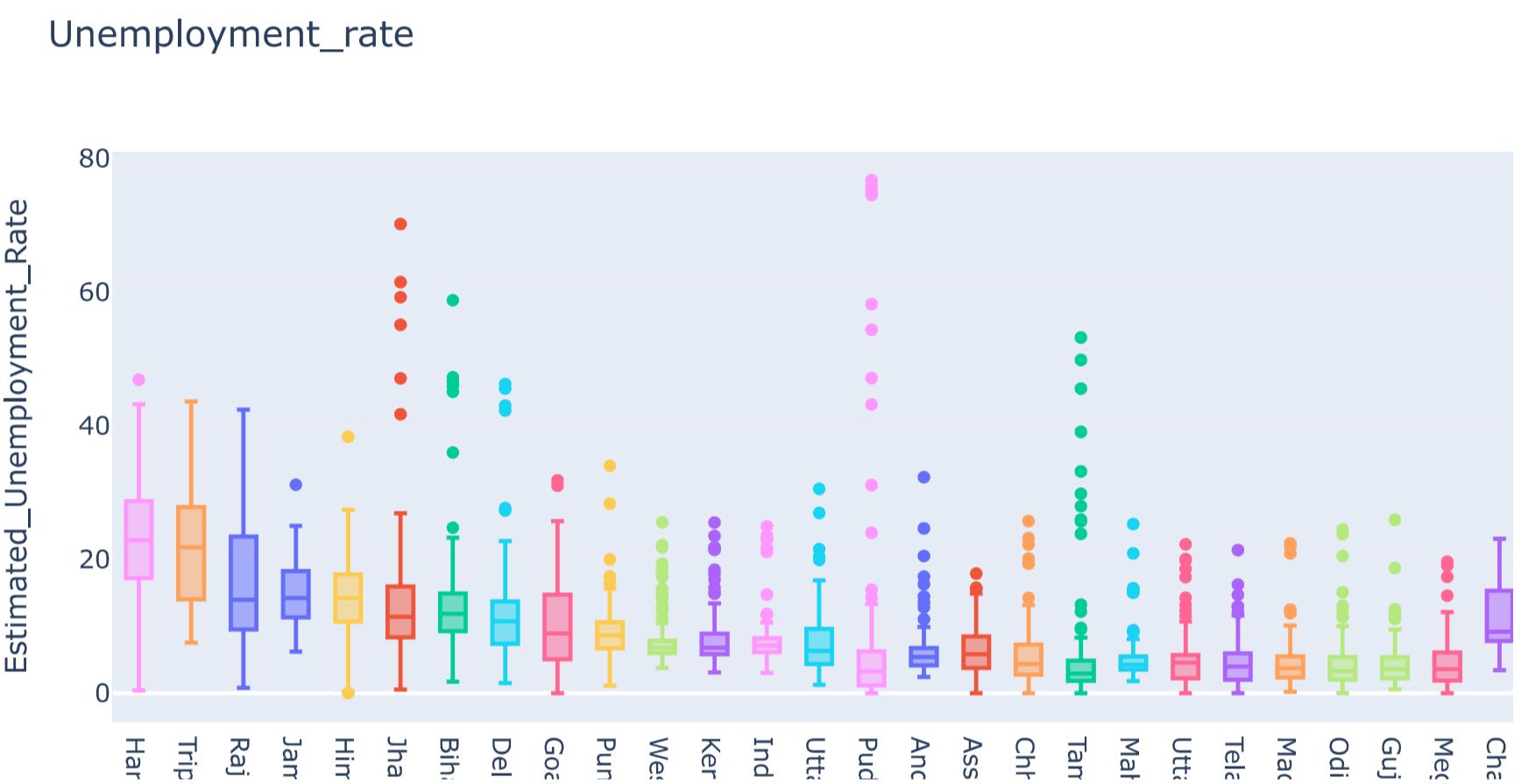
In [23]: `data.axes`

```
Out[23]: [RangeIndex(start=0, stop=4925, step=1),
Index(['States', 'Country', 'Date', 'Frequency', 'Estimated_Unemployment_Rate',
'Estimated_Employed', 'Estimated_Labour_Participation_Rate', 'Region',
'Area', 'Month_int', 'Month_name', 'Year'],
dtype='object')]
```

## 'Exploratory Data Analysis'.

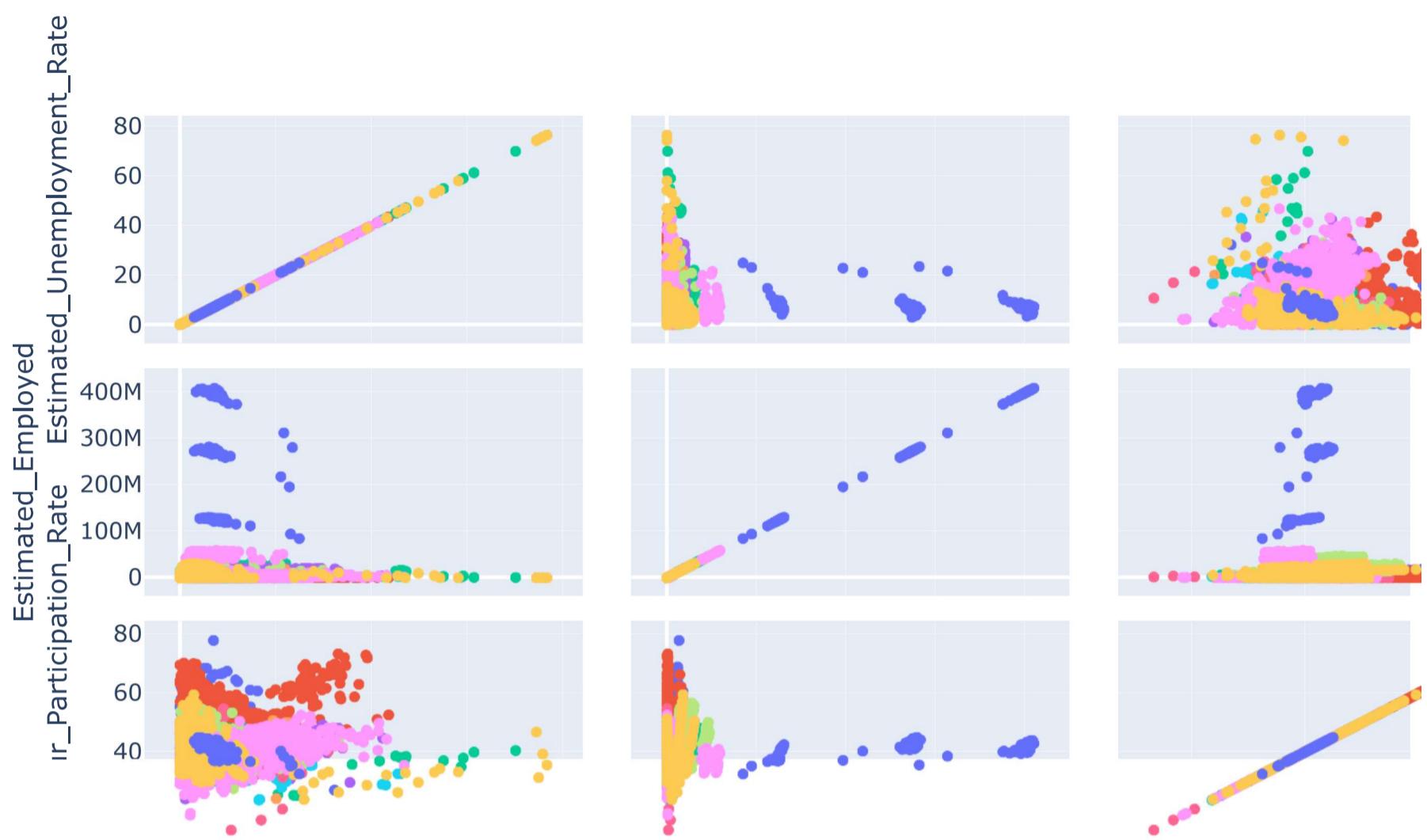
### 'plot boxplot of Unemployment Rate by Statewise'.

```
In [24]: fig = px.box(data,x='States',y='Estimated_Unemployment_Rate',color='States',title='Unemployment_rate')
fig.update_layout(xaxis={'categoryorder':'total descending'})
fig.show()
```



### 'Draw Scatterplot on the data'.

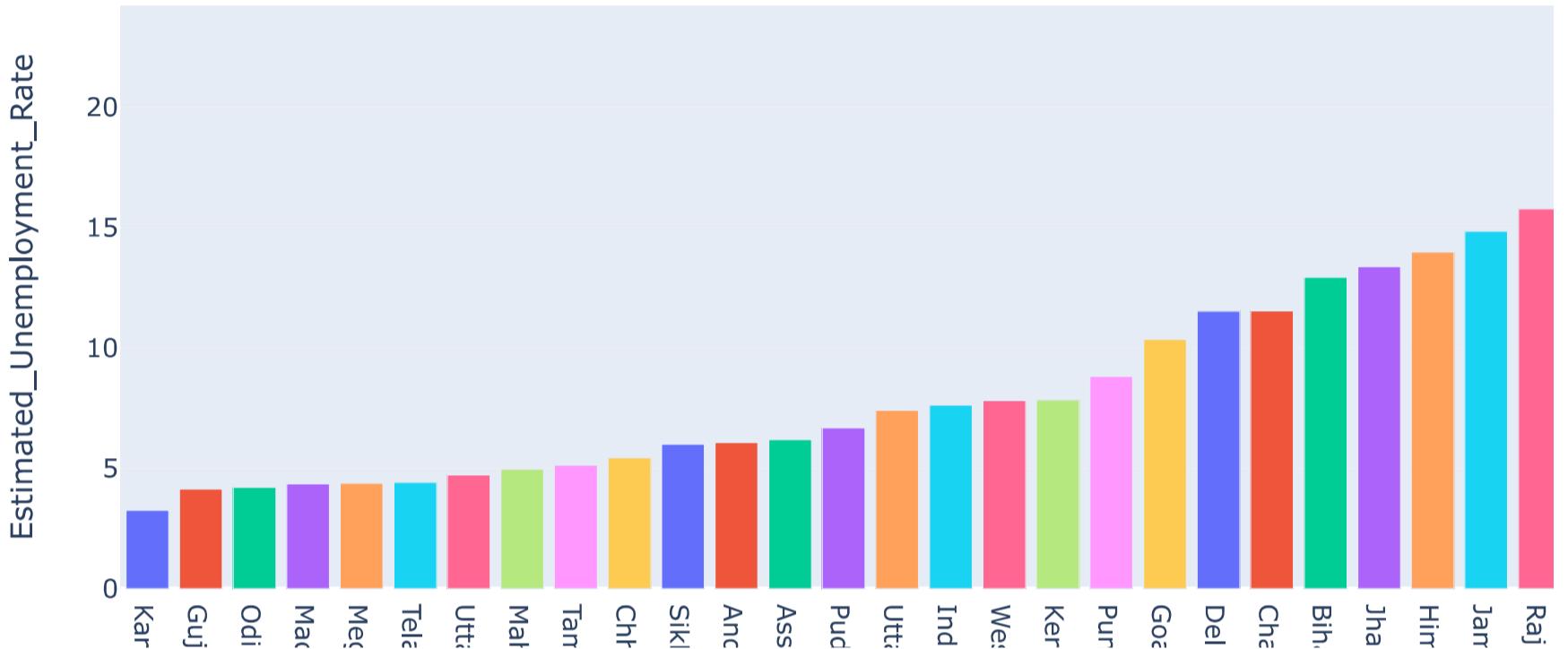
```
In [25]: fig = px.scatter_matrix(data, template='plotly',
    dimensions=['Estimated_Unemployment_Rate', 'Estimated_Employed',
                'Estimated_Labour_Participation_Rate'],
    color='Region')
fig.show()
```



'Draw bar chart for Average Unemployment Rate in each State'.

```
In [26]: plot_ump = data[['Estimated_Unemployment_Rate','States']]  
  
df_unemp = plot_ump.groupby('States').mean().reset_index()  
  
df_unemp = df_unemp.sort_values('Estimated_Unemployment_Rate')  
  
fig = px.bar(df_unemp, x='States',y='Estimated_Unemployment_Rate',color='States',  
              title='Average Unemployment Rate in each state',template='plotly')  
  
fig.show()
```

Average Unemployment Rate in each state



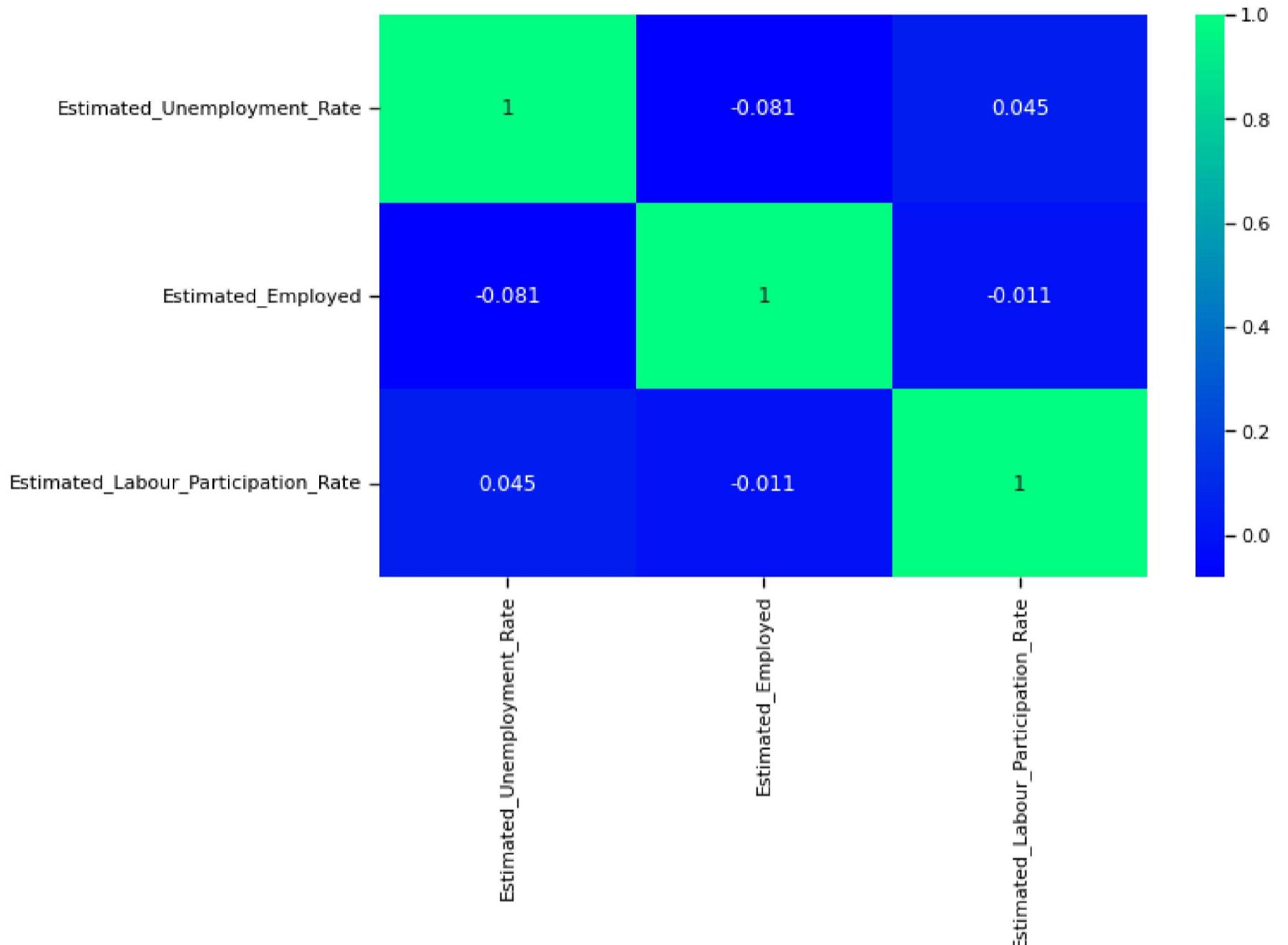
## 'Visualization on the Data'.

In [27]: #Heatmap.

```
heat_maps = data[['Estimated_Unemployment_Rate',
                  'Estimated_Employed', 'Estimated_Labour_Participation_Rate']]

heat_maps = heat_maps.corr()

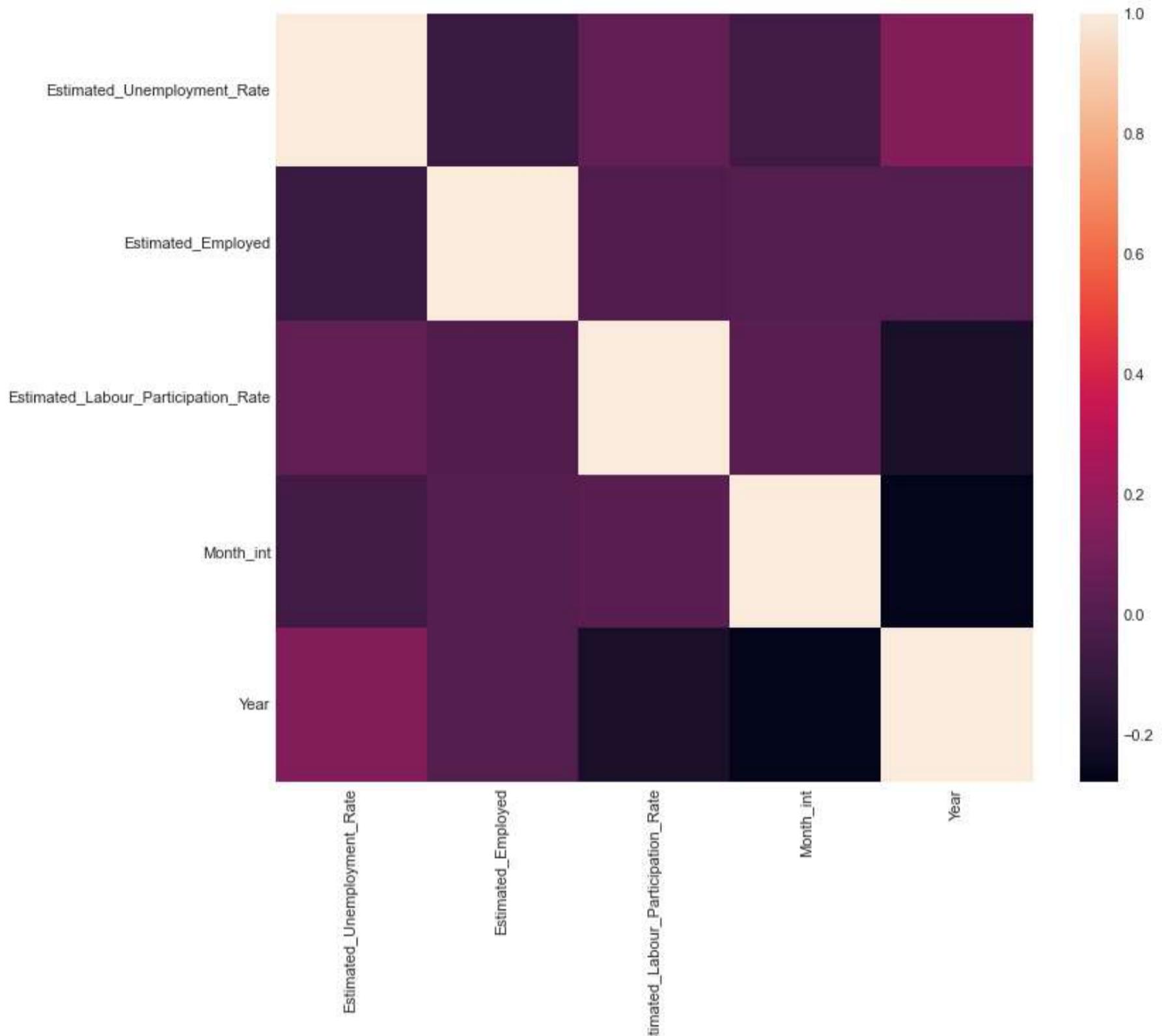
plt.figure(figsize=(10,6))
sns.set_context('notebook', font_scale=1)
sns.heatmap(heat_maps, annot=True, cmap='winter');
```



**'Show heatmap between entities'.**

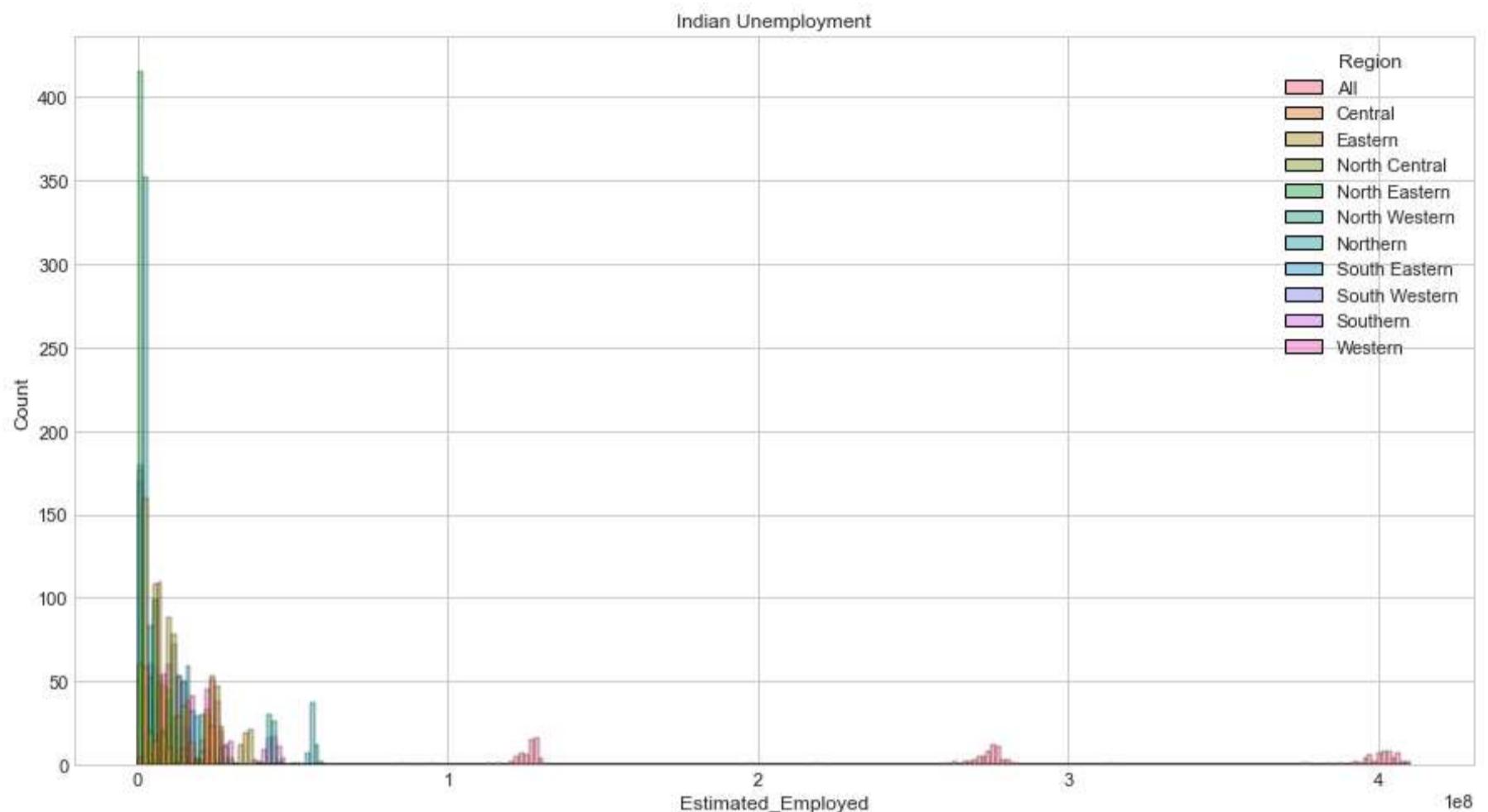
In [28]: #Heatmap on two entities.

```
plt.style.use('seaborn-whitegrid')
plt.figure(figsize=(12, 10))
sns.heatmap(data.corr())
plt.show()
```



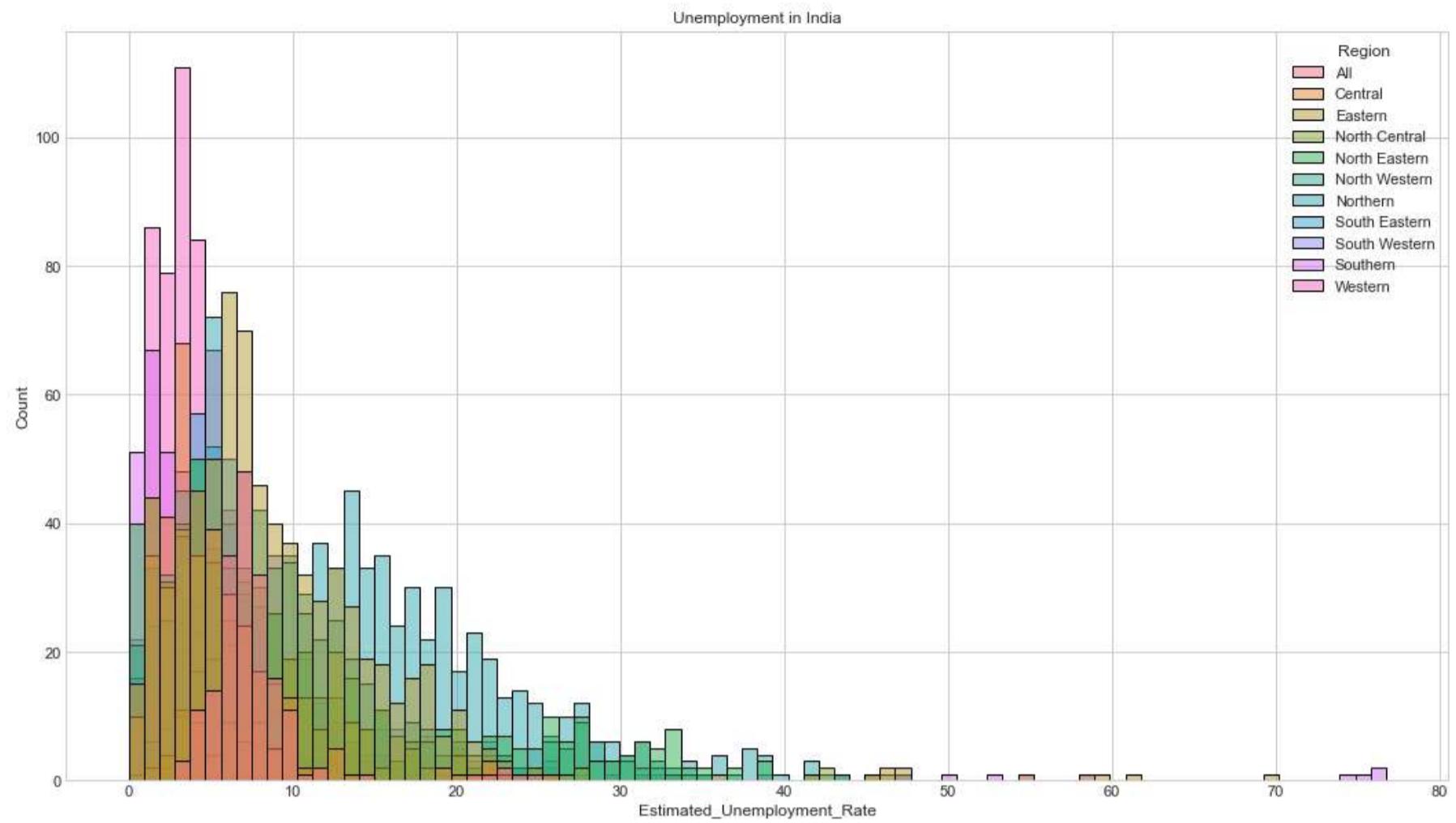
**'Hisplot figure on Estimated Employed data by region'.**

```
In [29]: data.columns= ["States", "Country", "Date", "Frequency",
                      "Estimated_Unemployment_Rate",
                      "Estimated_Employed",
                      "Estimated_Labour_Participation_Rate",
                      "Region", "Area", "Month_int", "Month_name", "Year"]
plt.figure(figsize=(15,8))
plt.title("Indian Unemployment")
sns.histplot(x="Estimated_Employed", hue="Region", data=data)
plt.show()
```



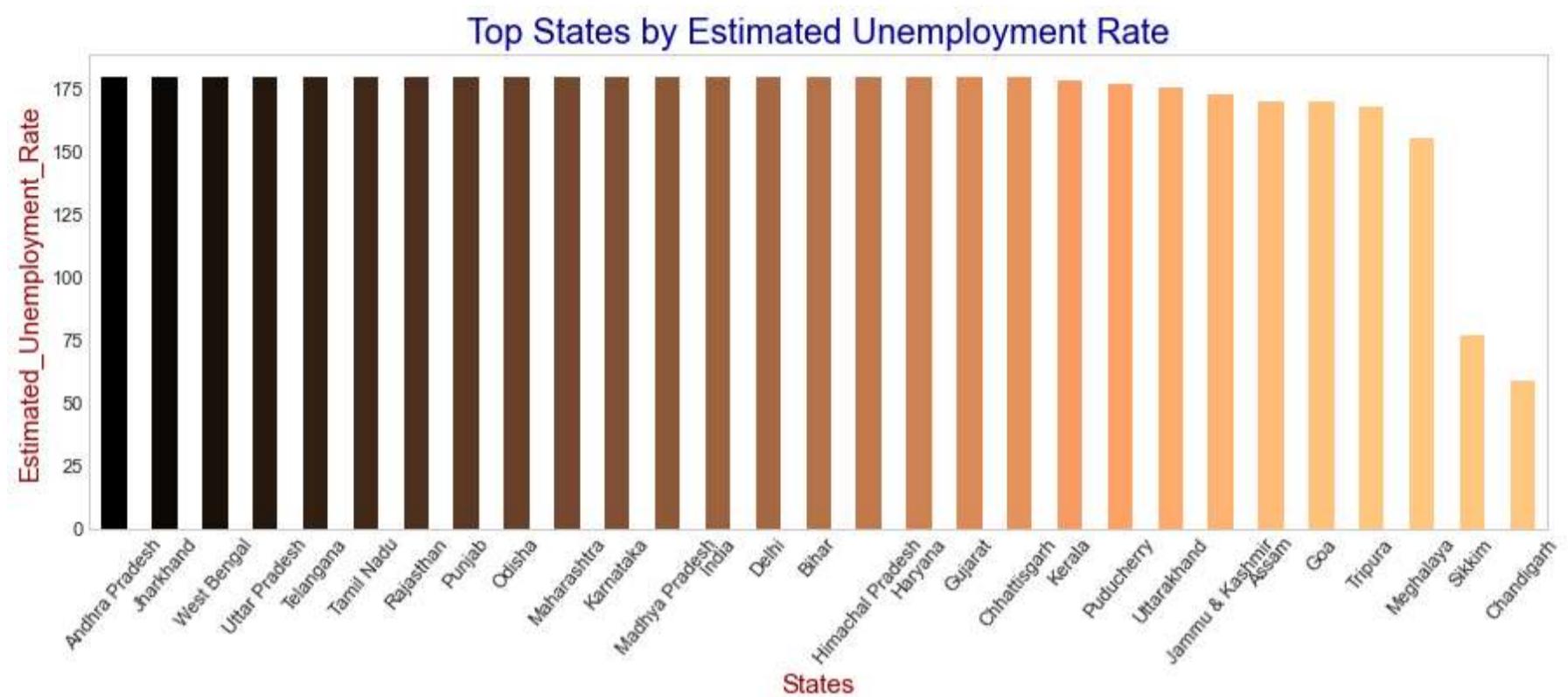
## 'Hisplot Figure on Estimated Unemployment Rate by Region'.

```
In [30]: plt.figure(figsize=(18, 10))
plt.title("Unemployment in India")
sns.histplot(x="Estimated_Unemployment_Rate", hue="Region", data=data)
plt.show()
```



**'Top States by Estimated Unemployment Rate in India'.**

```
In [31]: plt.rcParams['figure.figsize'] = (15, 5)
color = plt.cm.copper(np.linspace(0, 2, 50))
data['States'].value_counts().head(40).plot.bar(color = color)
plt.title('Top States by Estimated Unemployment Rate',color ='darkblue', fontsize = 20)
plt.xlabel('States', color = 'darkred', size = 15,)
plt.ylabel('Estimated_Unemployment_Rate', color = 'darkred', size = 15)
plt.xticks(rotation = 50)
plt.grid()
plt.show()
```



## 'Unemployment during covid19 Pandemic'.

### "Calculating Unemployment Rate before and after Lockdown".

```
In [32]: lock = data[(data['Month_int'] >= 4) & (data['Month_int'] <=7)]
bf_lock = data[(data['Month_int'] >= 1) & (data['Month_int'] <=4)]
```

```
In [33]: g_lock = lock.groupby('States')['Estimated_Unemployment_Rate'].mean().reset_index()

g_bf_lock = bf_lock.groupby('States')['Estimated_Unemployment_Rate'].mean().reset_index()

g_lock['Unemployment Rate before lockdown'] = g_bf_lock['Estimated_Unemployment_Rate']

g_lock.columns = ['States', 'Unemployment Rate after lockdown', 'Unemployment Rate before lockdown']

# Show only five states according to alphabetics A to Z.
g_lock.head(5)
```

Out[33]:

|   | States         | Unemployment Rate after lockdown | Unemployment Rate before lockdown |
|---|----------------|----------------------------------|-----------------------------------|
| 0 | Andhra Pradesh | 7.006000                         | 6.456833                          |
| 1 | Assam          | 6.157818                         | 5.952105                          |
| 2 | Bihar          | 15.401667                        | 14.764000                         |
| 3 | Chandigarh     | 11.611053                        | 12.662105                         |
| 4 | Chhattisgarh   | 5.412000                         | 4.872667                          |

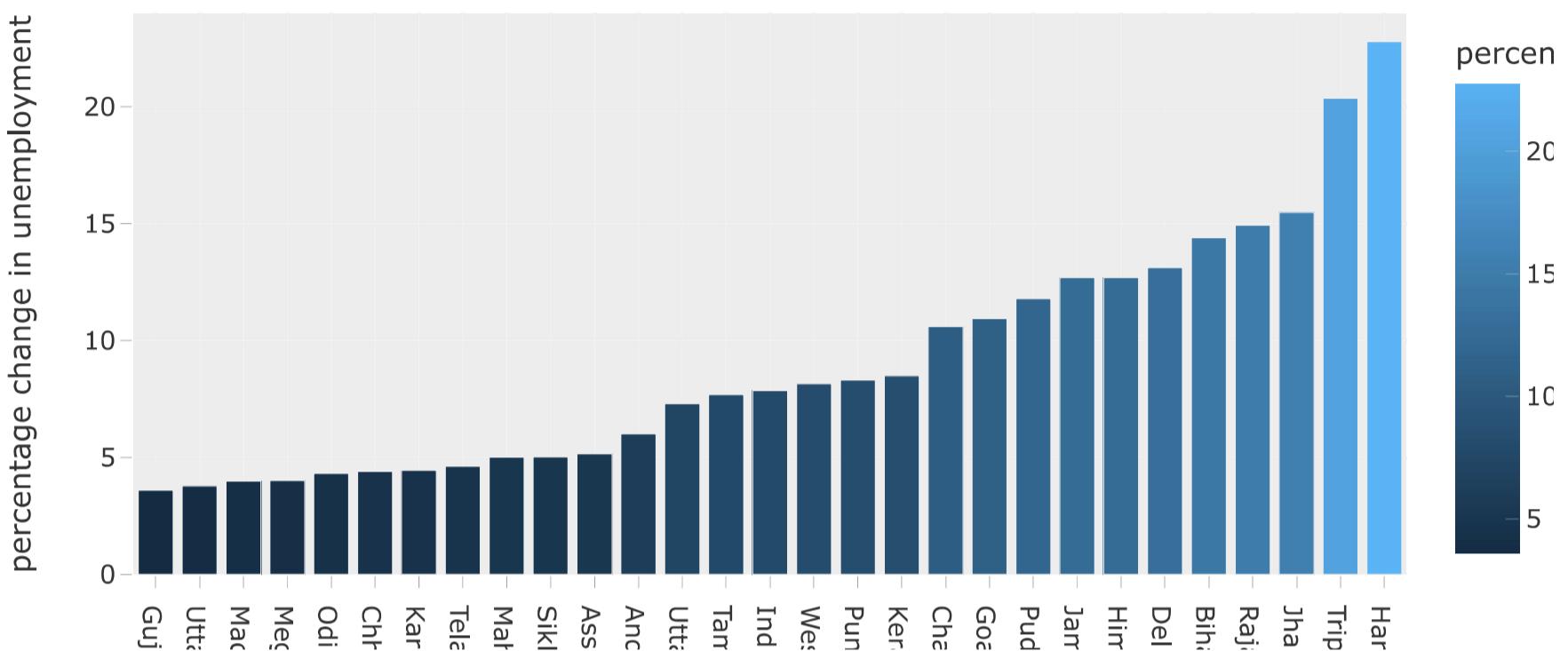
```
In [34]: # percentage change in unemployment rate.
g_lock['percentage change in unemployment'] = round(g_lock['Unemployment Rate after lockdown'] - g
```

```
In [35]: plot_per = g_lock.sort_values('percentage change in unemployment')
```

In [36]: # percentage change in unemployment after Lockdown.

```
fig = px.bar(plot_per, x='States', y='percentage change in unemployment', color='percentage change in unemployment', title='percentage change in Unemployment in each state after lockdown', template='ggplot2')
fig.show()
```

percentage change in Unemployment in each state after lockdown



## 'Most impacted states & Union Territory'.

- Haryana
- Tripura
- Jharkhand
- Rajasthan
- Bihar

## 'Impact of lockdown on employment across states'.

In [37]: # function to sort value based on impact.

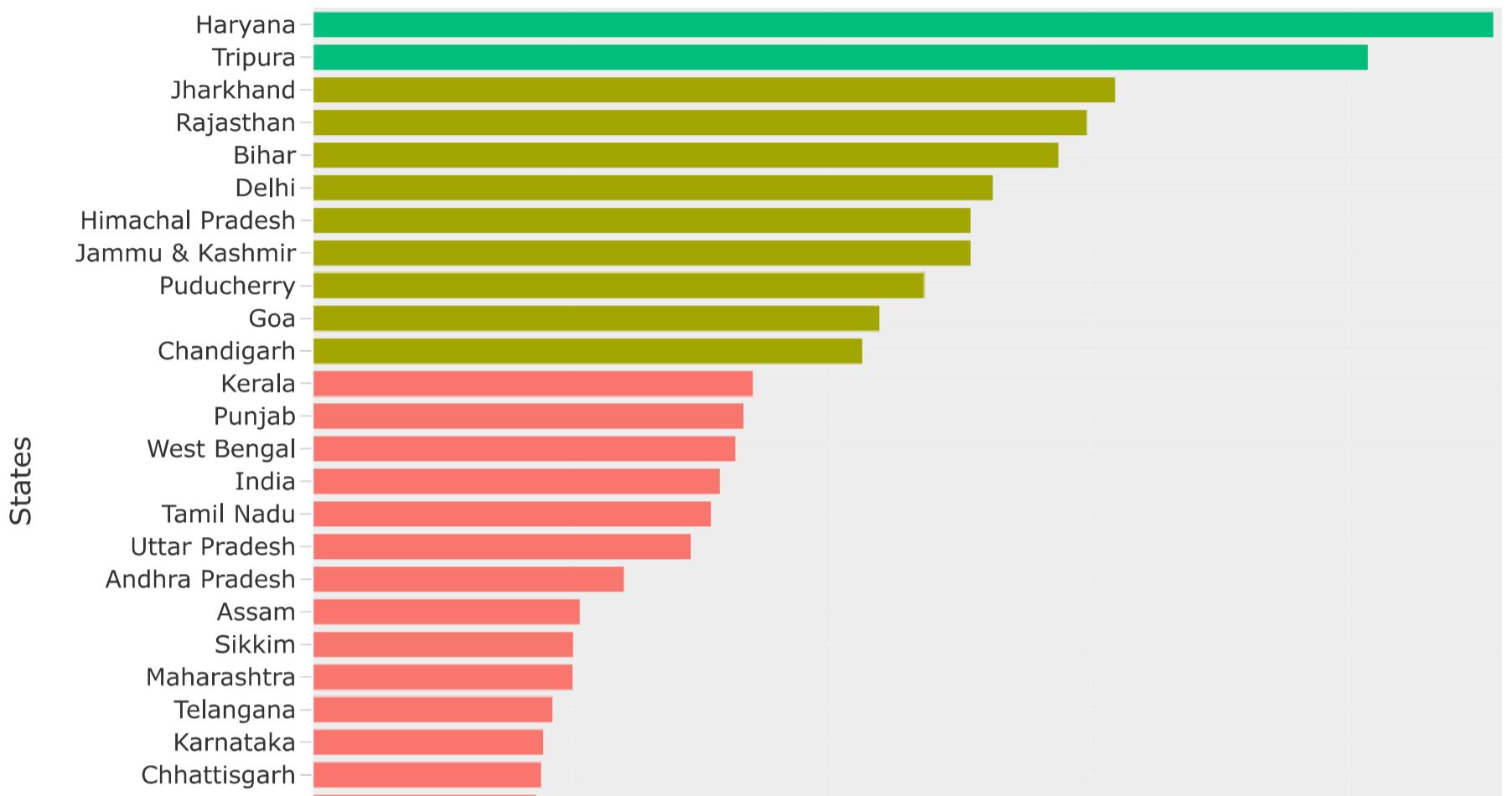
```
def sort_impact(x):
    if x <= 10:
        return 'impacted States'
    elif x <= 20:
        return 'hard impacted States'
    elif x <= 30:
        return 'harder impacted States'
    elif x <= 40:
        return 'hardest impacted States'
    return x
```

In [38]: plot\_per['impact status'] = plot\_per['percentage change in unemployment'].apply(lambda x:sort\_impact(x))

```
In [39]: fig = px.bar(plot_per, y='States',x='percentage change in unemployment',color='impact status',  
title='Impact of lockdown on employment across states',template='ggplot2',height=650)
```

```
fig.show()
```

Impact of lockdown on employment across states



**'Getting Data for Mapping coordinates'.**

```
In [40]: data2 = pd.read_csv("D:/CSV Files/Unemployment/Unemployment Data 2.csv")
data2
```

Out[40]:

|    | States                               | Country | Total Population of Country/State | Date       | Estimated Unemployment Rate (%) | Estimated Employed | Estimated Labour Participation Rate (%) | Region        |
|----|--------------------------------------|---------|-----------------------------------|------------|---------------------------------|--------------------|---|---------------|
| 0  | Andaman and Nicobar Islands          | India   | 380581                            | 31-05-2022 | NaN                             | NaN                | NaN                                     | South Eastern |
| 1  | Andhra Pradesh                       | India   | 49577103                          | 31-05-2022 | 4.38                            | 1.597120e+07       | 37.41                                   | South Eastern |
| 2  | Arunachal Pradesh                    | India   | 1383727                           | 31-05-2022 | NaN                             | NaN                | NaN                                     | North Eastern |
| 3  | Assam                                | India   | 31205576                          | 31-05-2022 | 8.24                            | 1.457290e+07       | 58.13                                   | North Eastern |
| 4  | Bihar                                | India   | 104099452                         | 31-05-2022 | 13.26                           | 2.670459e+07       | 37.04                                   | Eastern       |
| 5  | Chandigarh                           | India   | 1055450                           | 31-05-2022 | NaN                             | NaN                | NaN                                     | North Western |
| 6  | Chhattisgarh                         | India   | 29436231                          | 31-05-2022 | 0.71                            | 9.128904e+06       | 39.3                                    | Central       |
| 7  | Dadra and Nagar Haveli Daman and Diu | India   | 585764                            | 31-05-2022 | NaN                             | NaN                | NaN                                     | Western       |
| 8  | Delhi                                | India   | 16787941                          | 31-05-2022 | 13.64                           | 5.432451e+06       | 37.6                                    | North Central |
| 9  | Goa                                  | India   | 1458545                           | 31-05-2022 | 13.42                           | 3.743290e+05       | 32.74                                   | South Western |
| 10 | Gujarat                              | India   | 60439692                          | 31-05-2022 | 2.10                            | 2.540074e+07       | 46.64                                   | Western       |
| 11 | Haryana                              | India   | 25351462                          | 31-05-2022 | 24.60                           | 7.351377e+06       | 41.25                                   | Northern      |
| 12 | Himachal Pradesh                     | India   | 6864602                           | 31-05-2022 | 9.58                            | 2.022323e+06       | 35.35                                   | Northern      |
| 13 | India                                | India   | 1352642280                        | 31-05-2022 | 7.12                            | 4.039812e+08       | 39.91                                   | All           |
| 14 | Jammu & Kashmir                      | India   | 12267032                          | 31-05-2022 | 18.30                           | 3.347152e+06       | 37.24                                   | Northern      |
| 15 | Jharkhand                            | India   | 32988134                          | 31-05-2022 | 13.14                           | 1.054540e+07       | 42.96                                   | Eastern       |
| 16 | Karnataka                            | India   | 61130704                          | 31-05-2022 | 4.27                            | 2.137232e+07       | 38.14                                   | Western       |
| 17 | Kerala                               | India   | 34630192                          | 31-05-2022 | 5.83                            | 9.545387e+06       | 35.06                                   | South Western |
| 18 | Ladakh                               | India   | 274000                            | 31-05-2022 | NaN                             | NaN                | NaN                                     | Northern      |
| 19 | Lakshadweep                          | India   | 64473                             | 31-05-2022 | NaN                             | NaN                | NaN                                     | South Western |

|    | States         | Country | Total Population of Country/State | Date       | Estimated Unemployment Rate (%) | Estimated Employed | Estimated Labour Participation Rate (%) | Region        |
|----|----------------|---------|-----------------------------------|------------|---------------------------------|--------------------|---|---------------|
| 20 | Madhya Pradesh | India   | 72626809                          | 31-05-2022 | 1.65                            | 2.345039e+07       | 36.83                                   | Central       |
| 21 | Maharashtra    | India   | 112374333                         | 31-05-2022 | 4.08                            | 4.307540e+07       | 41.9                                    | Western       |
| 22 | Manipur        | India   | 2570390                           | 31-05-2022 | Nan                             | Nan                | Nan                                     | North Eastern |
| 23 | Meghalaya      | India   | 2966889                           | 31-05-2022 | 4.06                            | 1.465621e+06       | 61.62                                   | North Eastern |
| 24 | Mizoram        | India   | 1097206                           | 31-05-2022 | Nan                             | Nan                | Nan                                     | North Eastern |
| 25 | Nagaland       | India   | 1978502                           | 31-05-2022 | Nan                             | Nan                | Nan                                     | North Eastern |
| 26 | Odisha         | India   | 41974219                          | 31-05-2022 | 2.62                            | 1.434300e+07       | 39.62                                   | Eastern       |
| 27 | Puducherry     | India   | 1394467                           | 31-05-2022 | 5.58                            | 4.490160e+05       | 36.08                                   | Southern      |
| 28 | Punjab         | India   | 27743338                          | 31-05-2022 | 9.15                            | 9.172799e+06       | 38.77                                   | North Western |
| 29 | Rajasthan      | India   | 68548437                          | 31-05-2022 | 22.20                           | 2.078312e+07       | 43.76                                   | North Western |
| 30 | Sikkim         | India   | 610577                            | 31-05-2022 | 7.52                            | 2.676990e+05       | 47.02                                   | North Eastern |
| 31 | Tamil Nadu     | India   | 72147030                          | 31-05-2022 | 3.09                            | 2.176455e+07       | 33.01                                   | Southern      |
| 32 | Telangana      | India   | 35003674                          | 31-05-2022 | 9.38                            | 1.682925e+07       | 56.03                                   | South Eastern |
| 33 | Tripura        | India   | 3673917                           | 31-05-2022 | 17.35                           | 1.369861e+06       | 49.02                                   | North Eastern |
| 34 | Uttar Pradesh  | India   | 241066874                         | 31-05-2022 | 3.13                            | 5.503209e+07       | 32.91                                   | Northern      |
| 35 | Uttarakhand    | India   | 10086292                          | 31-05-2022 | 2.85                            | 2.575497e+06       | 28.69                                   | Northern      |
| 36 | West Bengal    | India   | 91347736                          | Nan        | 37816306.00                     | 4.681000e+01       | Eastern                                 | Nan           |

## 'Adding Column In Data for geographical use'.

```
In [41]: data2['Location']= data2['States']+", "+data2['Country']
```

## 'Getting Latitude and Longitude for plotting map'.

```
In [42]: from geopy.geocoders import Nominatim  
geocoder = Nominatim(user_agent = 'Rajkumar')  
from geopy.extra.rate_limiter import RateLimiter  
geocode = RateLimiter(geocoder.geocode, min_delay_seconds = 1, return_value_on_exception = None)
```

```
In [43]: data2['Latitude']=data2['Location'].apply(lambda x: geocode(x).latitude)
```

```
In [44]: data2['Longitude']=data2['Location'].apply(lambda x: geocode(x).longitude)
```

In [45]: data2

Out[45]:

|    | States                               | Country | Total Population of Country/State | Date       | Estimated Unemployment Rate (%) | Estimated Employed | Estimated Labour Participation Rate (%) | Region        | Location                                    |
|----|--------------------------------------|---------|-----------------------------------|------------|---------------------------------|--------------------|---|---------------|---|
| 0  | Andaman and Nicobar Islands          | India   | 380581                            | 31-05-2022 | NaN                             | NaN                | NaN                                     | South Eastern | Andaman and Nicobar Islands, India          |
| 1  | Andhra Pradesh                       | India   | 49577103                          | 31-05-2022 | 4.38                            | 1.597120e+07       | 37.41                                   | South Eastern | Andhra Pradesh, India                       |
| 2  | Arunachal Pradesh                    | India   | 1383727                           | 31-05-2022 | NaN                             | NaN                | NaN                                     | North Eastern | Arunachal Pradesh, India                    |
| 3  | Assam                                | India   | 31205576                          | 31-05-2022 | 8.24                            | 1.457290e+07       | 58.13                                   | North Eastern | Assam, India                                |
| 4  | Bihar                                | India   | 104099452                         | 31-05-2022 | 13.26                           | 2.670459e+07       | 37.04                                   | Eastern       | Bihar, India                                |
| 5  | Chandigarh                           | India   | 1055450                           | 31-05-2022 | NaN                             | NaN                | NaN                                     | North Western | Chandigarh, India                           |
| 6  | Chhattisgarh                         | India   | 29436231                          | 31-05-2022 | 0.71                            | 9.128904e+06       | 39.3                                    | Central       | Chhattisgarh, India                         |
| 7  | Dadra and Nagar Haveli Daman and Diu | India   | 585764                            | 31-05-2022 | NaN                             | NaN                | NaN                                     | Western       | Dadra and Nagar Haveli Daman and Diu, India |
| 8  | Delhi                                | India   | 16787941                          | 31-05-2022 | 13.64                           | 5.432451e+06       | 37.6                                    | North Central | Delhi, India                                |
| 9  | Goa                                  | India   | 1458545                           | 31-05-2022 | 13.42                           | 3.743290e+05       | 32.74                                   | South Western | Goa, India                                  |
| 10 | Gujarat                              | India   | 60439692                          | 31-05-2022 | 2.10                            | 2.540074e+07       | 46.64                                   | Western       | Gujarat, India                              |
| 11 | Haryana                              | India   | 25351462                          | 31-05-2022 | 24.60                           | 7.351377e+06       | 41.25                                   | Northern      | Haryana, India                              |
| 12 | Himachal Pradesh                     | India   | 6864602                           | 31-05-2022 | 9.58                            | 2.022323e+06       | 35.35                                   | Northern      | Himachal Pradesh, India                     |
| 13 | India                                | India   | 1352642280                        | 31-05-2022 | 7.12                            | 4.039812e+08       | 39.91                                   | All           | India, India                                |
| 14 | Jammu & Kashmir                      | India   | 12267032                          | 31-05-2022 | 18.30                           | 3.347152e+06       | 37.24                                   | Northern      | Jammu & Kashmir, India                      |
| 15 | Jharkhand                            | India   | 32988134                          | 31-05-2022 | 13.14                           | 1.054540e+07       | 42.96                                   | Eastern       | Jharkhand, India                            |
| 16 | Karnataka                            | India   | 61130704                          | 31-05-2022 | 4.27                            | 2.137232e+07       | 38.14                                   | Western       | Karnataka, India                            |
| 17 | Kerala                               | India   | 34630192                          | 31-05-2022 | 5.83                            | 9.545387e+06       | 35.06                                   | South Western | Kerala, India                               |
| 18 | Ladakh                               | India   | 274000                            | 31-05-2022 | NaN                             | NaN                | NaN                                     | Northern      | Ladakh, India                               |
| 19 | Lakshadweep                          | India   | 64473                             | 31-05-2022 | NaN                             | NaN                | NaN                                     | South Western | Lakshadweep, India                          |

|    |                | States | Country   | Total Population of Country/State | Date        | Estimated Unemployment Rate (%) | Estimated Employed | Estimated Labour Participation Rate (%) | Region                | Location |
|----|----------------|--------|-----------|-----------------------------------|-------------|---------------------------------|--------------------|---|-----------------------|----------|
| 20 | Madhya Pradesh | India  | 72626809  | 31-05-2022                        | 1.65        | 2.345039e+07                    | 36.83              | Central                                 | Madhya Pradesh, India |          |
| 21 | Maharashtra    | India  | 112374333 | 31-05-2022                        | 4.08        | 4.307540e+07                    | 41.9               | Western                                 | Maharashtra, India    |          |
| 22 | Manipur        | India  | 2570390   | 31-05-2022                        | NaN         | NaN                             | NaN                | North Eastern                           | Manipur, India        |          |
| 23 | Meghalaya      | India  | 2966889   | 31-05-2022                        | 4.06        | 1.465621e+06                    | 61.62              | North Eastern                           | Meghalaya, India      |          |
| 24 | Mizoram        | India  | 1097206   | 31-05-2022                        | NaN         | NaN                             | NaN                | North Eastern                           | Mizoram, India        |          |
| 25 | Nagaland       | India  | 1978502   | 31-05-2022                        | NaN         | NaN                             | NaN                | North Eastern                           | Nagaland, India       |          |
| 26 | Odisha         | India  | 41974219  | 31-05-2022                        | 2.62        | 1.434300e+07                    | 39.62              | Eastern                                 | Odisha, India         |          |
| 27 | Puducherry     | India  | 1394467   | 31-05-2022                        | 5.58        | 4.490160e+05                    | 36.08              | Southern                                | Puducherry, India     |          |
| 28 | Punjab         | India  | 27743338  | 31-05-2022                        | 9.15        | 9.172799e+06                    | 38.77              | North Western                           | Punjab, India         |          |
| 29 | Rajasthan      | India  | 68548437  | 31-05-2022                        | 22.20       | 2.078312e+07                    | 43.76              | North Western                           | Rajasthan, India      |          |
| 30 | Sikkim         | India  | 610577    | 31-05-2022                        | 7.52        | 2.676990e+05                    | 47.02              | North Eastern                           | Sikkim, India         |          |
| 31 | Tamil Nadu     | India  | 72147030  | 31-05-2022                        | 3.09        | 2.176455e+07                    | 33.01              | Southern                                | Tamil Nadu, India     |          |
| 32 | Telangana      | India  | 35003674  | 31-05-2022                        | 9.38        | 1.682925e+07                    | 56.03              | South Eastern                           | Telangana, India      |          |
| 33 | Tripura        | India  | 3673917   | 31-05-2022                        | 17.35       | 1.369861e+06                    | 49.02              | North Eastern                           | Tripura, India        |          |
| 34 | Uttar Pradesh  | India  | 241066874 | 31-05-2022                        | 3.13        | 5.503209e+07                    | 32.91              | Northern                                | Uttar Pradesh, India  |          |
| 35 | Uttarakhand    | India  | 10086292  | 31-05-2022                        | 2.85        | 2.575497e+06                    | 28.69              | Northern                                | Uttarakhand, India    |          |
| 36 | West Bengal    | India  | 91347736  | NaN                               | 37816306.00 | 4.681000e+01                    | Eastern            | NaN                                     | West Bengal, India    |          |

## 'Final CSV'.

```
In [46]: data2.to_csv("D:/CSV Files/Unemployment/Final Unemployment Data.csv")
```

## 'Removing Null values Rows'.

```
In [47]: data2.columns= ["States","Country","Total Population of Country/State","Date",
"Estimated Unemployment Rate",
"Estimated Employed",
"Estimated Labour Participation Rate",
"Region","Location","Latitude","Longitude"]
data2
```

Out[47]:

|   | States                      | Country | Total Population of Country/State | Date       | Estimated Unemployment Rate | Estimated Employed | Estimated Labour Participation Rate | Region        | Location                           |
|---|-----------------------------|---------|-----------------------------------|------------|-----------------------------|--------------------|-------------------------------------|---------------|------------------------------------|
| 0 | Andaman and Nicobar Islands | India   | 380581                            | 31-05-2022 | NaN                         | NaN                | NaN                                 | South Eastern | Andaman and Nicobar Islands, India |
| 1 | Andhra Pradesh              | India   | 49577103                          | 31-05-2022 | 4.38                        | 1.597120e+07       | 37.41                               | South Eastern | Andhra Pradesh, India              |
| 2 | Arunachal Pradesh           | India   | 1383727                           | 31-05-2022 | NaN                         | NaN                | NaN                                 | North Eastern | Arunachal Pradesh, India           |
| 3 | Assam                       | India   | 31205576                          | 31-05-2022 | 8.24                        | 1.457290e+07       | 58.13                               | North Eastern | Assam, India                       |

```
In [48]: data2 = data2.dropna(inplace=False)
print(data2)
```

|    | States           | Country | Total Population of Country/State | Date       | \ |
|----|------------------|---------|-----------------------------------|------------|---|
| 1  | Andhra Pradesh   | India   | 49577103                          | 31-05-2022 |   |
| 3  | Assam            | India   | 31205576                          | 31-05-2022 |   |
| 4  | Bihar            | India   | 104099452                         | 31-05-2022 |   |
| 6  | Chhattisgarh     | India   | 29436231                          | 31-05-2022 |   |
| 8  | Delhi            | India   | 16787941                          | 31-05-2022 |   |
| 9  | Goa              | India   | 1458545                           | 31-05-2022 |   |
| 10 | Gujarat          | India   | 60439692                          | 31-05-2022 |   |
| 11 | Haryana          | India   | 25351462                          | 31-05-2022 |   |
| 12 | Himachal Pradesh | India   | 6864602                           | 31-05-2022 |   |
| 13 | India            | India   | 1352642280                        | 31-05-2022 |   |
| 14 | Jammu & Kashmir  | India   | 12267032                          | 31-05-2022 |   |
| 15 | Jharkhand        | India   | 32988134                          | 31-05-2022 |   |
| 16 | Karnataka        | India   | 61130704                          | 31-05-2022 |   |
| 17 | Kerala           | India   | 34630192                          | 31-05-2022 |   |
| 20 | Madhya Pradesh   | India   | 72626809                          | 31-05-2022 |   |
| 21 | Maharashtra      | India   | 112374333                         | 31-05-2022 |   |
| 23 | Meghalaya        | India   | 2966889                           | 31-05-2022 |   |
| 26 | Odisha           | India   | 41974219                          | 31-05-2022 |   |
| 27 | Punjab           | India   | 3201167                           | 31-05-2022 |   |

In [49]: data2

Out[49]:

|    | States           | Country | Total Population of Country/State | Date       | Estimated Unemployment Rate | Estimated Employed | Estimated Labour Participation Rate | Region        | Location                | Latitude |
|----|------------------|---------|-----------------------------------|------------|-----------------------------|--------------------|-------------------------------------|---------------|-------------------------|----------|
| 1  | Andhra Pradesh   | India   | 49577103                          | 31-05-2022 | 4.38                        | 15971197.0         | 37.41                               | South Eastern | Andhra Pradesh, India   | 15.9241  |
| 3  | Assam            | India   | 31205576                          | 31-05-2022 | 8.24                        | 14572896.0         | 58.13                               | North Eastern | Assam, India            | 26.4071  |
| 4  | Bihar            | India   | 104099452                         | 31-05-2022 | 13.26                       | 26704592.0         | 37.04                               | Eastern       | Bihar, India            | 25.6441  |
| 6  | Chhattisgarh     | India   | 29436231                          | 31-05-2022 | 0.71                        | 9128904.0          | 39.3                                | Central       | Chhattisgarh, India     | 21.6631  |
| 8  | Delhi            | India   | 16787941                          | 31-05-2022 | 13.64                       | 5432451.0          | 37.6                                | North Central | Delhi, India            | 28.6511  |
| 9  | Goa              | India   | 1458545                           | 31-05-2022 | 13.42                       | 374329.0           | 32.74                               | South Western | Goa, India              | 15.3501  |
| 10 | Gujarat          | India   | 60439692                          | 31-05-2022 | 2.10                        | 25400738.0         | 46.64                               | Western       | Gujarat, India          | 22.3851  |
| 11 | Haryana          | India   | 25351462                          | 31-05-2022 | 24.60                       | 7351377.0          | 41.25                               | Northern      | Haryana, India          | 29.0001  |
| 12 | Himachal Pradesh | India   | 6864602                           | 31-05-2022 | 9.58                        | 2022323.0          | 35.35                               | Northern      | Himachal Pradesh, India | 31.8161  |
| 13 | India            | India   | 1352642280                        | 31-05-2022 | 7.12                        | 403981241.0        | 39.91                               | All           | India, India            | 22.351   |
| 14 | Jammu & Kashmir  | India   | 12267032                          | 31-05-2022 | 18.30                       | 3347152.0          | 37.24                               | Northern      | Jammu & Kashmir, India  | 32.7181  |
| 15 | Jharkhand        | India   | 32988134                          | 31-05-2022 | 13.14                       | 10545402.0         | 42.96                               | Eastern       | Jharkhand, India        | 23.6571  |
| 16 | Karnataka        | India   | 61130704                          | 31-05-2022 | 4.27                        | 21372315.0         | 38.14                               | Western       | Karnataka, India        | 14.5201  |
| 17 | Kerala           | India   | 34630192                          | 31-05-2022 | 5.83                        | 9545387.0          | 35.06                               | South Western | Kerala, India           | 10.3521  |
| 20 | Madhya Pradesh   | India   | 72626809                          | 31-05-2022 | 1.65                        | 23450391.0         | 36.83                               | Central       | Madhya Pradesh, India   | 23.8141  |
| 21 | Maharashtra      | India   | 112374333                         | 31-05-2022 | 4.08                        | 43075396.0         | 41.9                                | Western       | Maharashtra, India      | 18.9061  |
| 23 | Meghalaya        | India   | 2966889                           | 31-05-2022 | 4.06                        | 1465621.0          | 61.62                               | North Eastern | Meghalaya, India        | 25.5371  |
| 26 | Odisha           | India   | 41974219                          | 31-05-2022 | 2.62                        | 14342999.0         | 39.62                               | Eastern       | Odisha, India           | 20.5431  |
| 27 | Puducherry       | India   | 1394467                           | 31-05-2022 | 5.58                        | 449016.0           | 36.08                               | Southern      | Puducherry, India       | 11.9341  |
| 28 | Punjab           | India   | 27743338                          | 31-05-2022 | 9.15                        | 9172799.0          | 38.77                               | North Western | Punjab, India           | 30.9291  |

|    | States        | Country | Total Population of Country/State | Date       | Estimated Unemployment Rate | Estimated Employed | Estimated Labour Participation Rate | Region        | Location             | Latitude |
|----|---------------|---------|-----------------------------------|------------|-----------------------------|--------------------|-------------------------------------|---------------|----------------------|----------|
|    |               |         |                                   |            |                             |                    |                                     |               |                      |          |
| 29 | Rajasthan     | India   | 68548437                          | 31-05-2022 | 22.20                       | 20783118.0         | 43.76                               | North Western | Rajasthan, India     | 26.8101  |
| 30 | Sikkim        | India   | 610577                            | 31-05-2022 | 7.52                        | 267699.0           | 47.02                               | North Eastern | Sikkim, India        | 27.6011  |
| 31 | Tamil Nadu    | India   | 72147030                          | 31-05-2022 | 3.09                        | 21764549.0         | 33.01                               | Southern      | Tamil Nadu, India    | 10.9094  |
| 32 | Telangana     | India   | 35003674                          | 31-05-2022 | 9.38                        | 16829246.0         | 56.03                               | South Eastern | Telangana, India     | 17.8491  |
| 33 | Tripura       | India   | 3673917                           | 31-05-2022 | 17.35                       | 1369861.0          | 49.02                               | North Eastern | Tripura, India       | 23.7751  |
| 34 | Uttar Pradesh | India   | 241066874                         | 31-05-2022 | 3.13                        | 55032093.0         | 32.91                               | Northern      | Uttar Pradesh, India | 27.1301  |
| 35 | Uttarakhand   | India   | 10086292                          | 31-05-2022 | 2.85                        | 2575497.0          | 28.69                               | Northern      | Uttarakhand, India   | 30.0411  |



**'Plotting Sunburst Figure on whole data to show Specifically Unemployment Rate in India in last Month May 2022'.**

```
In [50]: unemplooment = data2[["States", "Region", "Estimated Unemployment Rate"]]
figure = px.sunburst(unemplooment, path=["Region", "States"],
                     values="Estimated Unemployment Rate",
                     width=700, height=700, color_continuous_scale="RdY1Gn",
                     title="Unemployment Rate in India on 31 May 2022")
figure.show()
```

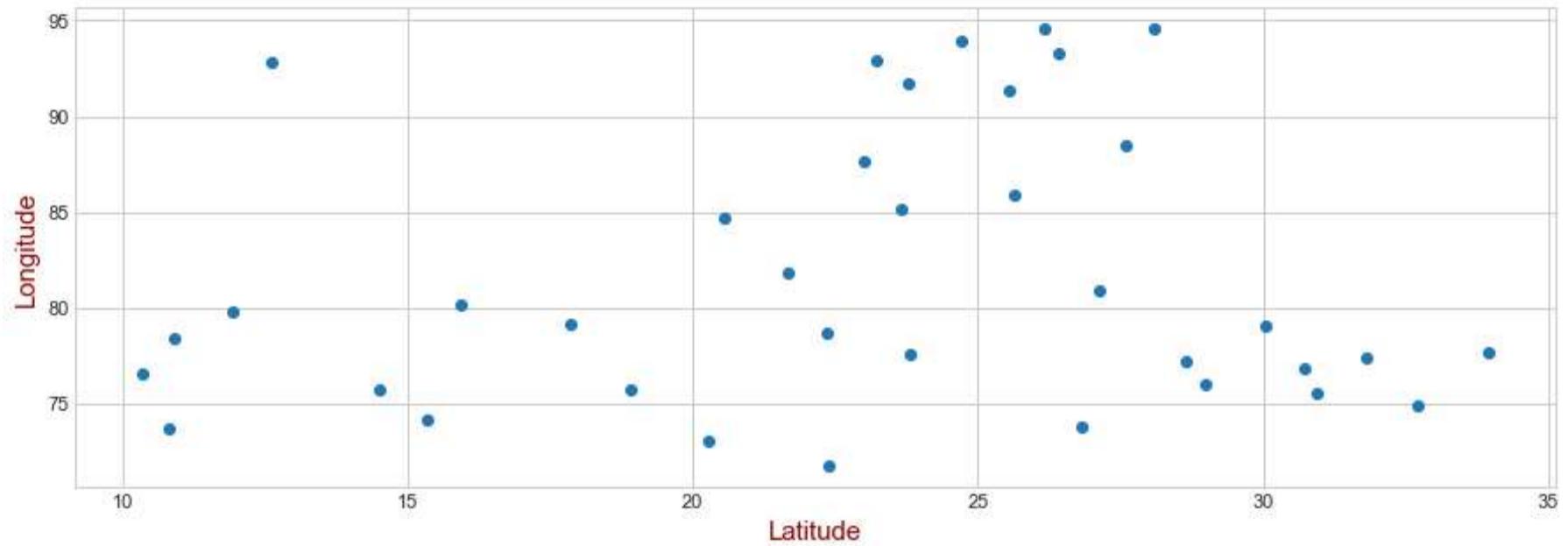
Unemployment Rate in India on 31 May 2022



**'Scatter plot on latitude and longitude'.**

```
In [51]: import matplotlib.pyplot as plt

#get data
df = pd.read_csv("D:/CSV Files/Unemployment/Final Unemployment Data.csv")
plt.scatter(x=df['Latitude'], y=df['Longitude'])
plt.xlabel('Latitude', color = 'darkred', size = 15)
plt.ylabel('Longitude', color = 'darkred', size = 15)
plt.xticks(rotation = 0)
plt.show()
```

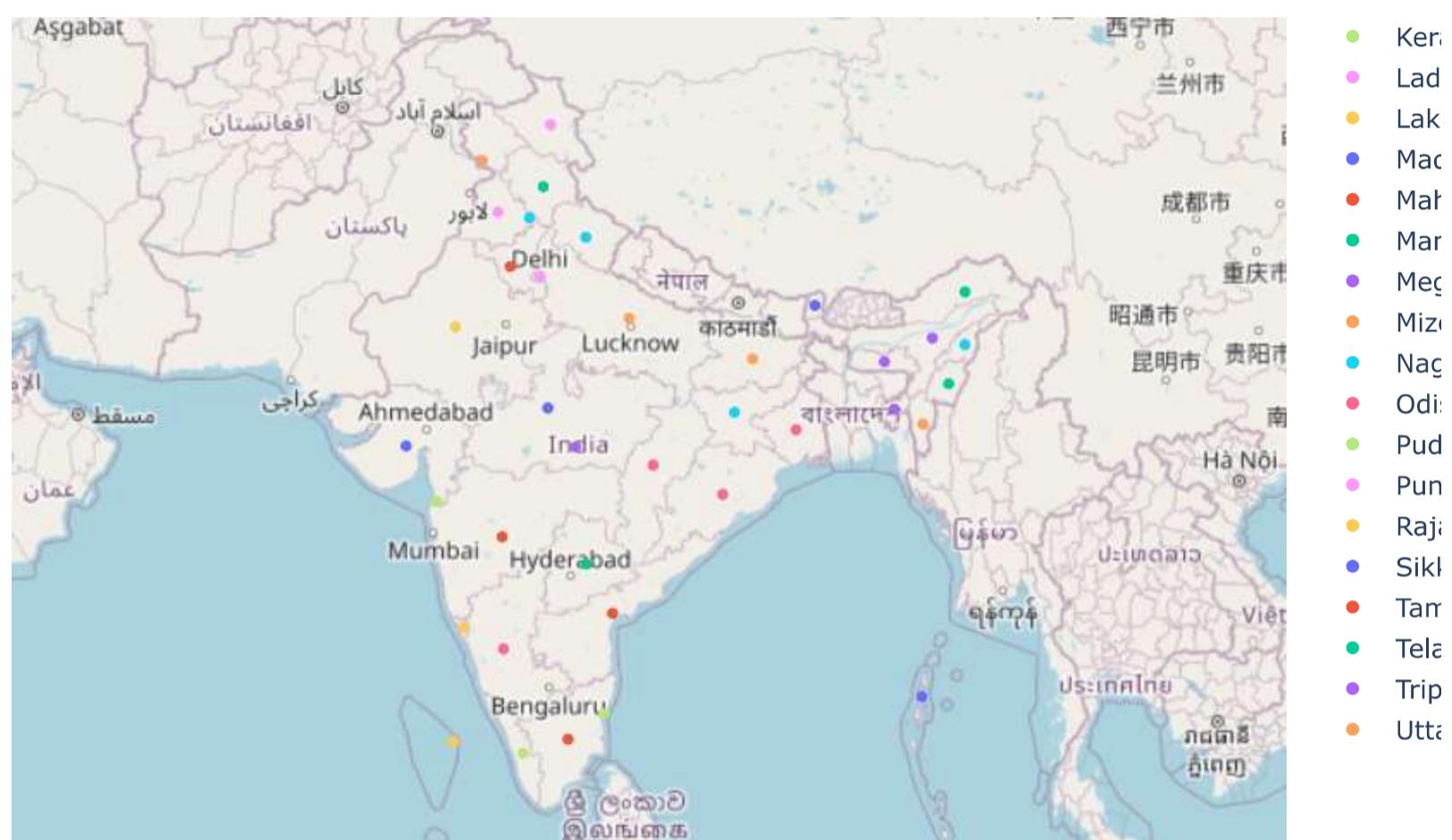


**'Map of india showing states using latitude and longitude'.**

```
In [52]: # import packages
import pandas as pd
import plotly.express as px
import numpy as np

#get data
fd = pd.read_csv("D:/CSV Files/Unemployment/Final Unemployment Data.csv")
fd.head()

# two-line code
fig = px.scatter_mapbox(fd, lat=fd['Latitude'], lon=fd['Longitude'], color='States', zoom=3, mapbox_center_lat=20, mapbox_center_lon=75)
fig.show()
```



**'Get the whole running time duration of this project'.**

```
In [53]: end_time=dt.now()
print('Duration: {}'.format(end_time-start_time))
```

Duration: 0:01:24.266844

..."Thank you"...

**Project by Rajkumar Choudhary...**

**School of Data Science and Forecasting...**

**End...**

