

**🗺️ Indian State Literacy Map - GeoPandas Visualization Project**

A comprehensive **GeoPandas-based choropleth mapping project** that visualizes literacy rates across Indian states with interactive features, statistical analysis, and highlighting of underperforming regions.

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**🎯 Features**

**Core Visualization Features**

* **📍 Choropleth Mapping**: Color-coded states based on literacy percentages
* **🎯 National Average Highlighting**: Red borders around states below national average
* **💡 Interactive Tooltips**: Hover information with state names and exact literacy rates
* **📊 Statistical Dashboard**: Real-time calculation of national averages and extremes
* **🎨 Custom Color Schemes**: Green-to-red gradient for intuitive interpretation

**Technical Features**

* **🔄 Dual Rendering**: Both Matplotlib (static) and Plotly (interactive) outputs
* **📱 Responsive Design**: Works across different screen sizes
* **⚡ Performance Optimized**: Efficient data processing and visualization
* **🔧 Modular Code**: Easy to extend and customize
* **📋 Data Validation**: Automatic data quality checks and error handling

**🚀 Quick Start**

**Prerequisites**

Python 3.8+  
pip (Python package manager)

**Installation**

1. **Clone the repository**

git clone https://github.com/your-username/Indian-State-Literacy-Map.git  
cd Indian-State-Literacy-Map

1. **Create virtual environment (recommended)**

python -m venv venv  
source venv/bin/activate # On Windows: venv\Scripts\activate

1. **Install dependencies**

pip install -r requirements.txt

**Quick Run**

# Generate static map  
python literacy\_map.py  
  
# Generate interactive map  
python literacy\_map.py --interactive  
  
# Generate both maps with analysis  
python literacy\_map.py --all

**📁 Project Structure**

Indian-State-Literacy-Map/  
│  
├── 📄 literacy\_map.py # Main script  
├── 📊 data/  
│ ├── literacy\_rates.csv # Source literacy data  
│ └── india\_states.geojson # Geographic boundaries (auto-downloaded)  
├── 📈 output/  
│ ├── static\_literacy\_map.png # Generated static map  
│ ├── interactive\_map.html # Generated interactive map  
│ └── analysis\_report.txt # Statistical analysis  
├── 📚 docs/  
│ ├── demo\_static.png # Static map preview  
│ └── demo\_interactive.gif # Interactive map demo  
├── 🛠️ requirements.txt # Python dependencies  
├── 📖 README.md # This file  
└── 📜 LICENSE # MIT License

**📊 Data Sources**

**Geographic Data**

* **Source**: Indian state boundaries GeoJSON from Data{Meet} community[[1]](#fn1)[[2]](#fn2)
* **Format**: GeoJSON with state polygons and metadata
* **Auto-download**: Script automatically fetches latest boundaries

**Literacy Rate Data**

* **Source**: Census 2023-24 compiled from government sources[[3]](#fn3)[[4]](#fn4)
* **Coverage**: All 28 states and 8 union territories
* **Format**: CSV with State and LiteracyRate columns

**Sample Data Format:**

State,LiteracyRate  
Kerala,95.3  
Mizoram,98.2  
Bihar,61.8

**📈 Expected Outputs**

**1. Static Choropleth Map (Matplotlib)**

* **File**: output/static\_literacy\_map.png
* **Resolution**: High-DPI (300 DPI) for publication quality
* **Features**:
  + Color-coded states by literacy percentage
  + Red borders highlighting below-average states
  + Statistical information panel
  + Professional styling with custom colormap

**2. Interactive Map (Plotly)**

* **File**: output/interactive\_map.html
* **Features**:
  + Hover tooltips with state details
  + Zoom and pan functionality
  + Click interactions
  + Responsive design for different devices

**3. Statistical Analysis Report**

* **File**: output/analysis\_report.txt
* **Contents**:
  + National literacy average calculation
  + Top 5 and bottom 5 performing states
  + States below national average identification
  + Statistical measures (standard deviation, range)

**Key Insights Generated**

Based on the latest data, the analysis reveals:[[3]](#fn3)

* **📊 National Average**: Approximately 76.3%
* **🏆 Highest Literacy**: Mizoram (98.2%), Lakshadweep (97.3%), Kerala (95.3%)
* **⚠️ Lowest Literacy**: Bihar (61.8%), Rajasthan (66.1%), Andhra Pradesh (67.0%)
* **📍 Regional Patterns**: Northeastern and southern states generally show higher literacy rates
* **🔍 States Below Average**: Automatically identified and highlighted with red borders

**🎨 Customization**

**Using Custom Data**

Replace data/literacy\_rates.csv with any CSV containing:

* State: State/region names matching GeoJSON boundaries
* LiteracyRate: Numerical values to visualize

**Command Line Options**

# Basic usage  
python literacy\_map.py  
  
# Custom data file  
python literacy\_map.py --data custom\_literacy.csv  
  
# Save specific outputs  
python literacy\_map.py --save-static --save-interactive  
  
# Disable below-average highlighting  
python literacy\_map.py --no-highlight  
  
# Custom threshold for highlighting  
python literacy\_map.py --threshold 70

**Color Scheme Customization**

The project supports multiple color palettes:

* **Default**: Green-to-red gradient
* **Education-focused**: Custom academic color scheme
* **Accessibility-friendly**: Color-blind safe palette

**🤝 Contributing**

We welcome contributions! Here's how to get started:

**Development Setup**

# Fork and clone the repository  
git clone https://github.com/your-username/Indian-State-Literacy-Map.git  
cd Indian-State-Literacy-Map  
  
# Create feature branch  
git checkout -b feature/amazing-feature  
  
# Install development dependencies  
pip install -r requirements-dev.txt  
  
# Run tests  
python -m pytest tests/  
  
# Check code style  
black literacy\_map.py  
flake8 literacy\_map.py

**Contribution Areas**

* [ ] Add district-level mapping capability
* [ ] Implement time-series analysis for multiple years
* [ ] Add export functionality for different formats (SVG, PDF)
* [ ] Create web-based dashboard interface
* [ ] Add comparison with other educational metrics
* [ ] Improve mobile responsiveness

**Guidelines**

1. **🐛 Bug Reports**: Use GitHub issues with detailed descriptions
2. **✨ Feature Requests**: Propose new features with use cases
3. **📝 Documentation**: Improve README, comments, or docs
4. **🧪 Testing**: Add tests for new functionality
5. **🎨 Code Style**: Follow PEP 8 and use black formatter

**📄 License**

This project is licensed under the **MIT License** - see the <LICENSE> file for details.

**Data Attribution**

* **Geographic boundaries**: Data{Meet} community (Public Domain)
* **Literacy statistics**: Government of India Census data (Open Government License)

**🏷️ Tags & Keywords**

geopandas - choropleth-map - data-visualization - india-literacy - educational-data - python-mapping - statistical-analysis - government-data - census-visualization - interactive-maps

**📞 Support & Contact**

* **🐛 Issues**: [GitHub Issues](https://github.com/your-username/Indian-State-Literacy-Map/issues)
* **💬 Discussions**: [GitHub Discussions](https://github.com/your-username/Indian-State-Literacy-Map/discussions)
* **📧 Email**: Contact for collaboration opportunities

**🌟 Acknowledgments**

* **Data{Meet}** community for providing open-source India boundary data
* **Government of India** for making census data publicly available
* **GeoPandas** and **Plotly** development teams for excellent visualization libraries
* Contributors and users who help improve this project

**⭐ If this project helps you understand Indian literacy patterns better, please star this repository!**

*Made with ❤️ for educational data visualization and evidence-based policy research.*

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1. <https://github.com/Subhash9325/GeoJson-Data-of-Indian-States>

1. <https://github.com/udit-001/india-maps-data>

1. <https://www.jagranjosh.com/general-knowledge/list-of-indian-states-with-highest-and-lowest-literacy-rate-1748938921-1>

1. <https://www.scribd.com/document/804432903/literacy-rate-csv-file-data>

1. <https://gist.github.com/ramantehlan/602ad8525699486e097092e4158c5bf1>

1. <https://docs.github.com/github/writing-on-github/getting-started-with-writing-and-formatting-on-github/basic-writing-and-formatting-syntax>

1. <https://stackoverflow.com/questions/23989232/is-there-a-way-to-represent-a-directory-tree-in-a-github-readme-md>

1. <https://www.freecodecamp.org/news/how-to-write-a-good-readme-file/>

1. <https://github.com/mhucka/readmine>

1. <https://coding-boot-camp.github.io/full-stack/github/professional-readme-guide/>

1. <https://github.com/RichardLitt/standard-readme>

1. <https://www.makeareadme.com>