PROJECT EVALUATION:

REGIONAL DISPARITIES IN ECONOMIC DEVELOPMENT

CONVERSATIONAL AI: ACCELERATED DATA SCIENCE [ADVANCED]

UCS622

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ABSTRACT

There is a plethora of evidence examining state-wise disparities in India and across nations, using different indicators and dimensions. However, insufficient efforts have been made to address the level of development and disparities in socioeconomic and environmental aspects, which refers to the basic amenities needed for the development of an individual's living conditions in any society or nation. The project involves preprocessing the data, including handling missing values, scaling features, and selecting relevant economic indicators. To do so, standardize the data, inter-state disparities in terms of social, environmental, and economic aspects, which comprise a broader aspect of human well-being, including access to education, health care, economic development of different Indian states have been studied. The aim of this project is to analyse regional disparities in economic development across different states and union territories of India. Using a dataset comprising key economic indicators such as GDP, literacy rate, HDI, unemployment rate, poverty rate, life expectancy, inflation, and foodgrain production, First, we conducted descriptive analysis to understand the distribution and summary statistics of the economic indicators, Next, we performed regression analysis to identify factors influencing regional economic development. Multiple linear regression was used to analyse the relationship between economic development and various economic indicators & at last we apply cluster analysis techniques to group regions with similar economic development characteristics. Visualization techniques are employed to illustrate these clusters, providing insights into the economic landscape of India and highlighting regions with similar economic development characteristics. The analysis revealed distinct patterns of economic development across different regions of India, with some regions showing higher levels of development compared to others. Understanding regional disparities in economic development is crucial for policymakers to design targeted interventions aimed at reducing disparities and fostering balanced and inclusive economic growth across all regions of India.

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INTRODUCTION

Regional disparities in economic development refer to the unequal distribution of economic prosperity and development across different geographical regions within a country. In the context of India, it reflects the significant variations in income levels, infrastructure, employment opportunities, access to basic services, and overall quality of life among states and union territories.

Few Key Aspects of Regional Disparities in India:

- GDP Per Capita: There is a considerable difference in GDP per capita among Indian states and union territories .
- Poverty Rates: States with higher levels of economic development tend to have lower poverty rates
- Social Indicators: Disparities also manifest in social indicators such as literacy rates, access to healthcare, and education levels.
- Unemployment rate : States with higher unemployment rate tend to depict lower growth.

Implications and Challenges:

- Regional disparities pose challenges to inclusive growth and social cohesion, leading to socio-economic imbalances and potential social unrest.

- Addressing regional disparities requires targeted policy interventions focusing on infrastructure development, skill enhancement, industrial diversification, and equitable resource allocation.

- Bridging the gap between developed and underdeveloped regions is crucial for achieving sustainable and inclusive economic growth in India.

Novelty in Work:

The novelty of this work lies in its comprehensive analysis of regional disparities in economic development across different states and union territories of India. While previous studies have examined various economic indicators individually, this project integrates multiple economic indicators to provide a holistic understanding of economic development at the regional level.

The use of cluster analysis techniques allows for the identification of distinct clusters of regions with similar economic development characteristics. This

approach goes beyond traditional methods of analysis and provides a more nuanced understanding of the economic landscape of India.

Furthermore, the project incorporates regression analysis to identify the factors influencing regional economic development. By examining the relationship between economic development and various economic indicators, this analysis offers valuable insights for policymakers and stakeholders aiming to address regional disparities and promote inclusive economic growth.

Additionally, the use of visualization techniques such as scatter plots and choropleth maps enhances the interpretability of the results and enables stakeholders to visualize regional disparities in economic development more effectively.

Overall, the novelty of this work lies in its comprehensive approach to analysing regional disparities in economic development, incorporating multiple economic indicators, advanced data analysis techniques, and visualization methods to provide valuable insights for policymakers and stakeholders.

LITERATURE SURVEY:

Article ownership	The article was written by Reena Kumari, Rakesh Raman & Ramesh Kumar Patel and is licensed under a Creative Commons Attribution 3.0 License. Article link: https://link.springer.com/article/10.1007/s10708-023-10868-9
Background of the article	The primary objective of this study was to evaluate regional differences in social, economic, and environmental indices among India's states. To achieve this objective, two questions have been proposed: (1) To what extent are regional differences in socioeconomic and environmental indices found among states? and (2) Do the 15 representative indicators show meaningful correlations?
Concept of the article	The social, environmental, economic, and CDI were used to map the spatial pattern of disparities in the context of society, environment, and economy using ArcGIS for the 29 states of India. The findings show that, in India, different states have the widest discrepancies among the four indices.
Outcomes	According to the results, the states of central and eastern India are underdeveloped, which corresponds to a wide variance in the overall position. Kerala, Mizoram, Goa, Sikkim, and Delhi performed under the top five categories in the CDI. Madhya Pradesh, Bihar, Uttar Pradesh, Rajasthan, and Arunachal Pradesh were the bottom five performers in CDI, accounting for 32.53% of the area and housing 39.96% of the total population who suffer greatly from poor access to social, environmental, and economic resources.

Article ownership	The article was written by KRISHNA MURARI SINGH, NARESH CHANDRA & ANIL KUMAR SINGH . Article link : https://www.jsure.org.in/journal/index.php/jas/article/view/31
Background of the article	A total of twenty six socio economic indicators comprising of various characteristics of education, agricultural & allied activities, urbanization, electrification, economic prosperity and modernization were examined for classifying the socio-economic status of the states in eastern region of India.
Concept of the article	The secondary data on these variables were collected from various sources. The variables were normalized to give zero mean and unit variance. The indices of various characteristics of the states as well as over all status of the states have been determined.

Outcomes	It was observed that the states like Bihar, Uttar Pradesh and Jharkhand are poor in education, agricultural and allied activity development, Urbanization, electrification and modernization. However, West Bengal is at better position in comparison to the other states of the eastern region of India. The education and modernization of Assam is considerably good. The overall result indicated that the education and electrification as key factors for the socio economic condition of the states

Article ownership	The article was written by Dr E.M. Naresh Babu Mrs D. Hemalatha . Article link: https://rvim.edu.in/RVIM-Journal/pdf/RVIM%20Journal%20of%20Management%20and%20Research%20July%20-%20Dec%202022.pdf#page=62
Background of the article	Economic position of the country depends upon some factors which are usually called as "Economic Indicators". These Economic indicators are measured with the help of Gross Domestic Product(GDP), Trade & Commerce, Purchasing Power Parity, Employment Rate, Inflation Rate, Minimum Wage Rate, Consumer Price Index, Retail Price Index, Wholesale Price Index, Export-Import Ratio, Food Inflation, Forex Reserves, Budget of Governments, Debt position and Taxation Policy.
Concept of the article	To ascertain state governments' financial health, most of the economists feel Debt to Gross State Domestic Product(GSDP) ratio as one of the most important indicators. According to the Fiscal Responsibility and Budget Management (FRBM) Act, 2005, the State Governments are allowed to take only 25% of Debt to GSDP ratio, but many states have exceeded that figure in FY 2022 due to various reasons and most important being the fulfilment of subsidies of their election manifestoes.
Outcomes	The state governments should focus more on increasing the Capital Outlay as it can generate revenue to the states over a period of time. In many of the states, Capital outlay is less than Capital Expenses and Interest payments, this is the reason why the state's economic position is not at all good. In this context, except Bihar all the remaining states are suffering a lot as the Capital Outlay is far less than both the Capital Expenses and interest payments. This shows that these states are not in a position to invest some amount as capital outlay which is impacting the states balance sheet adversely

Article ownership	The article was written by Abhik Ghosh , Olivia Mallick , Souvik Chattopadhay , Banasri Basu . Article link: https://www.sciencedirect.com/science/article/abs/pii/S0038012121001993

Background of the article	In this paper, we focus on the basic three socio-economic entities, namely, population, literacy and working population. Like population, education is a key element in any society that removes inequality from society, impacts the growth of employment and improves a country's gross national product. On the other hand, the distributional inequality of unemployment rates (that is given by the size of the non-working population) plays an important role for structuring the economic development. These three factors, together controls, to a large extent, the development of the human resources in any society.
Concept of the article	the data from Indian census which is conducted in every 10 years to capture a detailed picture of demographic, economic and social conditions of all persons in the country pertaining to that specific time. The raw census data for the years 2011 and 2001 are obtained from the *Primary Census data and Digital library* (www.censusindia.gov.in). Following the stratified administrative structure of India, we use the districts as smaller second-tier units within each state.
Outcomes	In this paper we have quantified the distributional uncertainty present in the various socio-economic indicators of all the Indian states, by studying the distribution of the districts within each individual states. The analysis is based on the DGB distribution, a typical rank-order distribution, which fits very well across many disciplines of Arts and Science.

Article ownership	The article was written by Dr.K.Ramesh Kumar, Dr.I.Sivakumar, Dr.N.Saravanakumar, R.Sathishkumar . Article link: https://www.researchgate.net/profile/Sivakumar-I/publication/342590854_REGIONAL_DISPARITIES_AND_INDIAN_STATES_A_MACRO_LEVEL_STUDY/links/5efc5cee45851550508109f4/REGIONAL-DISPARITIES-AND-INDIAN-STATES-A-MACRO-LEVEL-STUDY.pdf
Background of the article	The main objective of this present paper is to examine the disparities at the macro level in terms of NSDP, Per capita income, HD, work participation rate, and wages in six different regions of India from 1991 to 2018. The present study is based on secondary data. The secondary data for the study were collected from various published reports of government organizations. The records of the handbook of statistics on Indian states published by RBI and National Human Development reported - 2018 on UNDP. These records highlight the region's inequality including per capita income, NSDP, and Human Development Index in India.to a large extent, the development of the human resources in any society.
Concept of	The data, thus, generated were analysed through average and rank wise classified the regions with the help of the Gini Coefficient. The data were

the article	1991 to 2018 for the first five years (1991-1995) merged by complete data. He was analysed the NSSO reported on various years of publication in 61st round to 68th round India. 1991-2018 is divided by the six parts data. The study is based on the administrative division of India. The study comes across that the Gini Coefficient for regional per capita income of India indicated there is more inequality, which is 0.75 per cent throughout 1990-91 to 2017-18.
Outcomes	The study finds that the NSDP growth rate of first place at 18.6 per cent increase the growth rate in southern regions because Tamil Nadu is the most industrial based State. The southern state is leading the chart of the most industrialized states with at least 37,378 factories till 2013-2014. There are increasing the number of factories were just 14,617 after 1990-91. The industry has grown with a rate of more than 2.5 times for 25 years. Against that last place of growth rate the 9.1 per cent in Northeast regions.

Article ownership	The article was written by S. N. Nandy Article link: https://journals.sagepub.com/doi/abs/10.1177/2321024919844407
Background of the article	This article is an attempt to present the socio-economic disparities among various states/regions/sectors in India. Economic development reflects in the improvement of physical and social infrastructures which ease the quality of life in a society. But the pace and level of development are generally not uniform across the regions, and subsequently create regional disparities. The induced (man-made) disparities need to be quantified to analyse the cause and consequence of unequal development and the future course of action.
Concept of the article	Districts have been ranked on the basis of development indices and mapped across the states/districts using Geographic Information System (GIS) tools. The existing disparities are total (among states), sectoral and also between rural and urban inhabitants within each state. The aim of development is to equalise the disparities and make it equitable among states and also within a state, as only resource richness is not adequate to be a developed state.
Outcomes	Region-wise, southern states are ahead in many indices followed by north-western states, while eastern and central parts of India are lagging behind the overall development. The north-east India still remains in isolation with some exemption of higher ranked (developed) districts of Sikkim and Tripura. Disparities also exist within the districts of a state and have been presented as intra-state disparities on some selected parameters.

METHODOLOGY

1. **Data Collection**:
    - Data on key economic indicators such as GDP, literacy rate, HDI, sex ratio , population , gross-enrolment ratio , infant mortality rate , health infrastructure- Doctors & Specialists , unemployment rate, poverty rate, life expectancy, inflation, and foodgrain production for different states and union territories of India was collected from reliable sources such as government reports, national surveys, and databases.
2. **Data Preprocessing**:
    - Missing data was handled by dropping rows with missing values.
    - The data was then preprocessed by scaling the features using standardization to ensure that all features have the same scale.
3. **Descriptive Analysis**:
    - Descriptive statistics such as mean, median, standard deviation, and range were computed for each economic indicator and regional variable to understand their distribution and summary statistics.
4. **Regression Analysis**:
    - Multiple linear regression analysis was performed to identify factors influencing regional economic development.
    - The relationship between economic development and various economic indicators was analyzed to provide insights into the factors driving economic development in different regions of India.
5. **Cluster Analysis**:
    - K-means clustering was applied to group regions with similar economic development characteristics.
    - The optimal number of clusters was determined using techniques such as the elbow method or silhouette score.
    - Clusters of regions with similar economic development profiles were identified, providing insights into the economic landscape of India.
6. **Visualization**:

- Visualization techniques such as scatter plots and choropleth maps were employed to illustrate the clusters and provide insights into regional disparities in economic development.
- Scatter plots were used to visualize the relationship between economic indicators, and choropleth maps were used to visualize regional disparities in economic development across different states and union territories of India.

7. **Interpretation and Insights**:
    - The results of the analysis were interpreted to provide insights into regional disparities in economic development and to identify potential policy implications for addressing these disparities and promoting inclusive economic growth across all regions of India.

This methodology provided a comprehensive approach to analysing regional disparities in economic development, integrating multiple economic indicators, advanced data analysis techniques, and visualization methods to provide valuable insights for policymakers and stakeholders.

RESULTS & ANALYSIS:

The dataset used in this project contains information on key economic indicators for different states and union territories of India. The dataset includes the following variables:

1. **State/Union Territory**: Name of the state or union territory.
2. **GDP**: Gross Domestic Product (GDP) of the state or union territory.
3. **Literacy rate**: Literacy rate of the state or union territory.
4. **HDI**: Human Development Index (HDI) of the state or union territory.
5. **Unemployment Rate**: Unemployment rate of the state or union territory.
6. **Poverty Rate**: Poverty rate of the state or union territory.
7. **Life Expectancy**: Life expectancy in years for the state or union territory.
8. **Shortfall**: Shortfall in doctors/specialists for the state or union territory.
9. **Inflation (CPI)**: Inflation rate (Consumer Price Index) for the state or union territory.
10. **Production of Total Foodgrains**: Total foodgrain production for the state or union territory.
11. **Sex Ratio:** Ratio between the number of males and the number of females, expressed as the number of males per 100 females
12. **Population:** This indicator shows the number of people that usually live in an area.
13. **Infant mortality rate**: Infant mortality rate (IMR) is the number of deaths per 1,000 live births of children under one year of age.
14. **Gross-Enrolment Ratio**: Gross enrolment ratio is the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.

Data Source:

- The data was collected from reliable sources such as Wikipedia.
- The dataset is provided in CSV (Comma Separated Values) format.

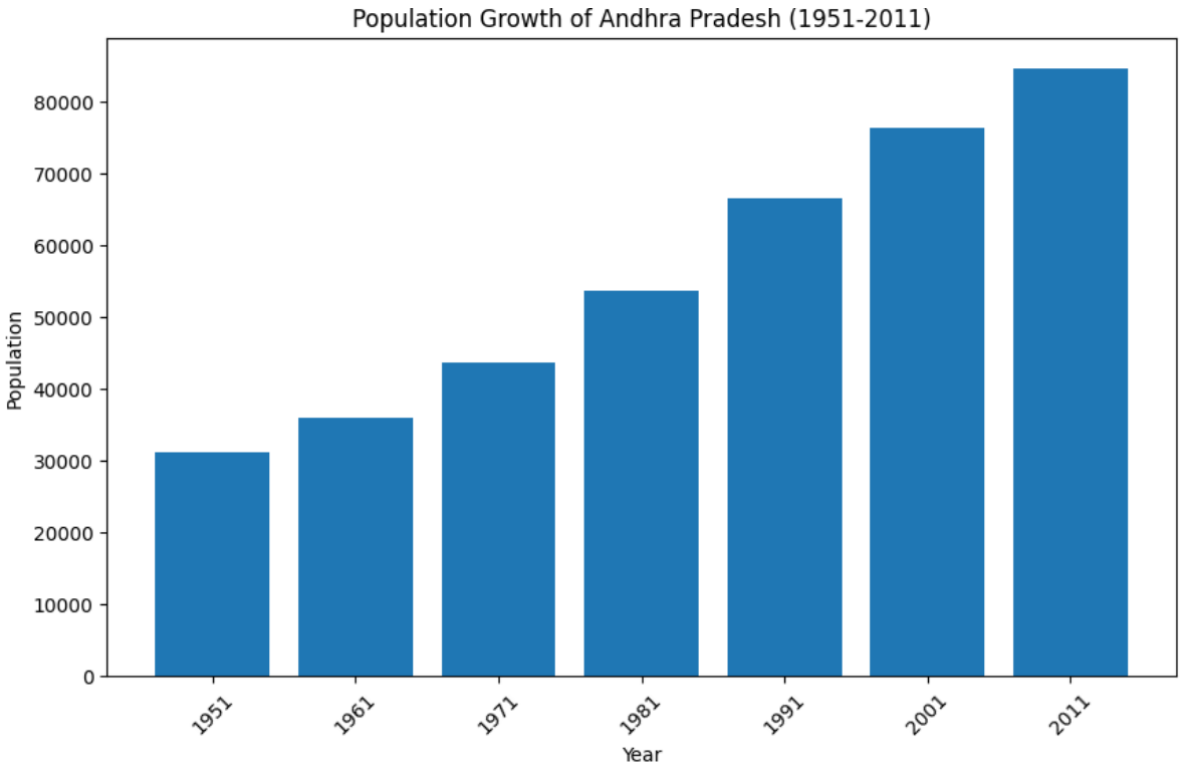

Figure1:Population growth of Andhra Pradesh

The bar graph clearly demonstrates a steady rise in the population of Andhra Pradesh over the six-decade period from 1951 to 2011. This significant growth trend suggests factors like improved living standards, healthcare advancements, and potentially higher birth rates might be influencing the population increase. Further analysis of demographic data alongside socio-economic indicators could provide deeper insights into the reasons behind this population growth.

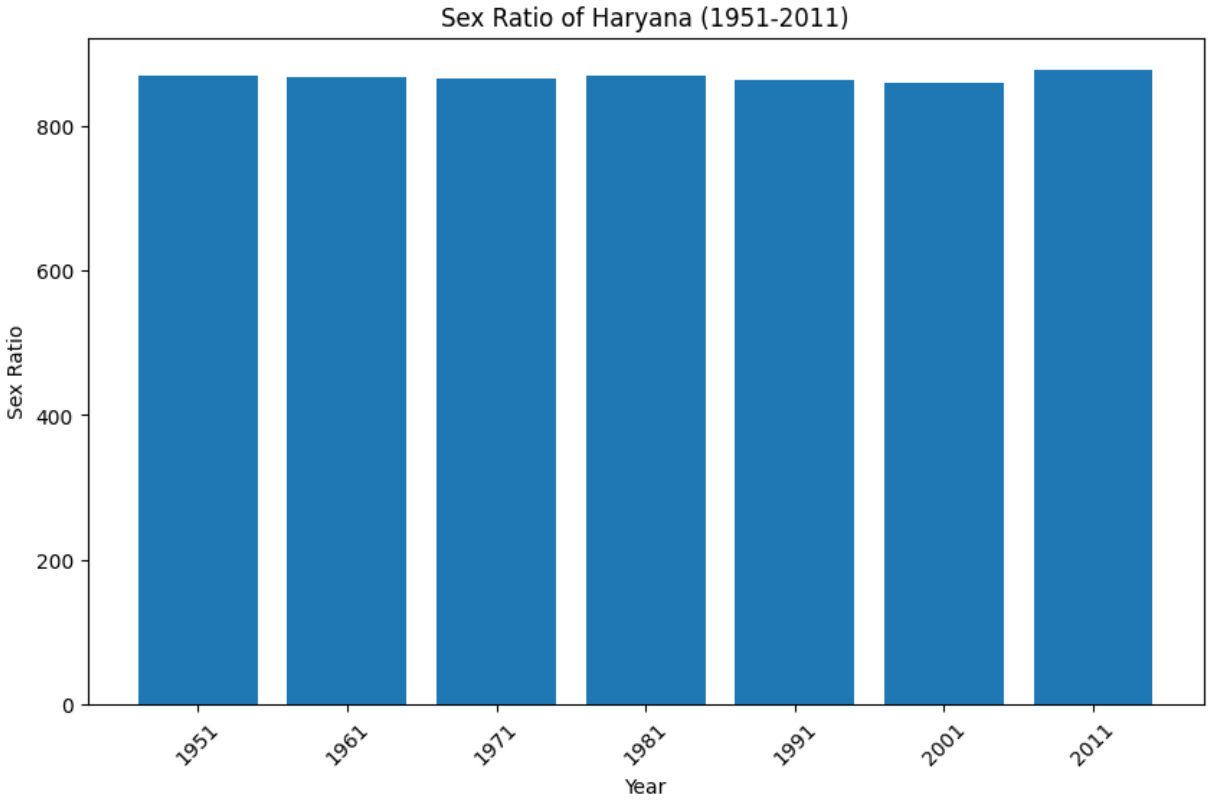

Figure 2:Sex ratio of Haryana

The graph reveals a concerning trend in the sex ratio of Haryana over the six decades from 1951 to 2011. There's a clear decline in the ratio of females per 1000 males, indicating a potential gender imbalance

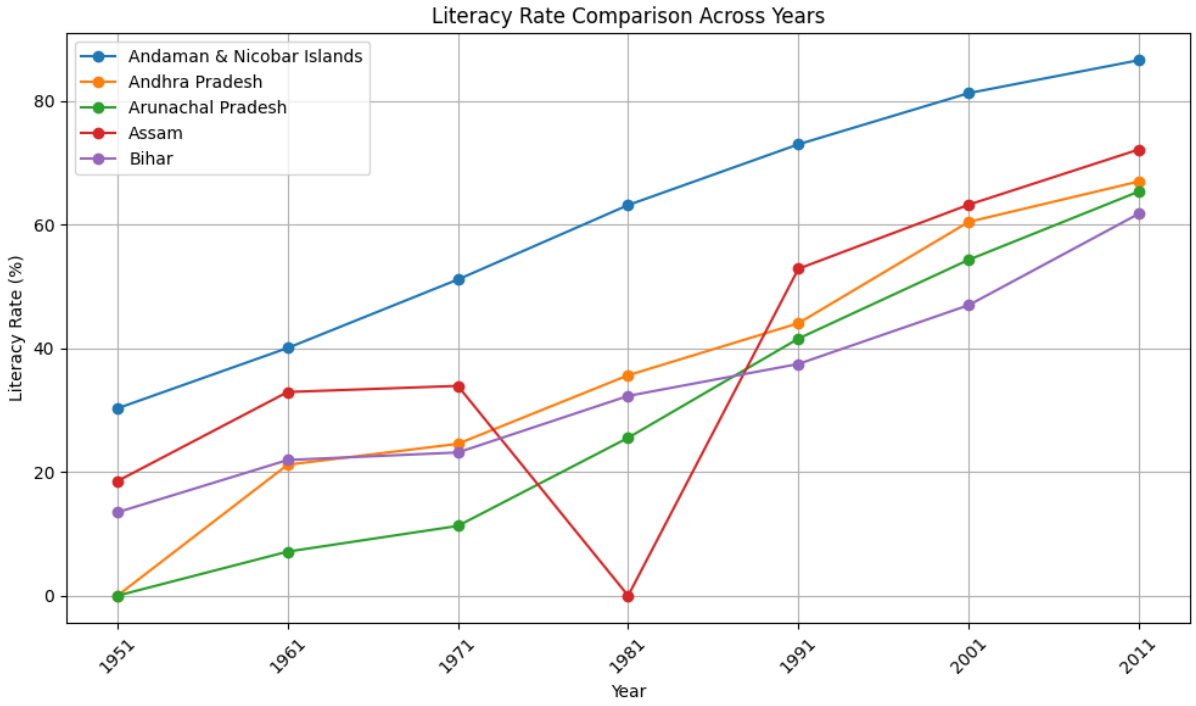

Figure 3: Literacy Rate comparison Across Years

The line graph reveals a positive trend in literacy rates across the five Indian states/regions depicted (Andaman & Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Assam, and Bihar) from 1951 to 2011. While the starting rates vary significantly, all regions show an increase in literacy over time. This suggests that efforts to improve educational access and quality might be yielding positive results. However, there appears to be a gap between some states/regions, indicating that continued focus on educational initiatives in areas with lower literacy rates is essential to ensure equitable access to education across India.

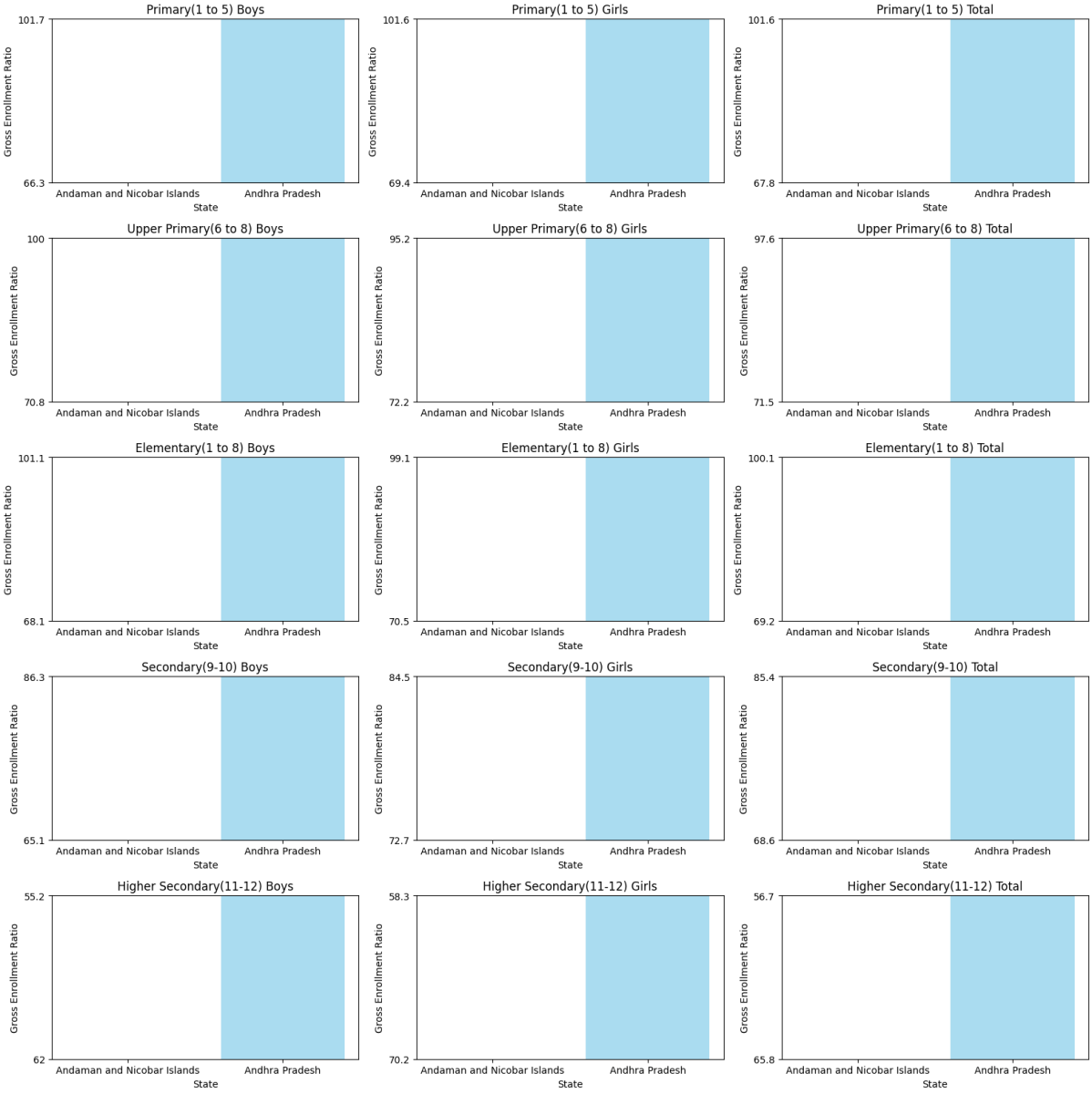

Figure 4: Gross-Enrolment Ratio:

The bar chart reveals a mixed picture of gross enrolment ratio (GER) across educational levels and genders in Andaman and Nicobar Islands and Andhra Pradesh. While there's a positive trend of generally higher enrolment in elementary education (combining primary and upper primary) compared to higher secondary education in both states, there are some disparities. Notably, GER for girls seems to be lower than boys in most categories across both states. This suggests a need to address potential gender gaps in educational access, particularly at higher secondary levels. Additionally, focusing on improvement in GER for higher secondary education in both states could be beneficial.

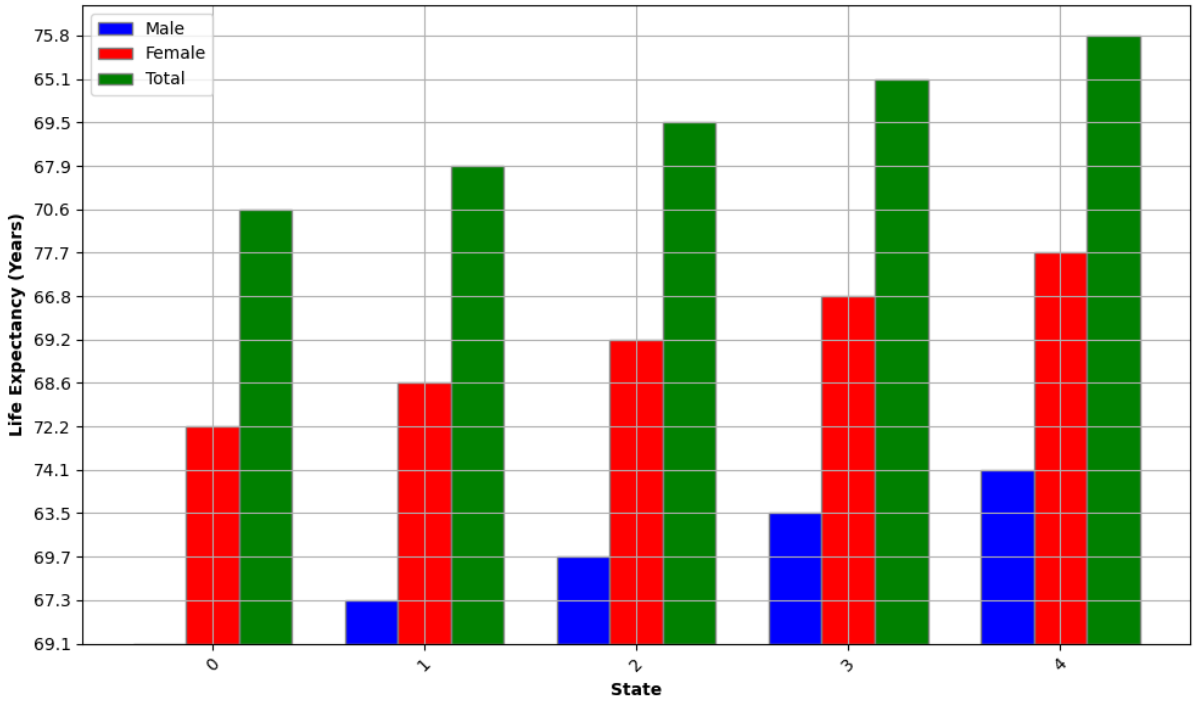

Figure 5 : Life expectancy(in Years)

The bar chart reveals a positive trend in life expectancy for both males and females in the Indian states. Over the four decades, life expectancy increased for both genders, with females consistently having a slightly higher average lifespan.

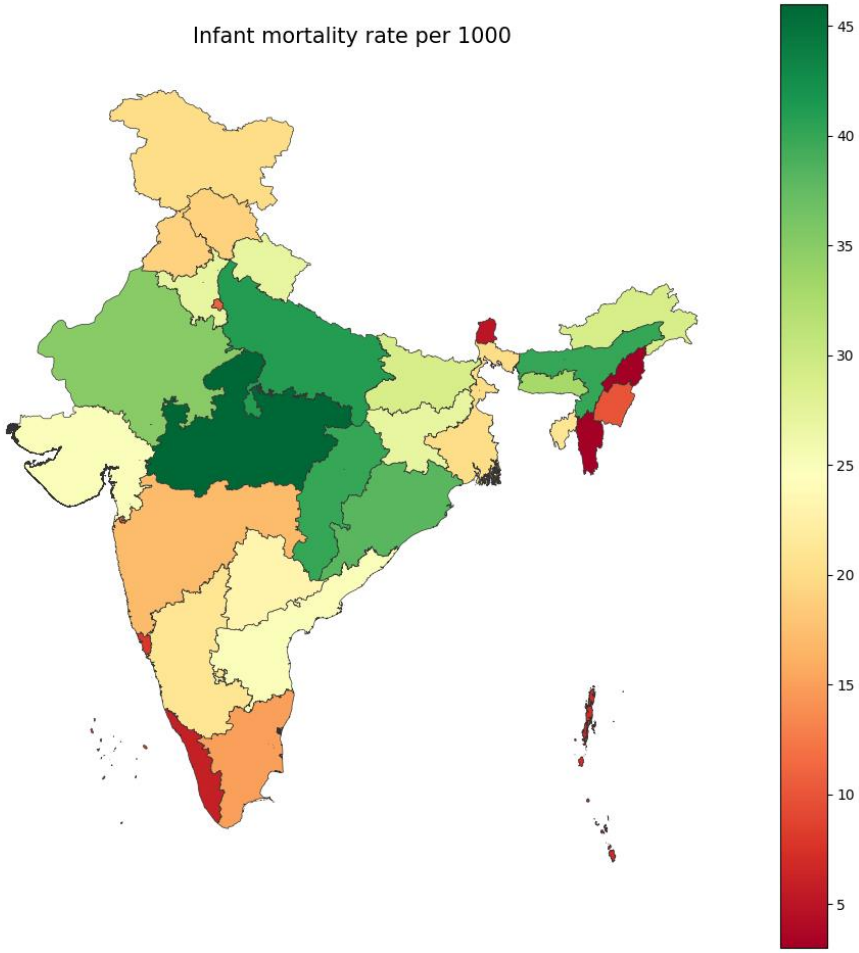

Figure 6 : Infant Mortality Rate:

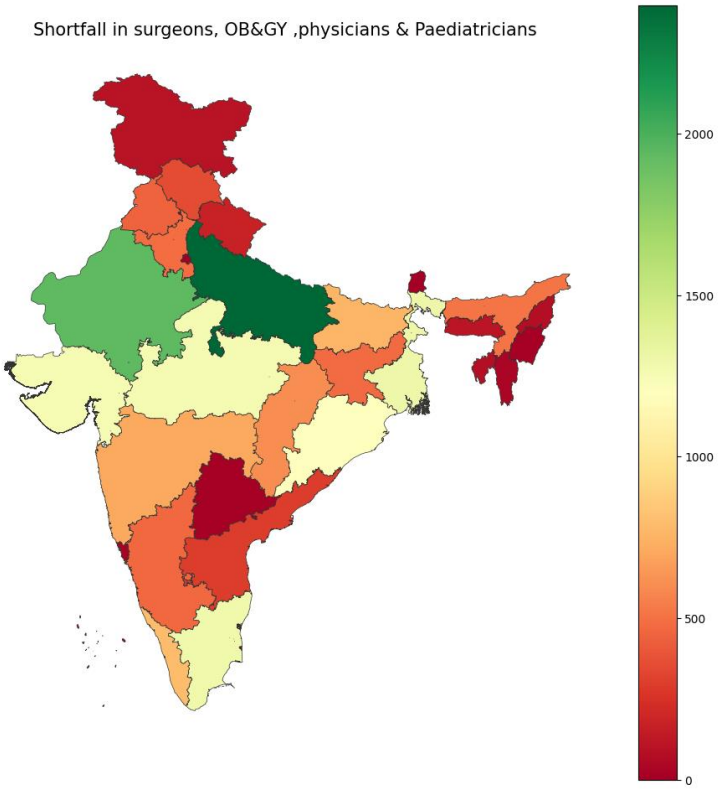

Figure 7 : 'Shortfal in surgeons, OB&GY ,physicians & Paediatricians '

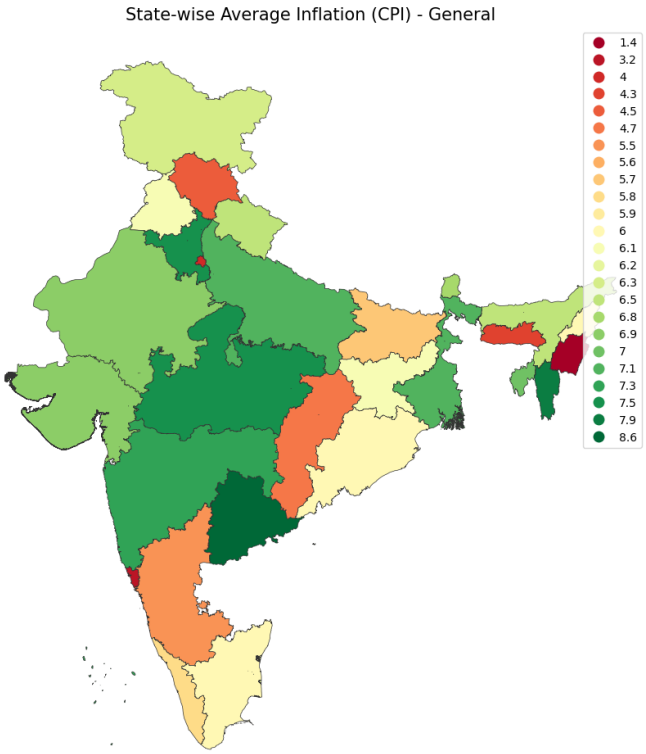

Figure 8: State-wise Average Inflation (CPI) - General

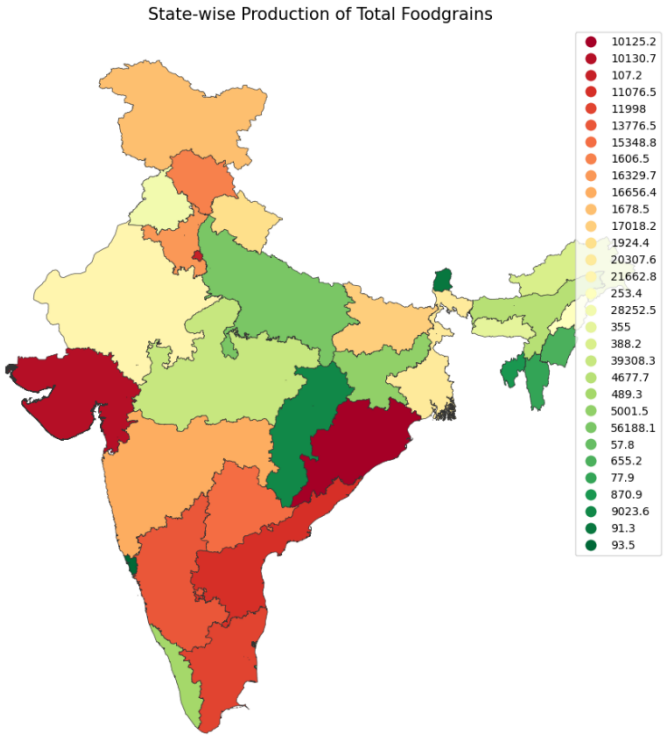

Figure 9 : State-wise Production of Total Foodgrains

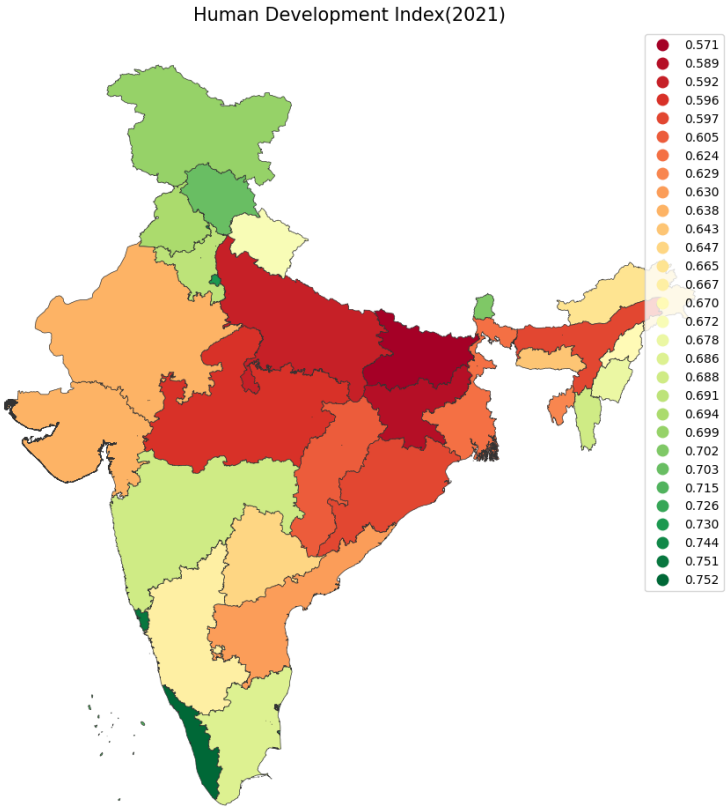

Figure 10 : Human Development Index(2021)

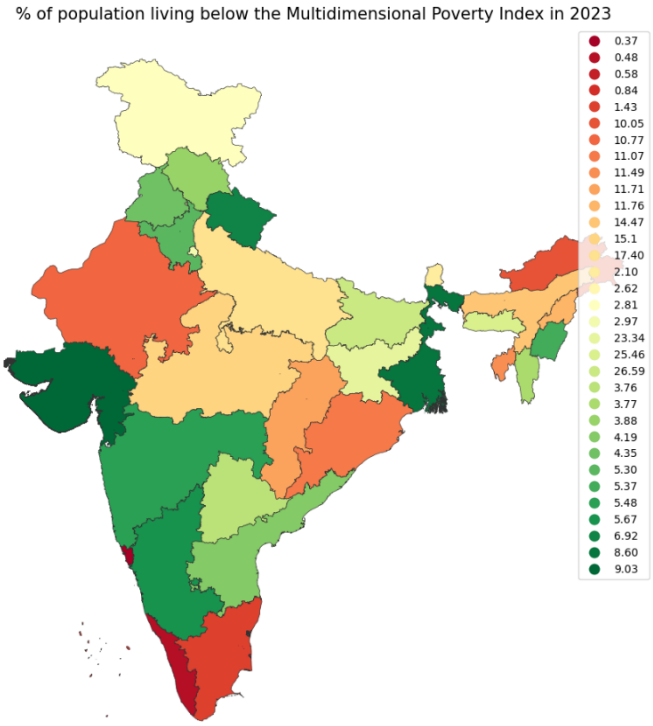

Figure 11 : % of population living below the Multidimensional Poverty Index

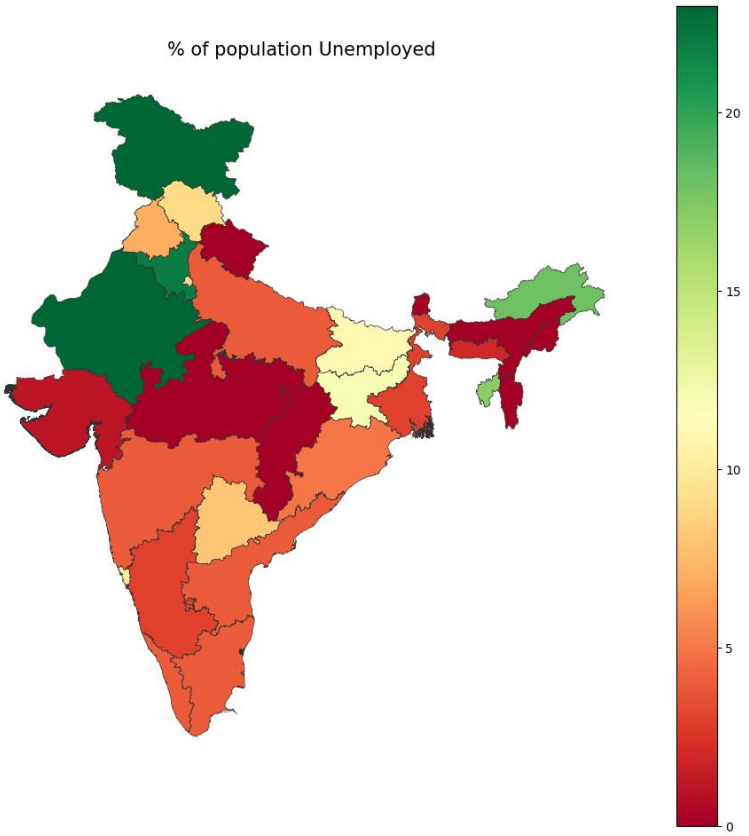

Figure 12: % of population Unemployed

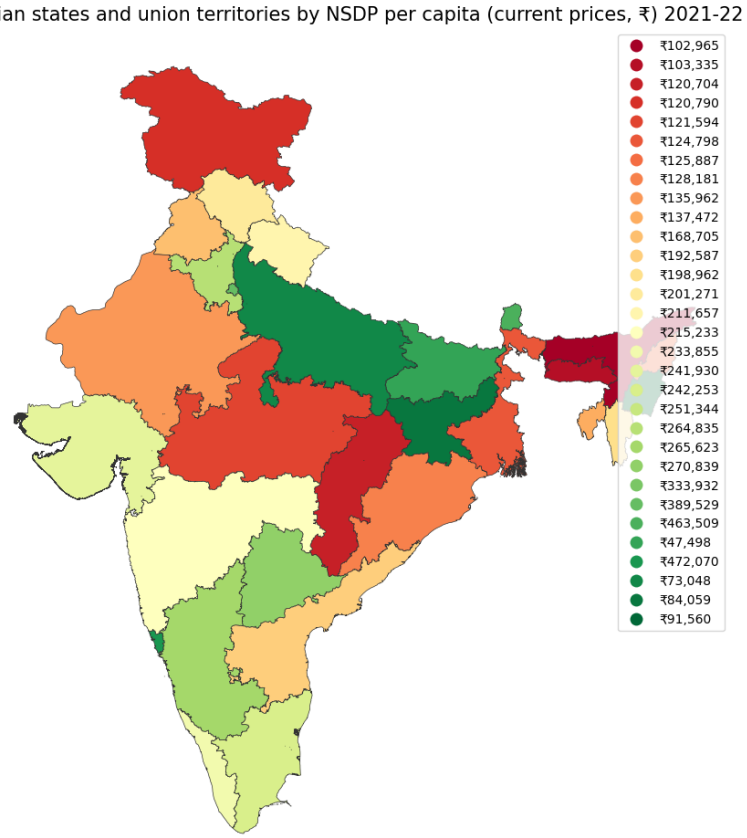

Figure 12: Indian states and union territories by NSDP per capita (current prices, ₹) 2021-22

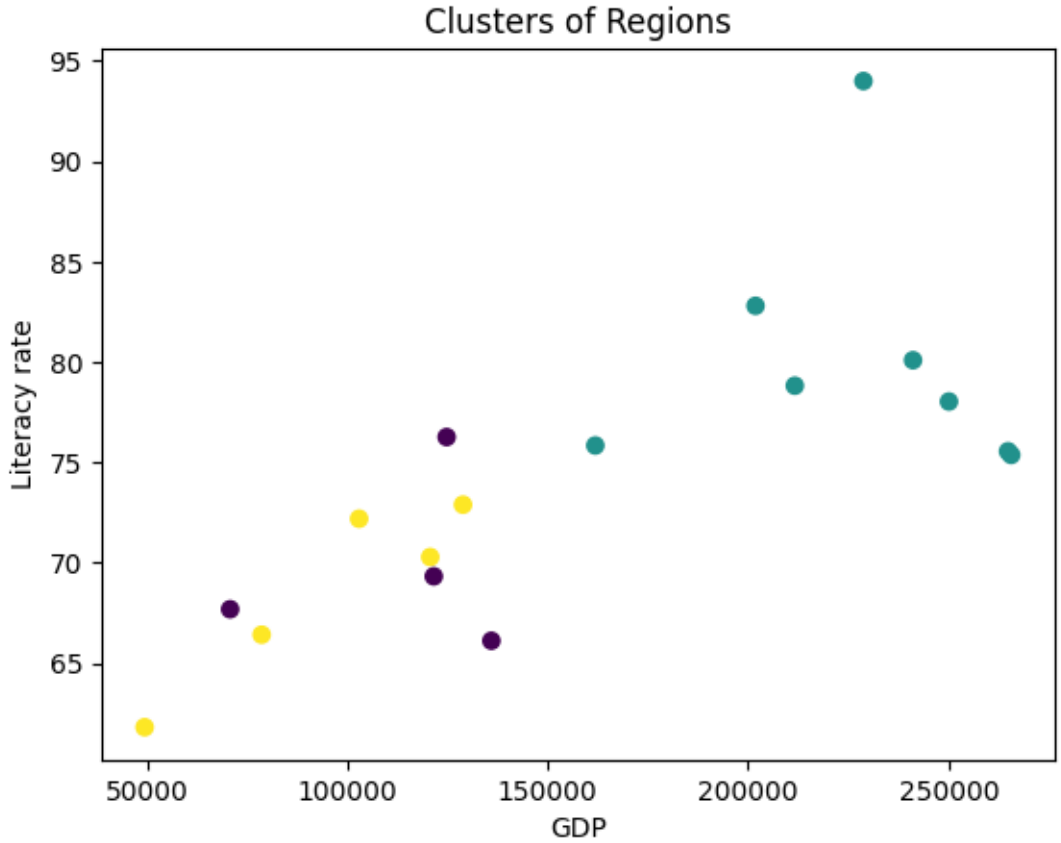

Figure 13: Cluster of Regions

The cluster bar chart reveals a positive association between literacy rate and GDP. Clusters in the upper right corner represent regions with both high literacy rates and high GDP, while clusters in the lower left corner represent regions with low literacy rates and low GDP. This suggests that there might be a link between a population's educational attainment and a country's economic development.

CONCLUSION & FUTURE SCOPE:

In this project, we analysed regional disparities in economic development across different states and union territories of India. We employed a comprehensive approach, integrating multiple economic indicators and advanced data analysis techniques to gain insights into the economic landscape of India.

Our analysis revealed distinct patterns of economic development across different regions, with some regions showing higher levels of development compared to others. Descriptive analysis provided a summary of key economic indicators, while regression analysis identified factors influencing regional economic development. Cluster analysis grouped regions with similar economic development characteristics, allowing us to identify clusters of regions with similar economic development profiles.

Visualization techniques such as scatter plots and choropleth maps helped illustrate regional disparities in economic development and provided valuable insights for policymakers and stakeholders. Understanding these regional disparities is crucial for designing targeted interventions aimed at reducing disparities and fostering balanced and inclusive economic growth across all regions of India.

Future Scope:

1. **Temporal Analysis:** Extend the analysis to examine how regional disparities in economic development have evolved over time. Analyzing trends over time can provide valuable insights into the dynamics of economic development in different regions.
2. **Impact Assessment:** Conduct impact assessments of various policy interventions and development programs on regional economic development. This can help evaluate the effectiveness of past interventions and inform future policy decisions.
3. **Predictive Modelling:** Develop predictive models to forecast future economic development trends in different regions. Machine learning algorithms can be used to identify patterns and make predictions based on historical data.
4. **Incorporate Additional Data:** Include additional socio-economic and demographic variables to enrich the analysis and provide a more comprehensive understanding of regional disparities in economic development.

5. **Policy Recommendations:** Provide specific policy recommendations based on the analysis to address regional disparities and promote inclusive economic growth. These recommendations can be tailored to the specific needs and characteristics of different regions.

By further exploring these avenues, future research can contribute to a deeper understanding of regional disparities in economic development and help inform evidence-based policymaking for promoting inclusive and sustainable development across all regions of India.

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