```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
import plotly.graph_objs as go
```

```
df = pd.read_csv('census2011.csv')
# Preprocessing
```

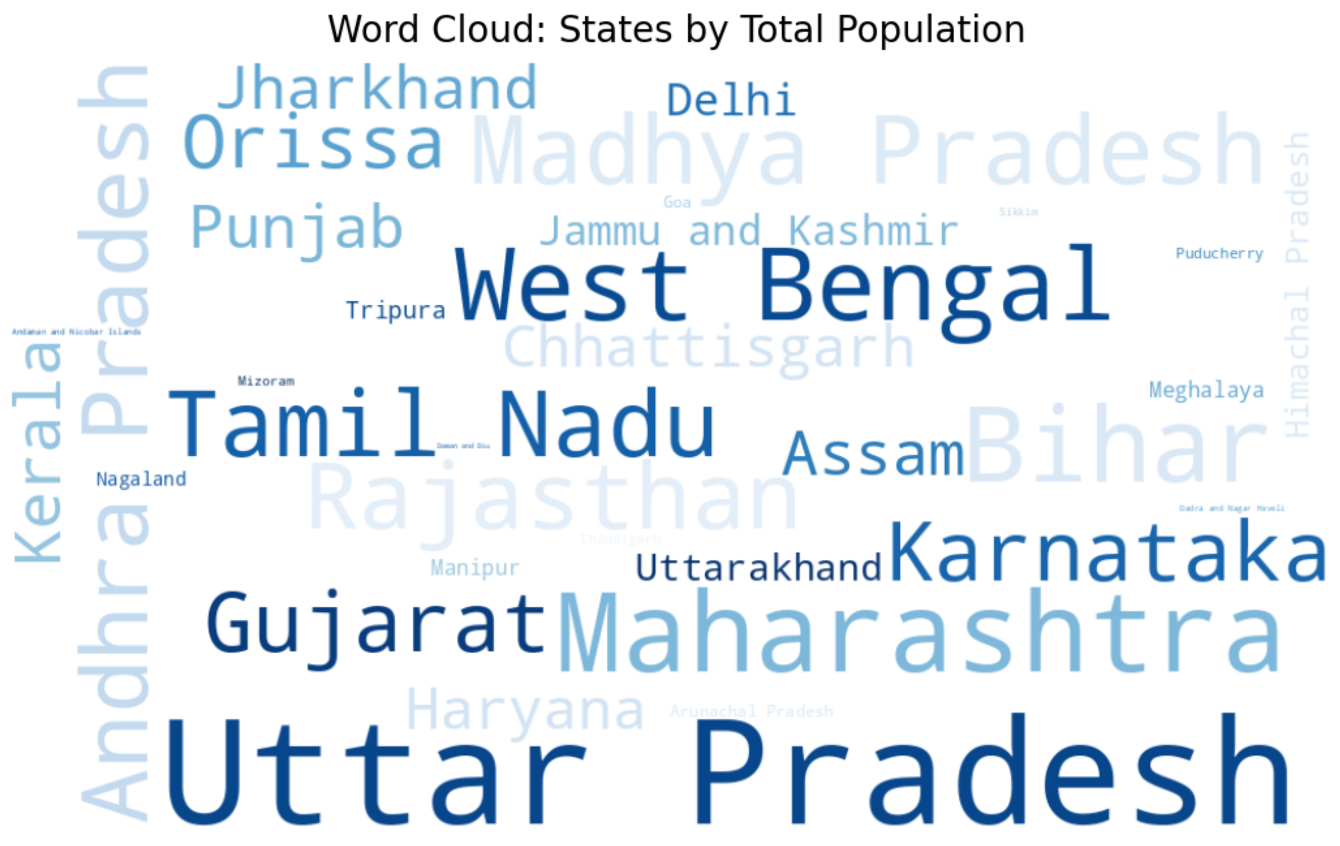
```
df.head()
```

	Ranking	District	State	Population	Growth	Sex-Ratio	Literacy
0	1	Thane	Maharashtra	11,060,148	36.01 %	886	84.53
1	2	North Twenty Four Parganas	West Bengal	10,009,781	12.04 %	955	84.06
2	3	Bangalore	Karnataka	9,621,551	47.18 %	916	87.67
3	4	Pune	Maharashtra	9,429,408	30.37 %	915	86.15
4	5	Mumbai Suburban	Maharashtra	9,356,962	8.29 %	860	89.91

Next steps: Generate code with df View recommended plots New interactive sheet

```
import pandas as pd
import matplotlib.pyplot as plt
from wordcloud import WordCloud

# Load the data
df = pd.read_csv('census2011.csv')

# Cleaning the Population column
def clean_population_value(value):
    # Remove any non-numeric characters and convert to integer
    value = ''.join(filter(str.isdigit, str(value)))
    return int(value) if value else 0

# Apply the cleaning function to the Population column
df['Population'] = df['Population'].apply(clean_population_value)

# Check the cleaned data
print(df[['State', 'Population']].head(10))

# Aggregate the population by state
state_population = df.groupby('State')['Population'].sum().reset_index()

# Check the aggregated population data
print(state_population)

# Create a dictionary with states as keys and total population as values
word_freq = {row['State']: row['Population'] for index, row in state_population.iterrows()}

# Generate the word cloud
wordcloud = WordCloud(
    width=1000,
    height=600,
    background_color='white',
    colormap='Blues',
    normalize_plurals=False
).generate_from_frequencies(word_freq)

# Plot the word cloud
plt.figure(figsize=(15, 8))
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis('off')
plt.title("Word Cloud: States by Total Population", fontsize=20)
plt.show()
```

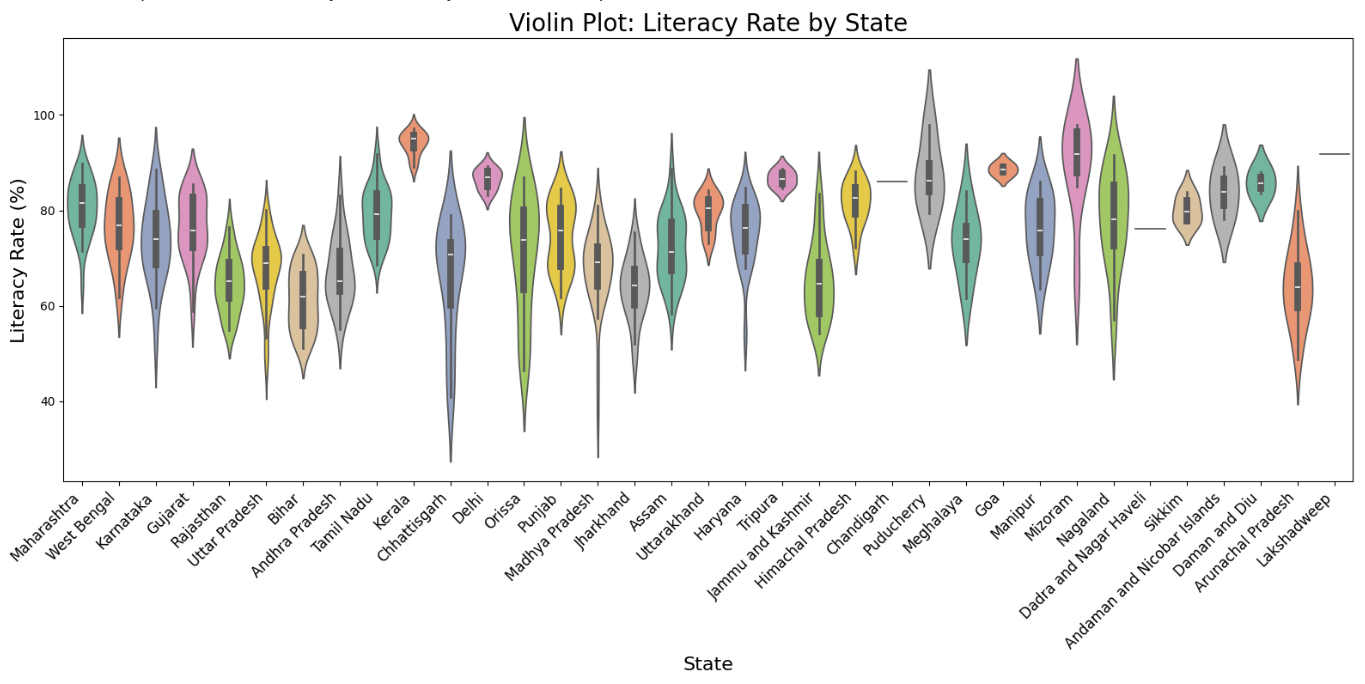
```
         State  Population
0  Maharashtra    11060148
1  West Bengal    10009781
2    Karnataka     9621551
3  Maharashtra     9429408
4  Maharashtra     9356962
5  West Bengal     8161961
6  West Bengal     7717563
7      Gujarat     7214225
8  West Bengal     7103807
9    Rajasthan     6626178
                          State  Population
0   Andaman and Nicobar Islands      380581
1                Andhra Pradesh    67459740
2             Arunachal Pradesh     1383727
3                         Assam    28381808
4                         Bihar    89751364
5                    Chandigarh     1055450
6                  Chhattisgarh    25545198
7        Dadra and Nagar Haveli      343709
8                 Daman and Diu      243247
9                         Delhi    14056012
10                          Goa     1458545
11                      Gujarat    54816245
12                      Haryana    25351462
13             Himachal Pradesh     6864602
14              Jammu and Kashmir    12541302
15                    Jharkhand    27389394
16                    Karnataka    55415190
17                       Kerala    30596127
18                  Lakshadweep       64473
19               Madhya Pradesh    72626809
20                  Maharashtra   100887656
21                      Manipur     2855794
22                    Meghalaya     2966889
23                      Mizoram     1097206
24                     Nagaland     1978502
25                       Orissa    41974218
26                   Puducherry     1247953
27                       Punjab    27743338
28                    Rajasthan    68548437
29                       Sikkim      610577
30                   Tamil Nadu    69424740
31                      Tripura     3673917
32                Uttar Pradesh   194121100
33                  Uttarakhand    10086292
34                  West Bengal    82519780
```



Obeservation :- Uttar Pradesh has Highest Population

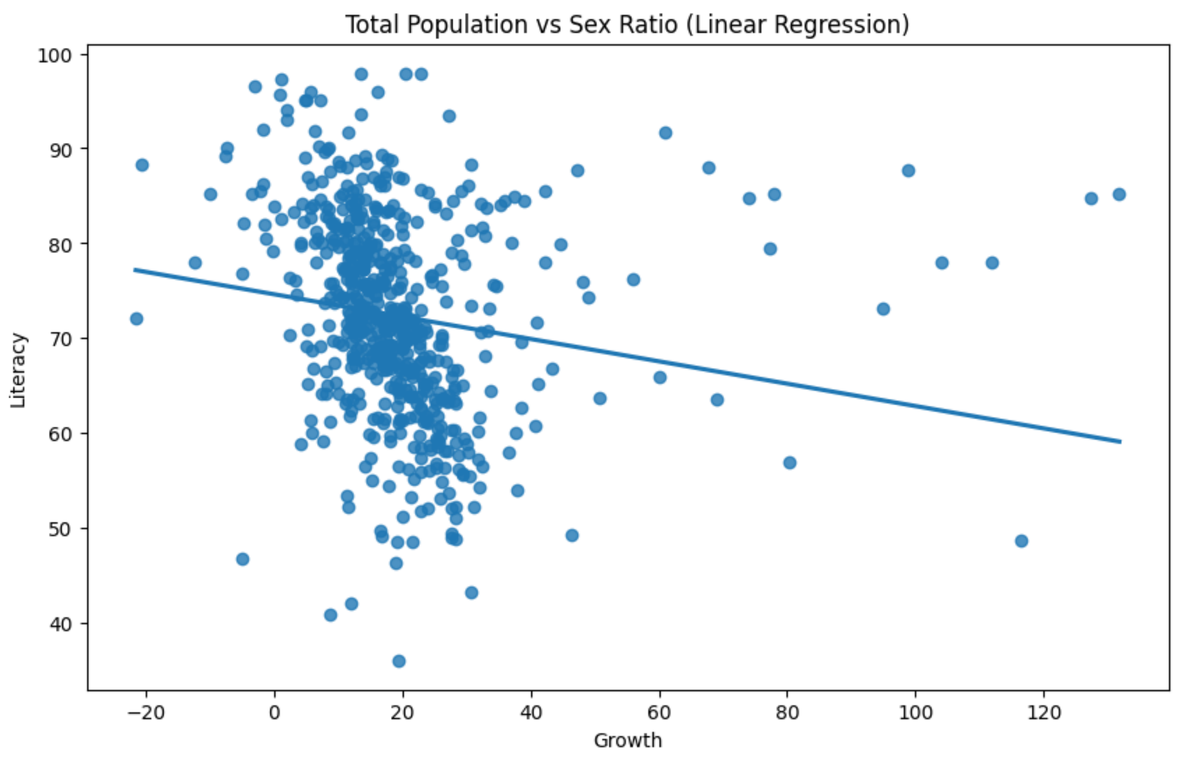
```
import seaborn as sns
import matplotlib.pyplot as plt

# Create the Violin Plot
plt.figure(figsize=(16, 8))  # Increase the figure size for better readability
sns.violinplot(x="State", y="Literacy", data=df, palette="Set2")

# Title and labels
plt.title("Violin Plot: Literacy Rate by State", fontsize=20)
plt.xlabel("State", fontsize=16)
plt.ylabel("Literacy Rate (%)", fontsize=16)

# Rotate x-axis labels
plt.xticks(rotation=45, ha='right', fontsize=12)  # Rotate labels 45 degrees and align to the right

# Show the plot
plt.tight_layout()  # Adjust layout to fit everything
plt.show()
```

```
<ipython-input-43-6887bcd7aa55>:6: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `

  sns.violinplot(x="State", y="Literacy", data=df, palette="Set2")
```



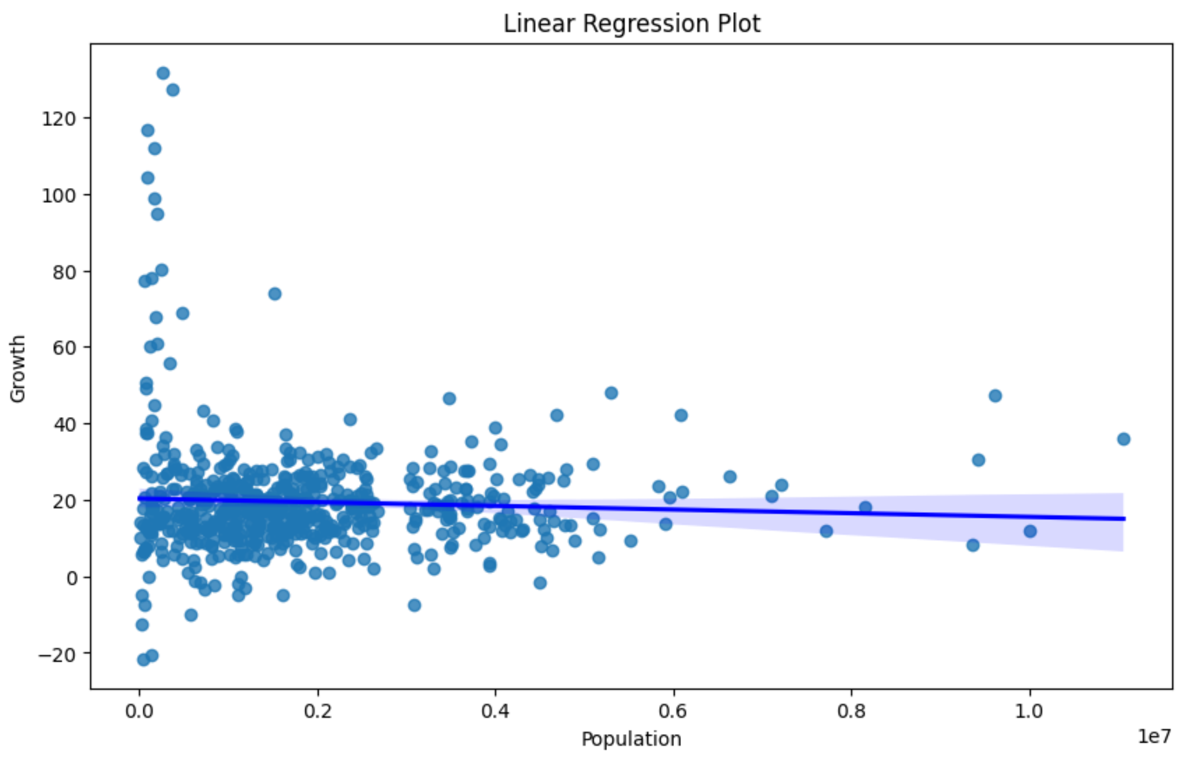
Observation :- Show States having Lowest and Highest literacy Rates

```
from sklearn.linear_model import LinearRegression
df = pd.read_csv('census2011.csv')

# Convert 'Growth' to string type first, then remove '%' and convert to float
df['Growth'] = df['Growth'].astype(str).str.replace('%', '').astype(float)

# Fit the linear regression model
X = df['Growth']
y = df['Literacy']

plt.figure(figsize=(10, 6))
sns.regplot(x=X, y=y, ci=None)
plt.title('Total Population vs Sex Ratio (Linear Regression)')
plt.show()
```

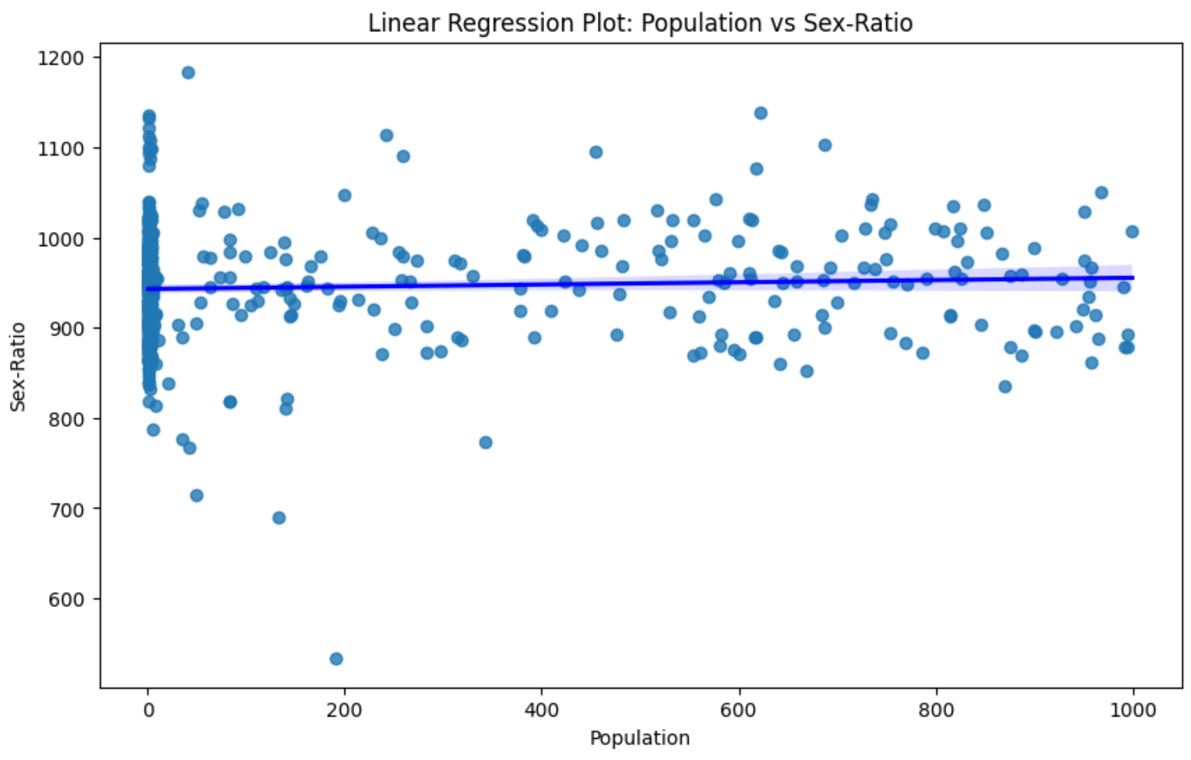


Oberservation :- As population Increases Literacy Rate goes down

```
# Linear Regression Plot
plt.figure(figsize=(10, 6))
sns.regplot(x='Population', y='Growth', data=df, line_kws={'color': 'blue'})
plt.title('Linear Regression Plot')
plt.xlabel('Population')
plt.ylabel('Growth')
plt.show()
```

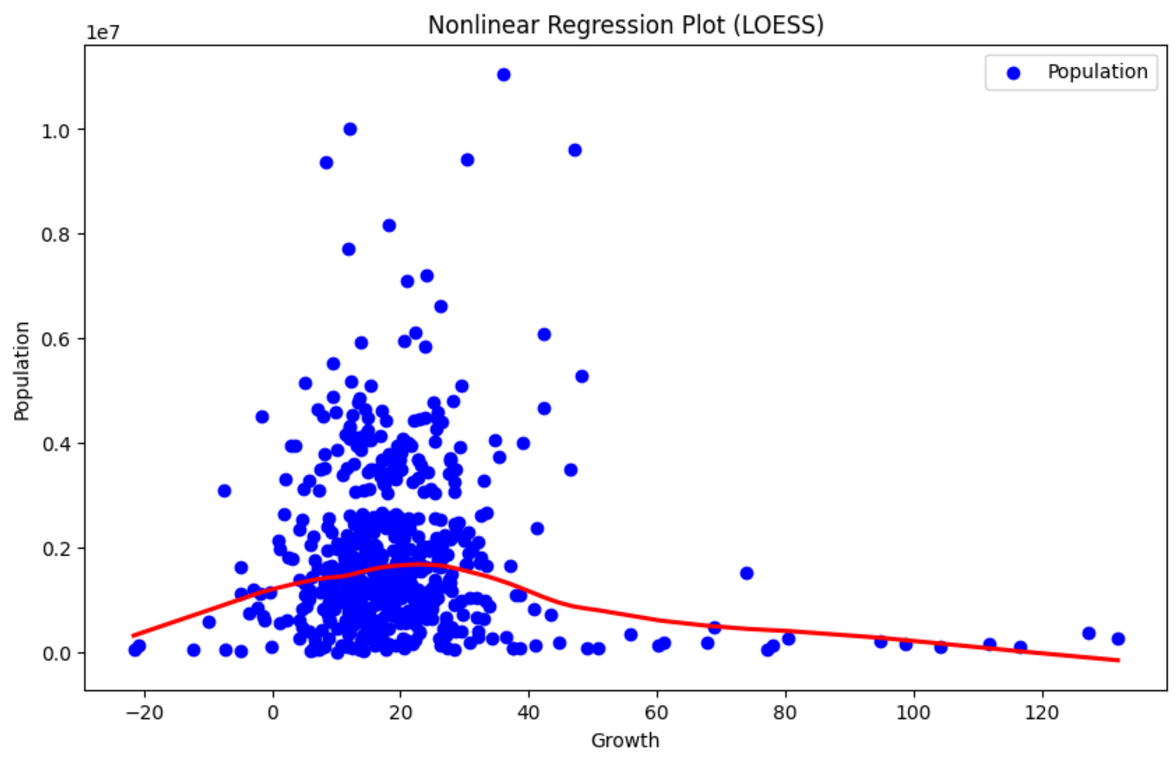


```
plt.figure(figsize=(10, 6))
sns.regplot(x='Population', y='Sex-Ratio', data=df, line_kws={'color': 'blue'})
plt.title('Linear Regression Plot: Population vs Sex-Ratio')
plt.xlabel('Population')
plt.ylabel('Sex-Ratio')
plt.show()
```

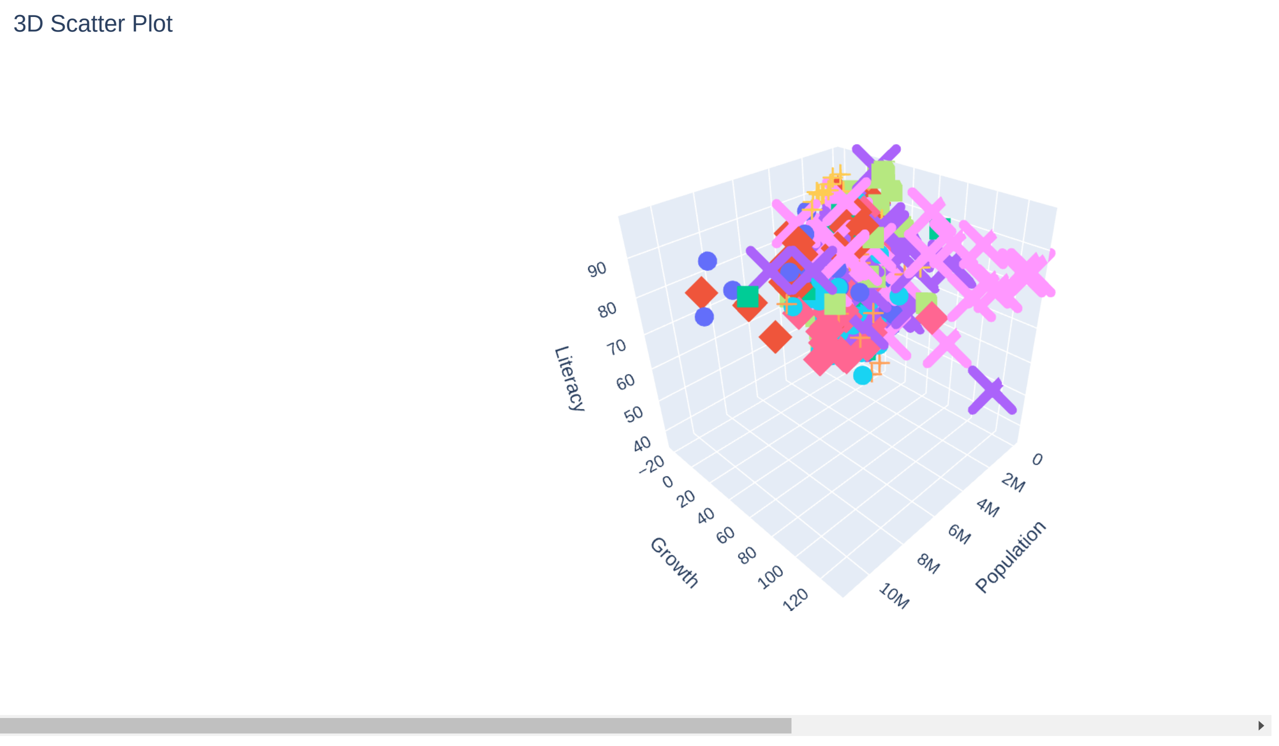


Observation :- Sex-Ratio is stable as the population incresing and decreasing

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

# Load the data
df = pd.read_csv('census2011.csv')

# Convert 'Growth' to a numeric type after cleaning
df['Growth'] = df['Growth'].astype(str).str.replace('%', '').astype(float)

# Convert 'Population' to a numeric type, cleaning up any commas
df['Population'] = df['Population'].astype(str).str.replace(',', '').astype(float)

# Plot the points with different colors
plt.figure(figsize=(10, 6))
plt.scatter(df['Growth'], df['Population'], color='blue', label='Population')

# Overlay the LOESS regression line
sns.regplot(x='Growth', y='Population', data=df, lowess=True, scatter=False, line_kws={'color': 'red'})

# Add titles and labels
plt.title('Nonlinear Regression Plot (LOESS)')
plt.xlabel('Growth')
plt.ylabel('Population')

# Add legend to differentiate between the points and the LOESS line
plt.legend()

# Show the plot
plt.show()
```

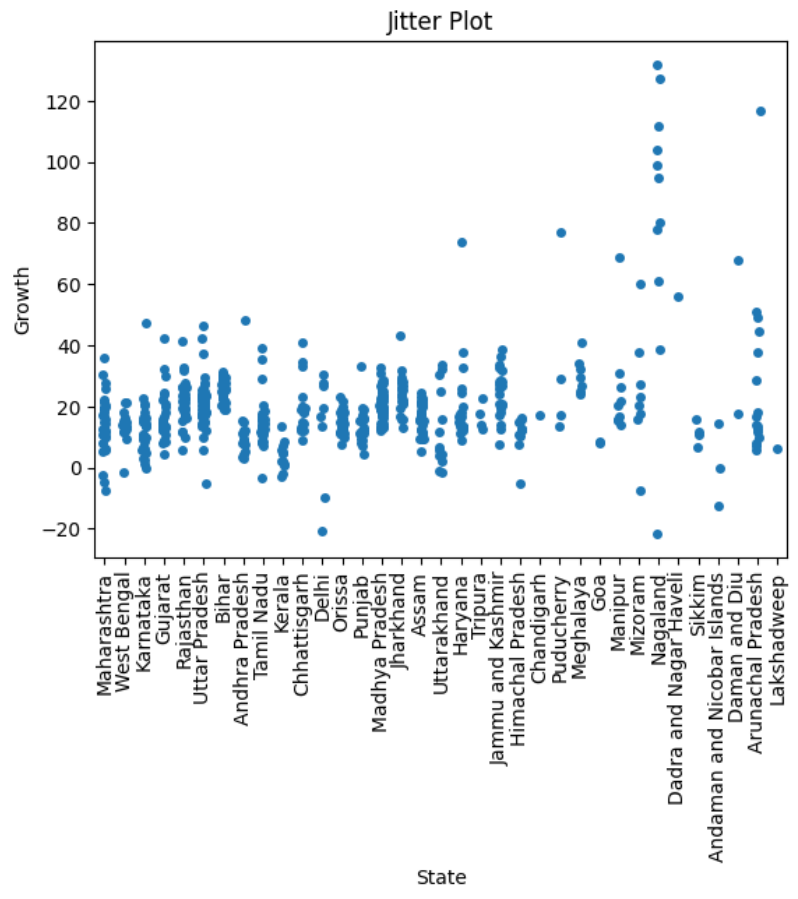


```
# 3D Chart
fig = px.scatter_3d(df, x='Population', y='Growth', z='Literacy', color='State', symbol='State')
fig.update_layout(title='3D Scatter Plot')
fig.show()
```



Observation :- Show Relationship between the Literacy, Growth and Population

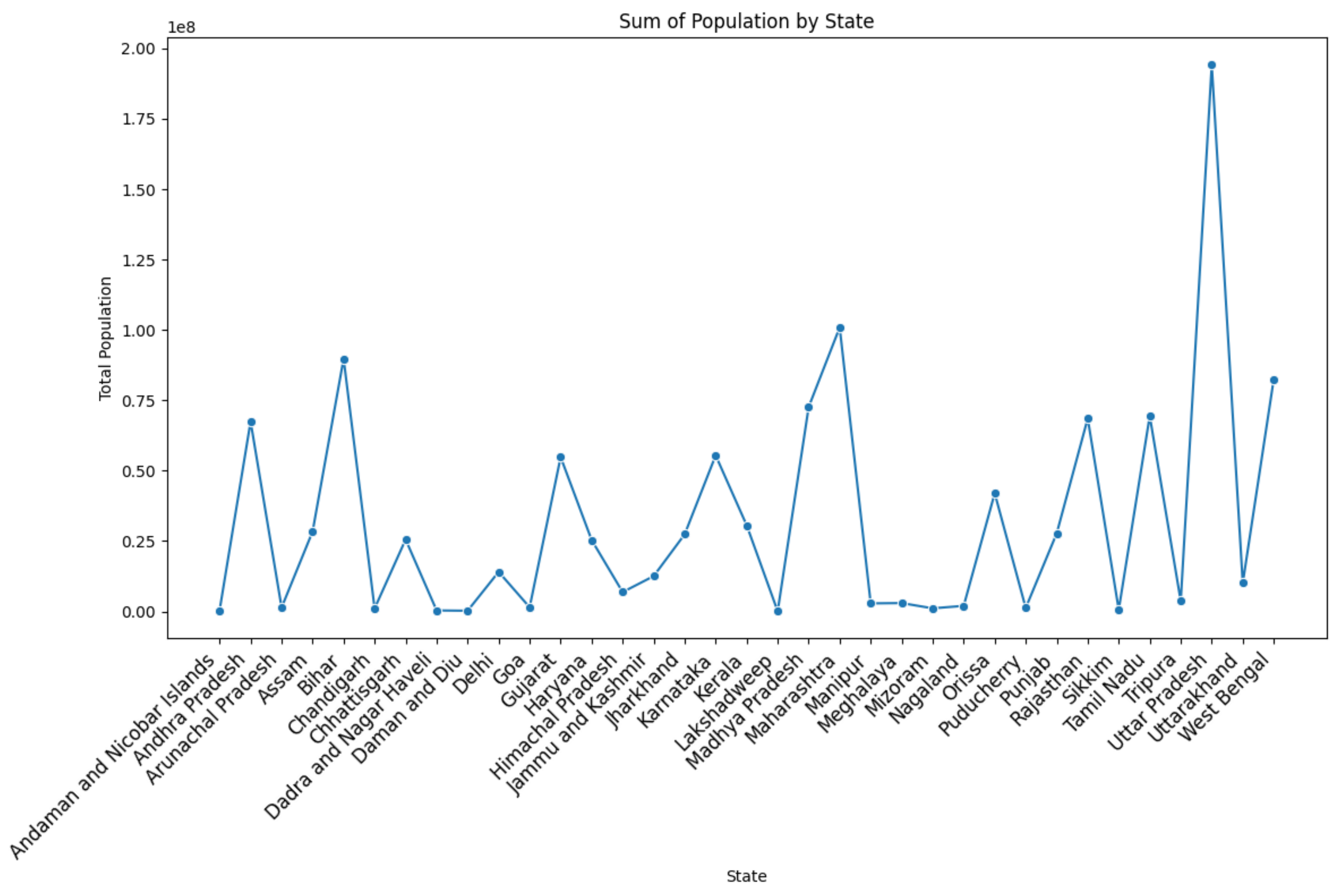
```
# Jitter Plot
sns.stripplot(x='State', y='Growth', data=df, jitter=True)
plt.title('Jitter Plot')
plt.xlabel('State')
plt.ylabel('Growth')
plt.xticks(rotation=90)
plt.show()
```



Obseravation :- Growth is higher in state of Mizoram

```
# Aggregate the population by state
state_population = df.groupby('State')['Population'].sum().reset_index()

# Line Plot of Population by State
plt.figure(figsize=(12, 8))
sns.lineplot(data=state_population, x='State', y='Population', marker='o', palette='tab10')
plt.title('Sum of Population by State')
plt.xlabel('State')
plt.ylabel('Total Population')
plt.xticks(rotation=45, ha='right', fontsize=12)  # Rotate labels 90 degrees and align to the right

# Show the plot
plt.tight_layout()  # Adjust layout to fit everything
plt.show()
```

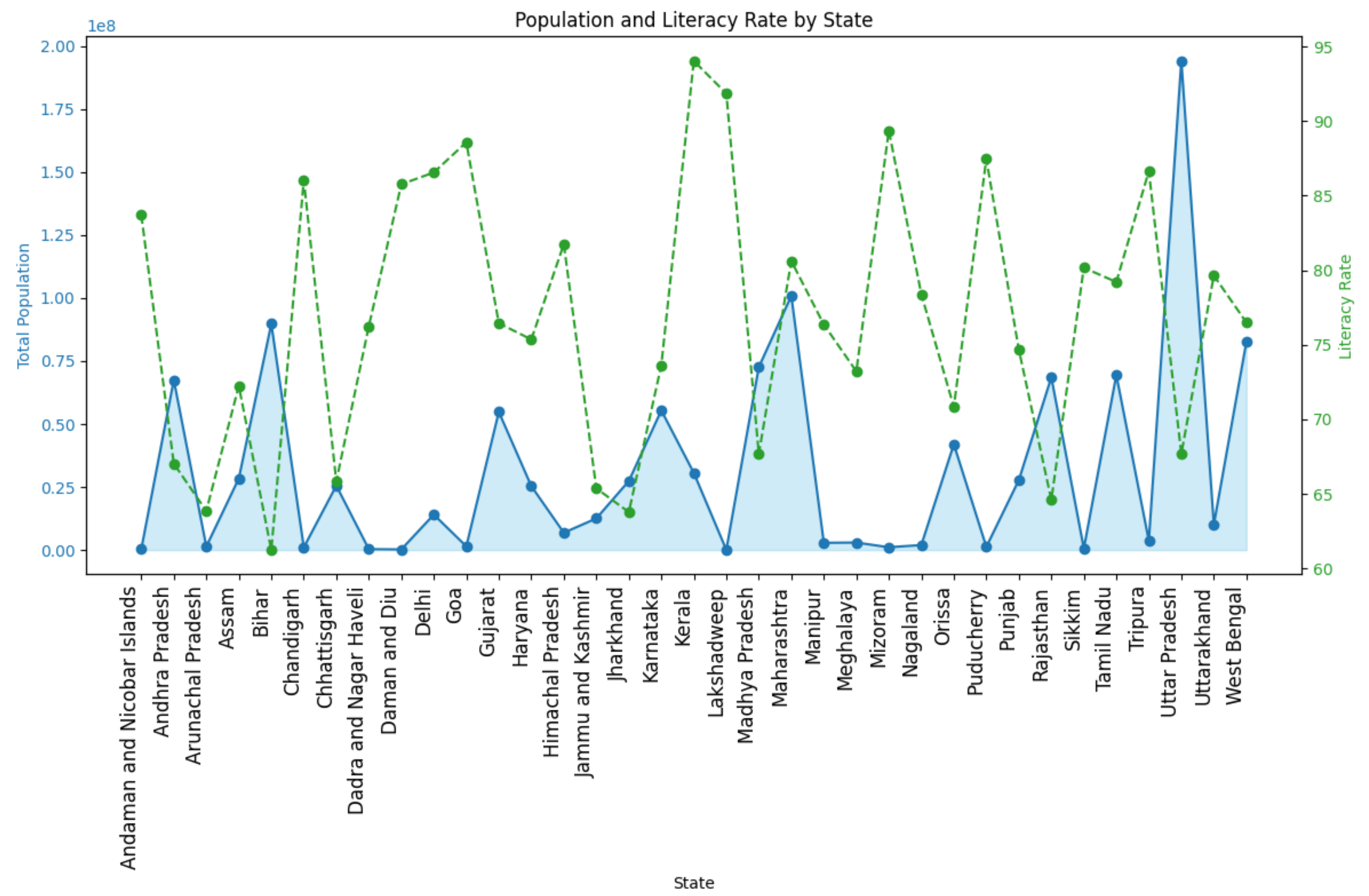
```
<ipython-input-61-a6b8524c8b08>:6: UserWarning:

Ignoring `palette` because no `hue` variable has been assigned.
```



Population in Uttar Pradesh is highesh

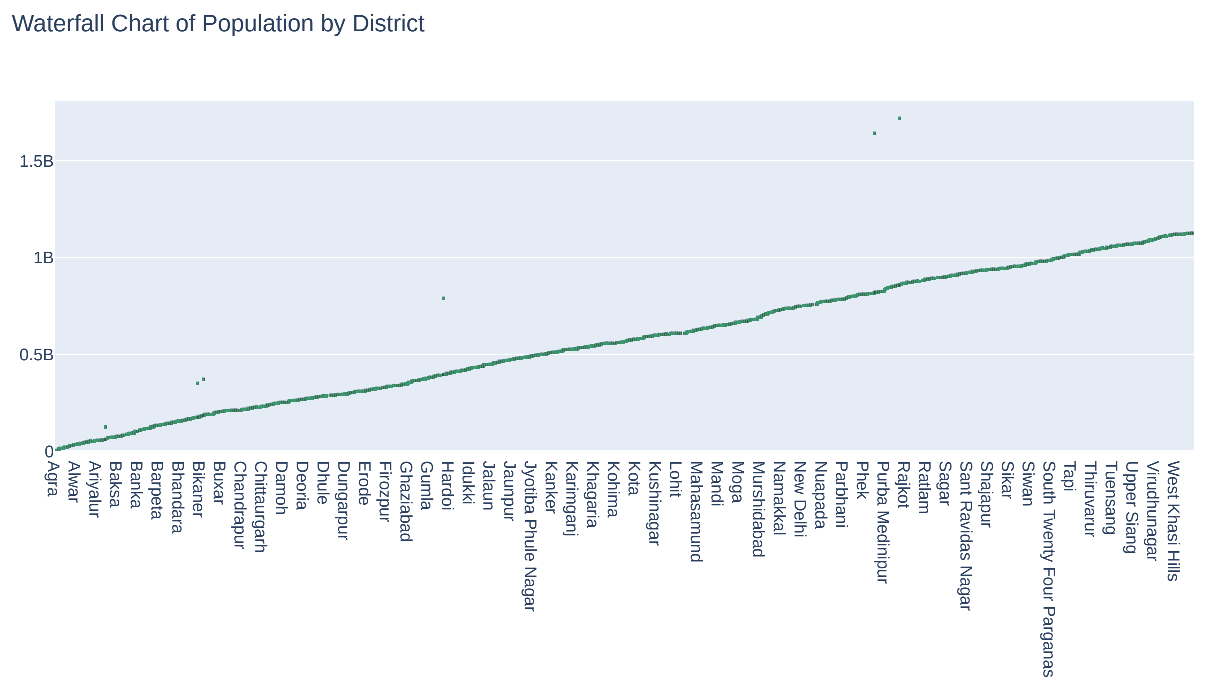
```
# Aggregate the population and literacy rate by state
state_data = df.groupby('State').agg({'Population': 'sum', 'Literacy': 'mean'}).reset_index()

# Sort DataFrame by State for better visualization
state_data = state_data.sort_values(by='State')

# Create the plot
fig, ax1 = plt.subplots(figsize=(12, 8))

# Plot for Population
color = 'tab:blue'
ax1.set_xlabel('State')
ax1.set_ylabel('Total Population', color=color)
ax1.plot(state_data['State'], state_data['Population'], marker='o', color=color, label='Population')
ax1.fill_between(state_data['State'], state_data['Population'], color='skyblue', alpha=0.4)
ax1.tick_params(axis='y', labelcolor=color)
ax1.set_xticklabels(state_data['State'], rotation=90, ha='right', fontsize=12)

# Create a second y-axis for Literacy
ax2 = ax1.twinx()
color = 'tab:green'
ax2.set_ylabel('Literacy Rate', color=color)
ax2.plot(state_data['State'], state_data['Literacy'], marker='o', color=color, linestyle='--', label='Literacy Rate')
ax2.tick_params(axis='y', labelcolor=color)

# Add titles and legends
plt.title('Population and Literacy Rate by State')
fig.tight_layout()  # Adjust layout to fit everything

# Show the plot
plt.show()
```

```
<ipython-input-66-dd73649cb5ed>:17: UserWarning:

FixedFormatter should only be used together with FixedLocator
```



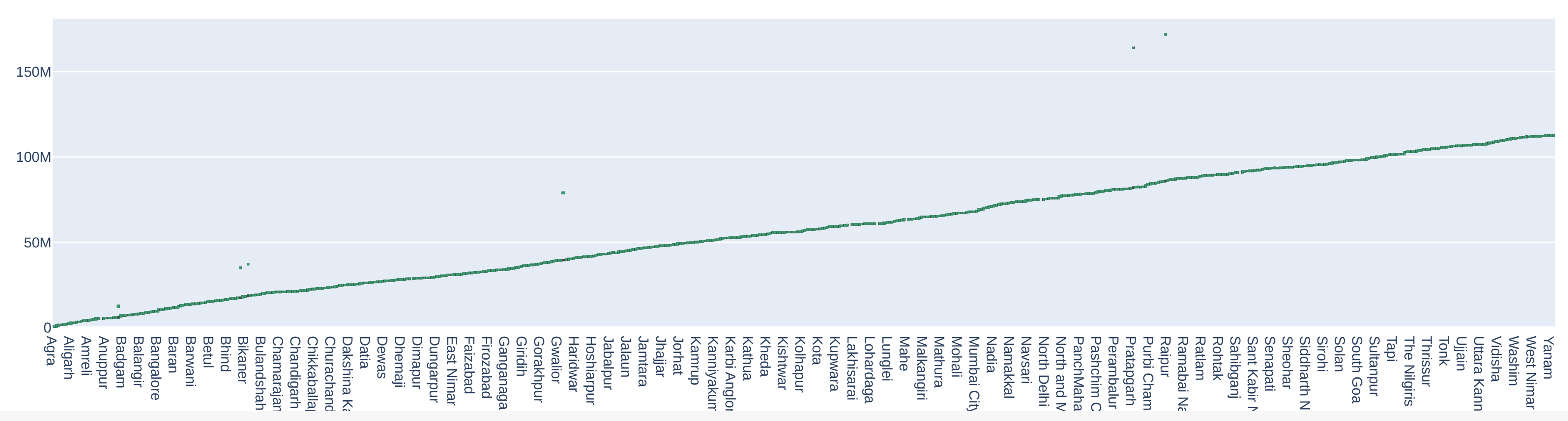
Literacy Rate in the Karnataka is Highest

```
# Waterfall Chart
fig = go.Figure(go.Waterfall(
    x=df['District'],
    y=df['Population'],
    measure=["relative"] * len(df),
    text=df['Population'].apply(lambda x: f'{x:,}'),
    textposition="outside"
))
fig.update_layout(title='Waterfall Chart of Population by District')
fig.show()
```



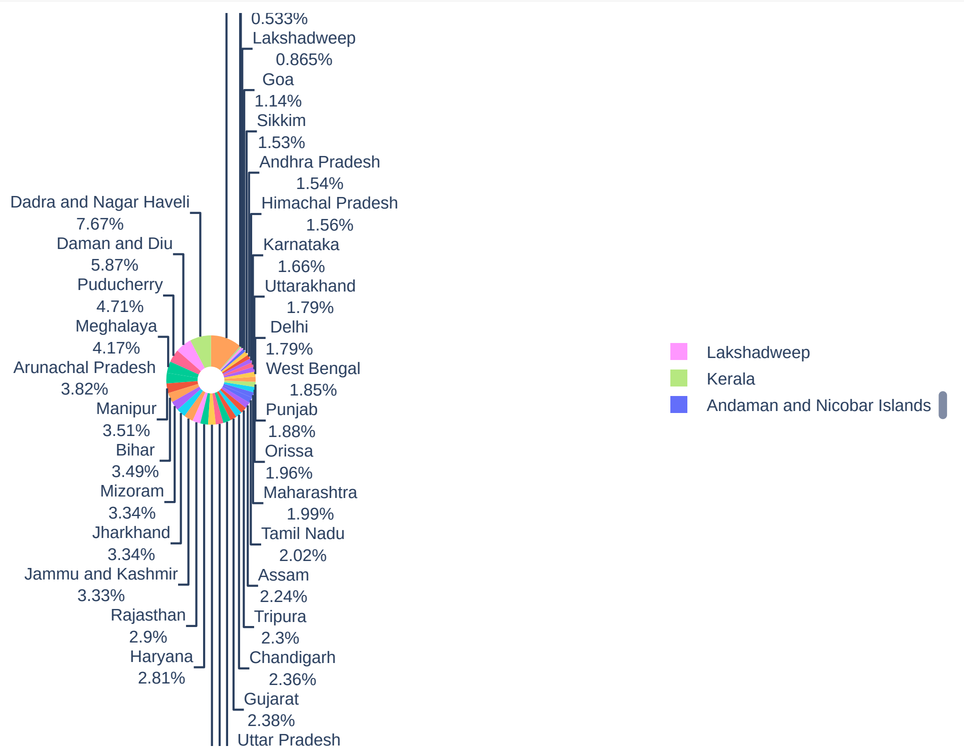
```
# Create a composite metric
df['Composite'] = (df['Population'] * 0.1 + df['Literacy'] * 0.1 +
                   df['Sex-Ratio'] * 0.1 + df['Growth'])  # Adjust weights as needed

# Waterfall Chart
fig = go.Figure(go.Waterfall(
    x=df['District'],
    y=df['Composite'],
    measure=["relative"] * len(df),
    text=df[['Population', 'Literacy', 'Sex-Ratio', 'Growth']].apply(
        lambda row: f"Pop: {row['Population']:,}, Lit: {row['Literacy']:.2f}, Sex: {row['Sex-Ratio']}, Growth: {row['Growth']:.2f}%",
        axis=1),
    textposition="outside"
))

fig.update_layout(title='Composite Waterfall Chart of Population, Literacy Rate, Sex Ratio, and Growth by District')
fig.show()
```

Composite Waterfall Chart of Population, Literacy Rate, Sex Ratio, and Growth by District



```
state_growth = df.groupby('State')['Growth'].mean().reset_index()

# Create Donut Chart
fig = px.pie(state_growth,
             names='State',
             values='Growth',
             hole=0.3,
             title='Donut Chart of Average Growth by State',
             labels={'Growth': 'Average Growth (%)'},
             color='State')

# Update hover information
fig.update_traces(
    textinfo='label+percent',
    hovertemplate='<b>%{label}</b><br>Average Growth: %{value:.2f}%<extra></extra>'
)

fig.show()
```

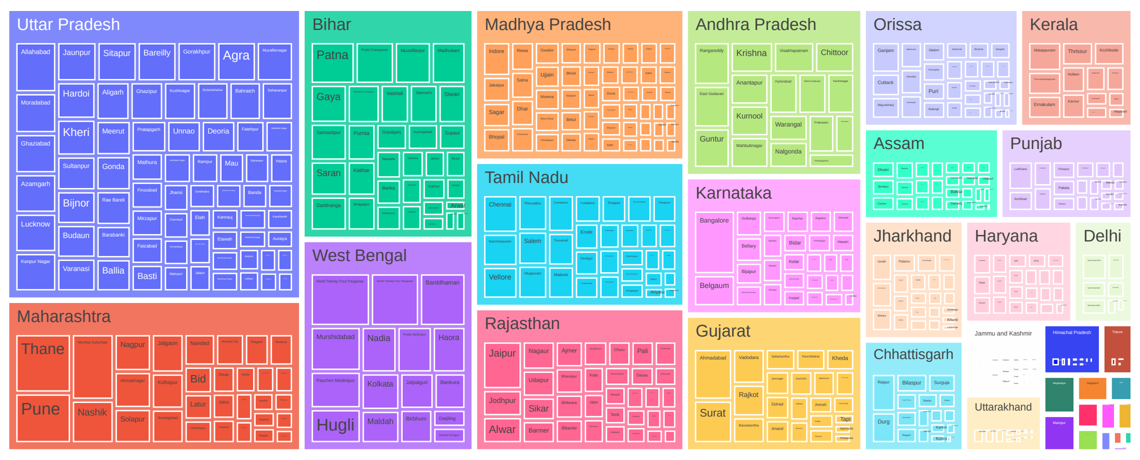
Donut Chart of Average Growth by State

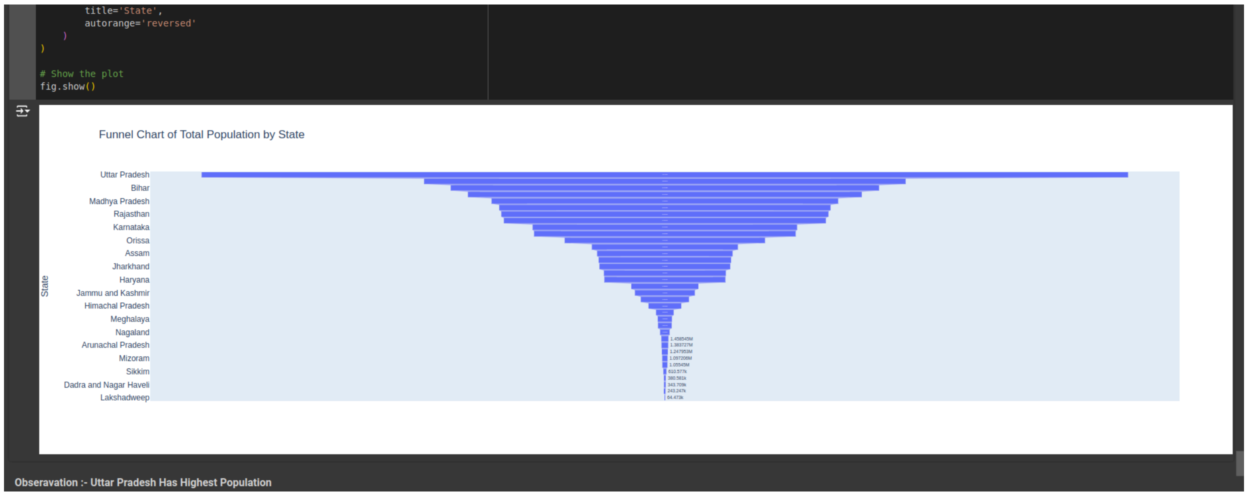


Obseravation :- Nagaland Has highest growth percentage 82.2%

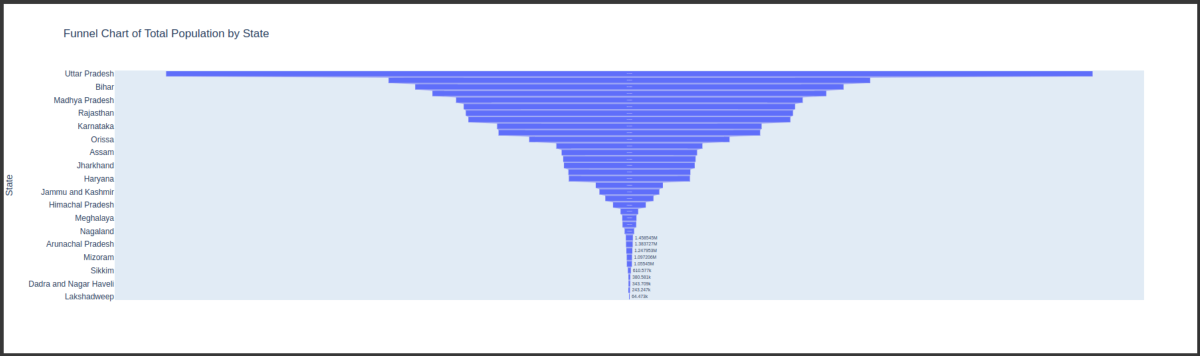
```
# Treemap
fig = px.treemap(df, path=['State', 'District'], values='Population', title='Treemap of Population by State and District')
fig.show()
```

Treemap of Population by State and District





```
        title='State',
        autorange='reversed'
    )
)

# Show the plot
fig.show()
```



Obseravation :- Uttar Pradesh Has Highest Population

V