

# Infosys Internship 5.0

**Project Documentation: IndiaCityGDP - A Visualization of Urban Economic Metrics**

**Developer: B Lokesh Kumar Reddy**

**Mentor: Durga Prasad**

**Coordinator: Mohammed Hussain**

## **Introduction**

The "**IndiaCityGDP: A Visualization of Urban Economic Metrics**" project is a comprehensive initiative aimed at analyzing and visualizing economic data to provide insights into the Gross Domestic Product (GDP) and productivity metrics of various Indian cities. This project leverages advanced data analytics and visualization tools to convert complex datasets into intuitive and actionable formats. The goal is to empower policymakers, business leaders, and researchers with clear, accessible insights to support strategic decision-making.

The dataset for this project includes GDP data from Tier 1, Tier 2, and selected Tier 3 cities in India, covering the years 2019 to 2022. By integrating the Power BI dashboard into a Streamlit web application, the project ensures seamless user interaction and accessibility for a wide audience.

## **Project Scope**

The scope of the project includes:

1. **Data Collection and Preparation:** Acquiring GDP and economic metrics data from reliable sources, followed by preprocessing to ensure accuracy and consistency.
2. **Data Structuring and Visualization:** Developing an interactive Power BI dashboard to present data in an easily understandable manner.
3. **Web Application Integration:** Embedding the dashboard within a Streamlit application to provide an intuitive interface for users.

4. **Analysis and Insights:** Highlighting trends, disparities, and key economic indicators to support strategic decisions.
5. **Documentation and Future Enhancements:** Delivering comprehensive documentation and creating provisions for scalability and updates.

## **Requirements**

### **Functional Requirements**

- A dashboard displaying GDP trends, economic indicators, and sectoral contributions.
- Filters and drill-down features for detailed city-level analysis.
- A responsive web application to host the dashboard and enable user interaction.

### **Non-Functional Requirements**

- Scalability to accommodate additional data and metrics.
- High performance with optimized loading times.
- Secure handling of data to protect sensitive information.

## **Technology**

- **Programming Languages:** Python (Pandas, NumPy for data processing).
- **Visualization Tools:** Power BI for creating interactive dashboards.
- **Web Development:** Streamlit for building the web application.
- **Database:** SQLite for structured data storage.
- **Utilities:** Microsoft Excel, Jupyter Notebooks for data exploration and preprocessing.

## **Architecture and Design**

### **System Architecture**

1. **Data Layer:** Collection and preprocessing of raw economic data.
2. **Processing Layer:** Data transformation using Python libraries.

3. **Visualization Layer:** Power BI dashboards for interactive and dynamic visualizations.
4. **Integration Layer:** Streamlit application for hosting and user interaction.
5. **Interface Layer:** A user-friendly, responsive web interface.

### **Design Principles**

- **Modularity:** Ensuring that each component is independent for easier maintenance and scalability.
- **User-Centric Design:** Prioritizing clarity and usability to accommodate users with varying technical expertise.
- **Secure and Reliable:** Incorporating security measures to protect sensitive data and ensure application stability.

### **Dashboard Pages**

The Power BI dashboard consists of the following key pages:

1. **Overview of GDP and Economic Indicators:**
  - A high-level summary of GDP trends and key economic metrics across Indian cities.
  - Comparative visualizations of city-level GDP contributions.
2. **Sector-Wise GDP Distribution:**
  - Insights into GDP contributions from various sectors such as agriculture, industry, and services.
  - Regional comparisons to identify dominant economic sectors.
3. **R&D and Innovation Indicators:**
  - Metrics related to research and development, including innovation investments.
  - Analysis of innovation-driven economic growth.
4. **Employment and Unemployment Rates:**
  - Detailed trends in employment and unemployment rates.
  - City-level and sector-wise employment metrics.

## **Testing**

- **Unit Testing:** Testing individual components such as data preprocessing scripts and dashboard functionalities.
- **Integration Testing:** Ensuring seamless interaction between Power BI dashboards and the Streamlit application.
- **Performance Testing:** Evaluating application speed, responsiveness, and scalability under various data loads.
- **Usability Testing:** Collecting user feedback to refine the interface and enhance the user experience.
- **Error Handling and Debugging:** Identifying and resolving issues during development and testing phases.

## **Deployment**

- **Platform:** Hosting the Streamlit application on a cloud service (e.g., AWS, Heroku, or Streamlit Cloud).
- **Dashboard Deployment:** Publishing the Power BI dashboard to a shared workspace or embedding it directly into the application.
- **Production Testing:** Conducting rigorous tests in the production environment to ensure stability and performance.

## **User Guide**

### **1. Accessing the Application:**

- Open the web link to the deployed Streamlit application.
- Log in (if required) or access the dashboard without authentication for open use.

### **2. Navigating the Dashboard:**

- **Overview Page:** View city-level GDP trends and key economic metrics.
- **Sector-Wise Distribution:** Analyze contributions from agriculture, industry, and services.

- **R&D and Innovation:** Explore data on research and development indicators.
- **Employment Page:** Compare employment and unemployment rates across regions.

### 3. Using Filters and Drill-Down Features:

- Apply filters to refine data by year, region, or sector.
- Use drill-down options to explore granular details.

### 4. Exporting Insights:

- Export visualizations and reports for offline analysis and presentation.

### 5. Troubleshooting:

- Refer to the FAQs or contact support for assistance with technical issues.

## **Conclusion**

The "IndiaCityGDP: A Visualization of Urban Economic Metrics" project successfully delivers an interactive platform for analyzing and visualizing complex economic data. By integrating Power BI dashboards within a Streamlit web application, the project enhances accessibility and usability, empowering stakeholders to make data-driven decisions. The modular design and scalable architecture ensure the platform's adaptability to future expansions, making it a valuable tool for policymakers, researchers, and business leaders.

This documentation serves as a comprehensive guide to understanding the project, its components, and its operational framework, paving the way for future enhancements and long-term utility.

## **Code Snippets**

Below is some code snippets used in the project:

```
File Edit Selection View Go Run Terminal Help
myenv
powerbi_overview.html U powerbi_md.html U powerbi_sectorwise.html U powerbi_employment.html U app.py U x s.py U chatbot.py U feedback.py U styles.css
project > app.py > ...
1 import streamlit as st
2 from auth import authenticate_user, register_user
3 from utils.chatbot import get_chatbot_response
4 from utils.feedback import save_feedback
5
6 # Streamlit page config
7 st.set_page_config(
8     page_title="India City GDP Dashboard",
9     layout="wide",
10     page_icon="🇮🇳",
11     initial_sidebar_state="expanded",
12 )
13
14 # Initialize session state for authentication
15 if "logged_in" not in st.session_state:
16     st.session_state["logged_in"] = False
17     st.session_state["user_name"] = ""
18
19 # Function: Login Page
20 def login_page():
21     st.title("Login Page")
22     email = st.text_input("Email")
23     password = st.text_input("Password", type="password")
24
25     if st.button("Login"):
26         is_authenticated, user_name = authenticate_user(email, password)
27         if is_authenticated:
28             st.session_state["logged_in"] = True
29             st.session_state["user_name"] = user_name
30             st.success(f"Welcome, {user_name}!")
31         else:
32             st.error("Invalid email or password. Please try again.")
33
34 # Function: Register Page
35 def register_page():
36     st.title("Register Page")
37     name = st.text_input("Name")
38     email = st.text_input("Email")
39     password = st.text_input("Password", type="password")
```

```
File Edit Selection View Go Run Terminal Help
powerbi_overview.html U powerbi_rnd.html U powerbi_sectorwise.html U powerbi_employment.html U app.py U .spy U chatbot.py U feedback.py U # styles.css
project > app.py > ...
70 def chatbot_page():
71     def chatbot_response(user_input):
72         "how are you": "I'm just a bot, but I'm here to help!",
73         "services": "We offer insights into sector-wise trends, analytics, and reporting.",
74         "bye": "Goodbye! Have a great day!",
75     }
76     return responses.get(user_input.lower(), "I'm sorry, I didn't understand that. Can you rephrase?")
77
78 # Chat input
79 user_message = st.text_input("Your Message:", key="chat_input")
80 if st.button("Send"):
81     if user_message:
82         response = chatbot_response(user_message)
83         st.write(f"Bot: {response}")
84     else:
85         st.write("Please enter a message!")
86
87 # Function for Feedback Page
88 def feedback_page():
89     st.title("Feedback")
90     st.write("We value your feedback! Please let us know how we're doing.")
91
92     # Feedback form
93     with st.form("feedback_form"):
94         name = st.text_input("Your Name", "")
95         email = st.text_input("Your Email (optional)", "")
96         feedback = st.text_area("Your Feedback")
97         rating = st.slider("Rate your experience", 1, 5, 3)
98
99     # Form submission
100     submitted = st.form_submit_button("Submit Feedback")
101     if submitted:
102         st.success("Thank you for your feedback!")
103         # Optionally, store feedback in a database or file
104         st.write(f"Name: {name}")
105         st.write(f"Rating: {rating}/5")
106         st.write(f"Feedback: {feedback}")
107
108 # Function: About Page
109 def about_page():
110     st.title("About the India City GDP Project")
111     st.write("Overview")
112
113     Welcome to the GDP Insights Dashboard! This interactive tool provides real-time data and analysis on the Gross Domestic Product (GDP) of cities across India. With a focus on e
114
115     **Objective**
116
117     The primary objective of this dashboard is to visualize the GDP distribution among major cities in India, allowing users to compare economic performance and track growth trend
118
119     **Data Sources**
120
121     The data for this project is sourced from a variety of reputable sources, including government reports, economic surveys, and regional economic bodies. We continuously update
122
123     **Key Features**
124
125     City-wise GDP: Interactive charts that display the GDP of individual cities in India, including both nominal and per capita data.
126
127     Comparative Analysis: A feature that allows users to compare the GDPs of different cities across sectors like services, manufacturing, and agriculture.
128
129     Growth Trends: Visualizations of GDP growth trends over time, giving insights into the economic health of cities.
130
131     Sector Breakdown: Breakdown of GDP contribution from different industries such as IT, manufacturing, agriculture, etc., for each city.
132
133     **Why GDP Matters**
134
135     Gross Domestic Product is a key indicator of a region's economic health. Understanding GDP at the city level helps identify regional disparities, measure growth, and understand
136
137     ***
138
139     # Function: Insights Page
140     def insights_page():
141         st.title("Insights into India's City GDP")
142         st.write("1. **Services Sector Leads**")
143         The services sector contributes the most, with **8.44K units**, showcasing its dominance in the economy.
144
145         2. **Industry Sector**
146         The industrial sector follows, contributing **6.23K units**, reflecting significant industrial activity.
```

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144 def insights_page():
153 3. **Technology Sector's Rising Influence**
154 With **4.69K units**, the technology sector demonstrates its growing importance.
155
156 4. **Agriculture Sector Contribution**
157 Agriculture, while the smallest at **2.62K units**, remains vital for foundational economic stability.
158 """
159 # Replace the URLs with relevant images
160 st.image("C:/Users/lokes/Downloads/Springboard/ss1.png", caption="Sector-wise GDP Distribution")
161
162 st.write("""
163 1. **SME Sector Dominance:**
164 The SME sector shows the highest employment percentages across cities, reflecting its critical role in the economy.
165
166 2. **Tourism and ICT Sector Trends:**
167 Both tourism and ICT sectors have comparatively lower contributions, with ICT being more stable across cities.
168
169 3. **City-Specific Highlights:**
170 Cities like **Amritsar** and **Patna** exhibit significantly higher SME employment percentages, making them hotspots for SME activity.
171
172 4. **Employment Variability Across Cities:**
173 The gradual decline or stability in tourism and ICT sectors across cities indicates a potential for targeted growth strategies.
174 """
175 st.image("C:/Users/lokes/Downloads/Springboard/ss3.png", caption="Employment and Unemployment Rates")
176
177
178 # Sidebar navigation
179 st.sidebar.title("Navigation")
180 page = st.sidebar.radio("Go to", ["Login", "Register", "About", "Insights", "Dashboard", "Chatbot", "Feedback"])
181
182 # Page routing logic
183 if st.session_state["logged_in"]:
184 if page == "Dashboard":
185 dashboard_page()
186 elif page == "About":
187 about_page()
188 elif page == "Insights":
189 insights_page()
190 elif page == "Chatbot":
191 chatbot_page()
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