CAPSTONE PROJECT

ANALYZING DEMOGRAPHIC AND REGIONAL DISPARITIES IN TELE-LAW CASE REGISTRATIONS FOR INCLUSIVE LEGAL ACCESS

Presented By:
M.R.SIVA CHARAN-GITAM UNIVERSITY-CSE

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OUTLINE

- **Problem Statement** (Should not include solution)
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result (Output Image)**
- **Conclusion**
- **Future Scope**
- **References**

PROBLEM STATEMENT

Despite the expansion of the Tele-Law initiative across states and districts, there is limited understanding of demographic utilization patterns and regional disparities in legal aid access. The challenge is to analyze Tele-Law case registration data to uncover gender-wise, caste-wise, and geographic disparities in service utilization across Common Service Centres (CSCs). Uneven representation among marginalized groups (SC, ST, OBC) and low outreach in certain districts raise concerns about equity and effectiveness. This problem demands a data-driven approach to evaluate inclusivity and optimize service delivery.

PROPOSED SOLUTION

•**Body:** The proposed solution is a comprehensive data analysis of the "District-wise Tele-Law Case Registration" dataset. The system is designed to process this data and present a clear picture of the current utilization landscape through the following key components:

•**Data Ingestion and Cleaning:** Loading the raw dataset and performing necessary preprocessing steps, such as standardizing column names and filtering for relevant 'Case Registered' information to ensure data quality and accuracy.

•**Demographic Analysis:** Aggregating the data to quantify disparities based on gender (male vs. female) and caste (General, OBC, SC, ST). This involves calculating totals and percentage distributions to highlight imbalances.

•**Geographic Analysis:** Identifying regional disparities by aggregating data at the state level. To ensure a fair comparison between states with a varying number of service centers, the analysis normalizes the data by calculating a "cases per CSC" metric.

•**Visualization:** Generating a series of clear and informative visualizations to present the findings. This includes pie charts for demographic breakdowns, a bar chart for top-performing states, and a choropleth map of India for an intuitive view of the geographic spread of service utilization.

SYSTEM APPROACH

- **Title:** System Development Approach (Technology Used)
- **Cloud Platform:** IBM Cloud
- **Development Environment:** Jupyter Notebook
- **Core Libraries:**
  - Pandas (for data manipulation)
  - Matplotlib & Seaborn (for charts)
  - Geopandas (for mapping)

ALGORITHM & DEPLOYMENT

•**Algorithm (Analysis Workflow):** The core of this project is a descriptive analytics workflow executed in
• a sequential pipeline:

1.Input: The raw DistrictswiseCR_AEdataf_24-25.csv dataset is ingested into the environment.

2.Preprocessing: The data is loaded into a Pandas DataFrame. Column names are standardized (e.g., converted to lowercase, special characters removed) for easier access. The dataset is then filtered to isolate only the 'Case Registered' entries, which are relevant for this analysis.

3.Aggregation:

- **Demographic:** National totals for gender and caste categories are calculated by summing their respective columns.
- **Geographic:** The DataFrame is grouped by state using groupby(). The total cases and number of CSCs for each state are then calculated using sum aggregation. A new metric, 'cases per CSC', is computed to normalize the data.

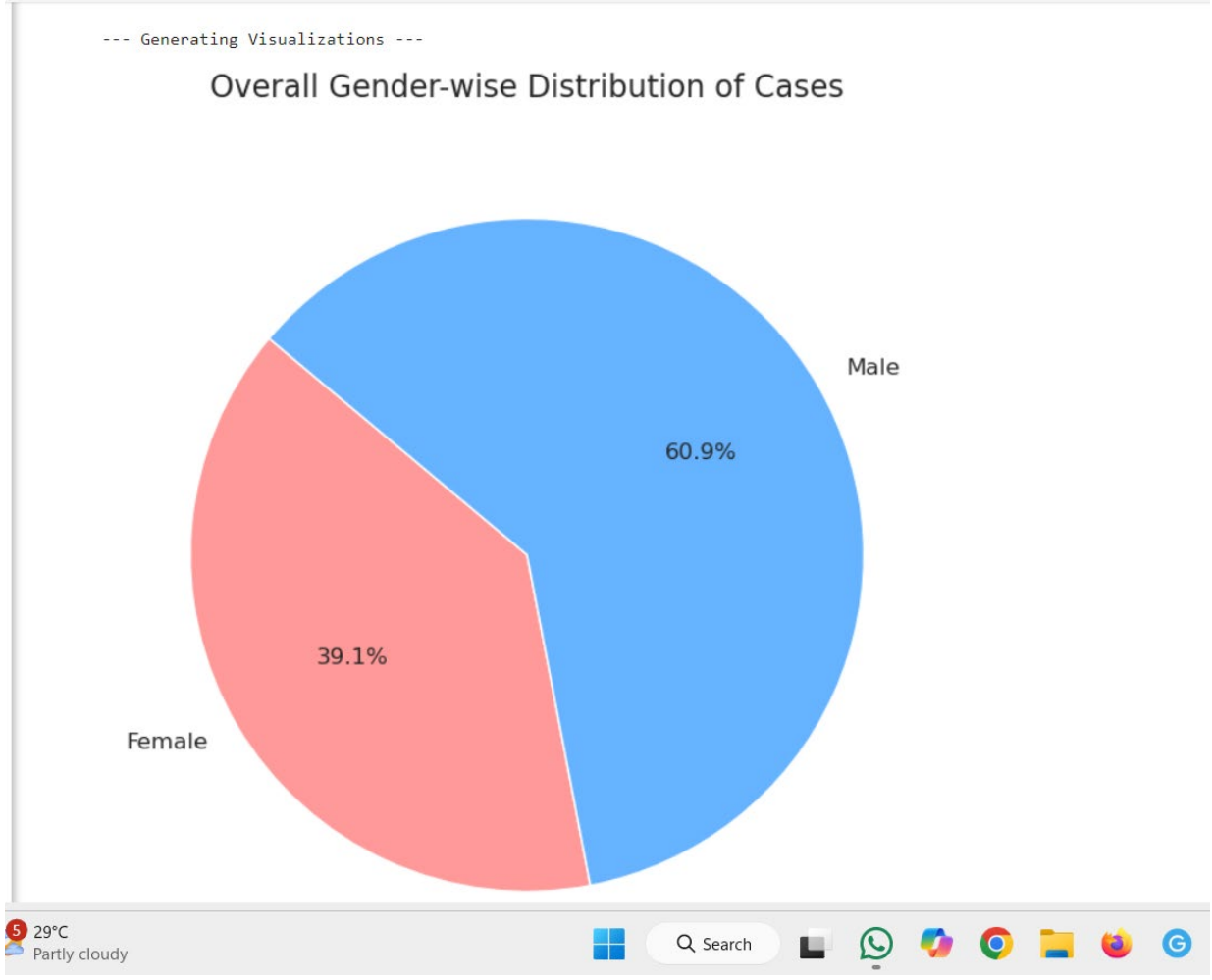
4.Visualization: Using the aggregated data, Matplotlib and Seaborn are used to generate pie charts for demographic distributions and a bar chart for state-wise comparisons. Geopandas is used to merge the state-level data with a GeoJSON map of India to create the final choropleth visualization.

•**Deployment:**

•The solution is deployed and fully contained within the **IBM Cloud's Jupyter Notebook environment**. This provides a reproducible and shareable platform where the entire analysis, from data loading to visualization, can be executed in a single run. The final outputs (textual analysis and image files) are generated directly within this cloud-based notebook.

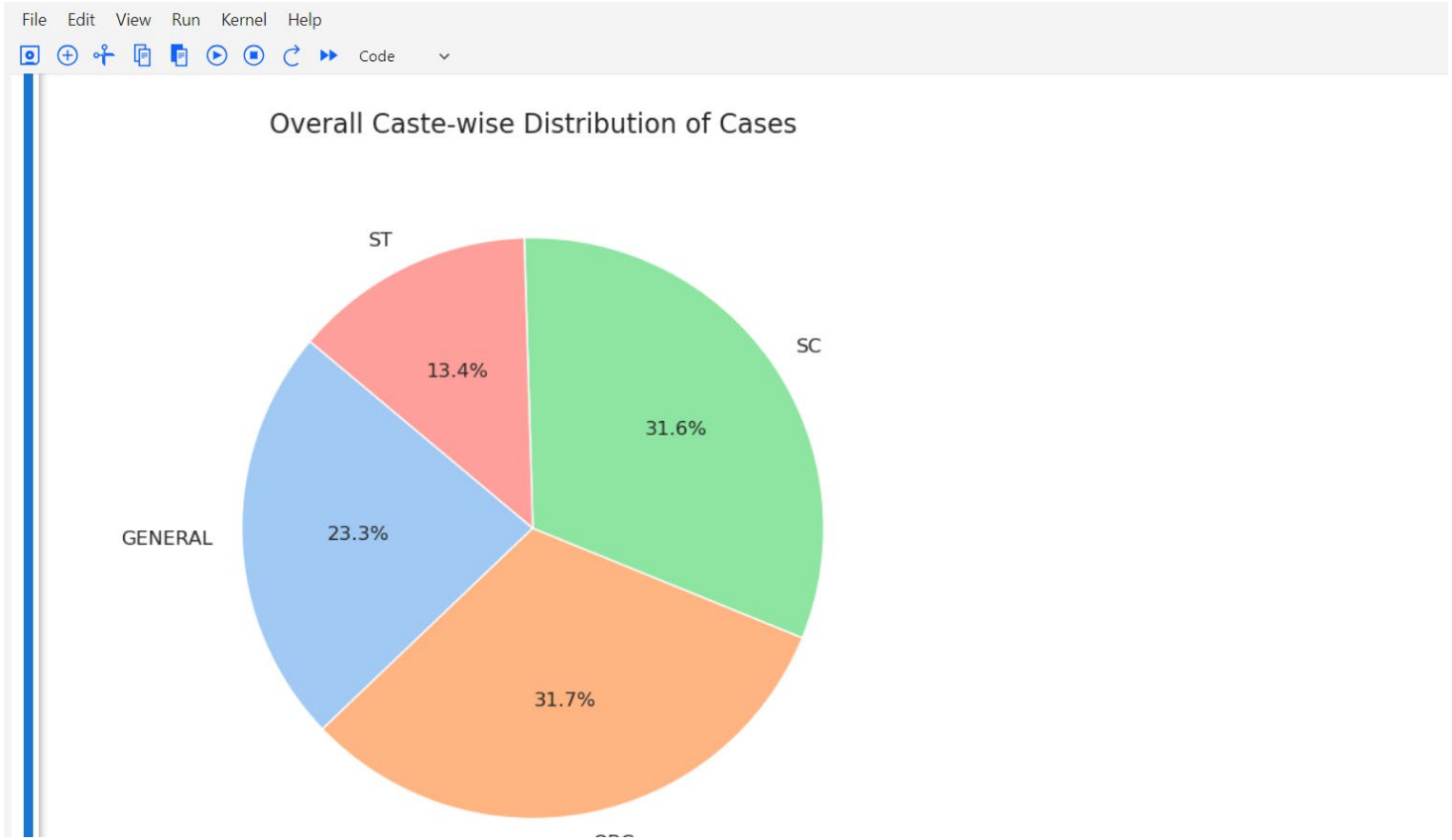
RESULT - GENDER-WISE DISPARITY

The analysis shows a significant gender gap, with males accounting for approximately 61% of the cases.



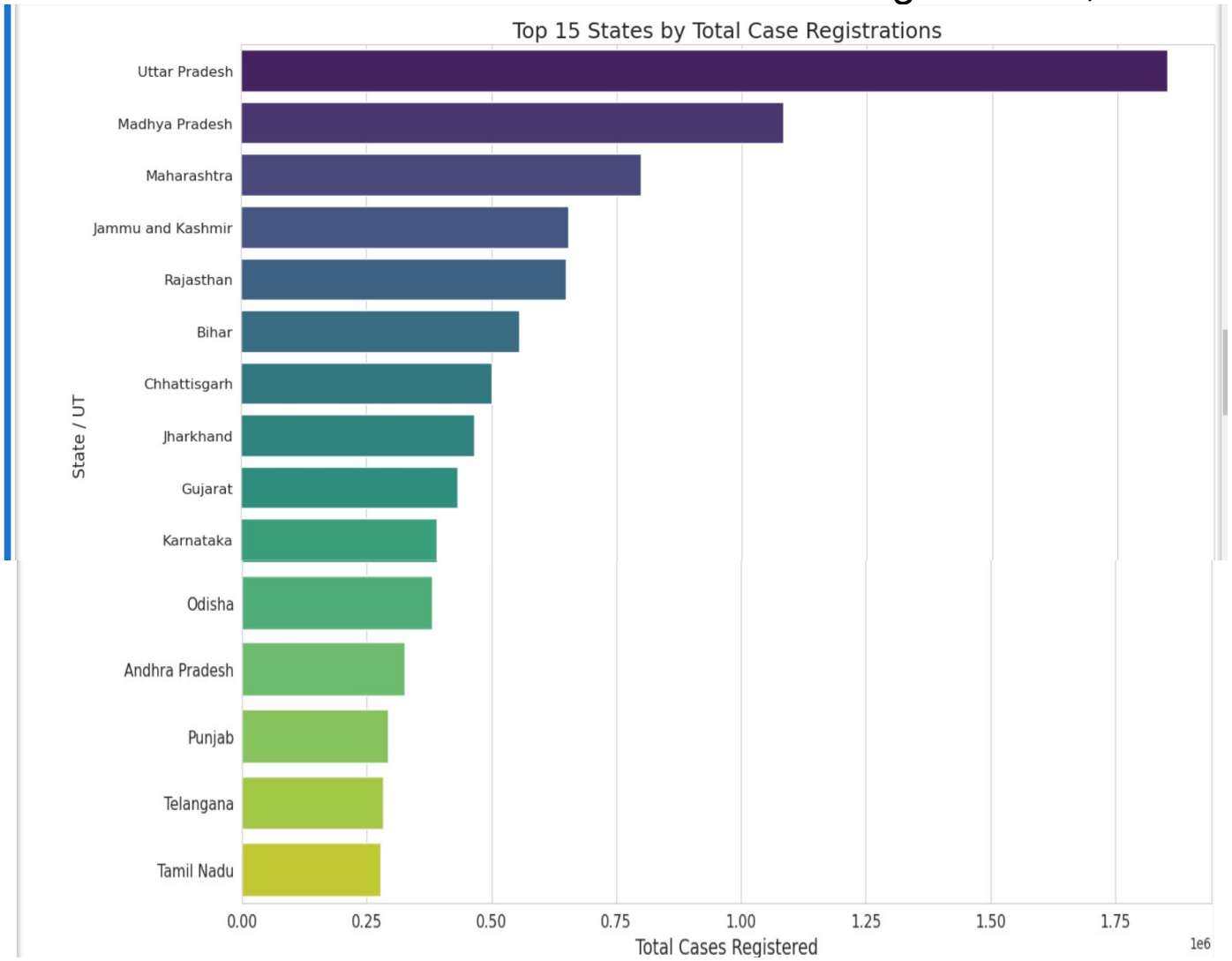
RESULT - CASTE-WISE DISPARITY

The distribution among caste categories is relatively balanced between OBC and SC, with a smaller representation from the ST community.



RESULT - GEOGRAPHIC DISPARITY (TOP STATES)

•uttar Pradesh leads in the total number of case registrations, followed by Madhya Pradesh and Maharashtra.



(Note: The x-axis values are shown in millions, e.g., 0.25 represents 250,000 cases).

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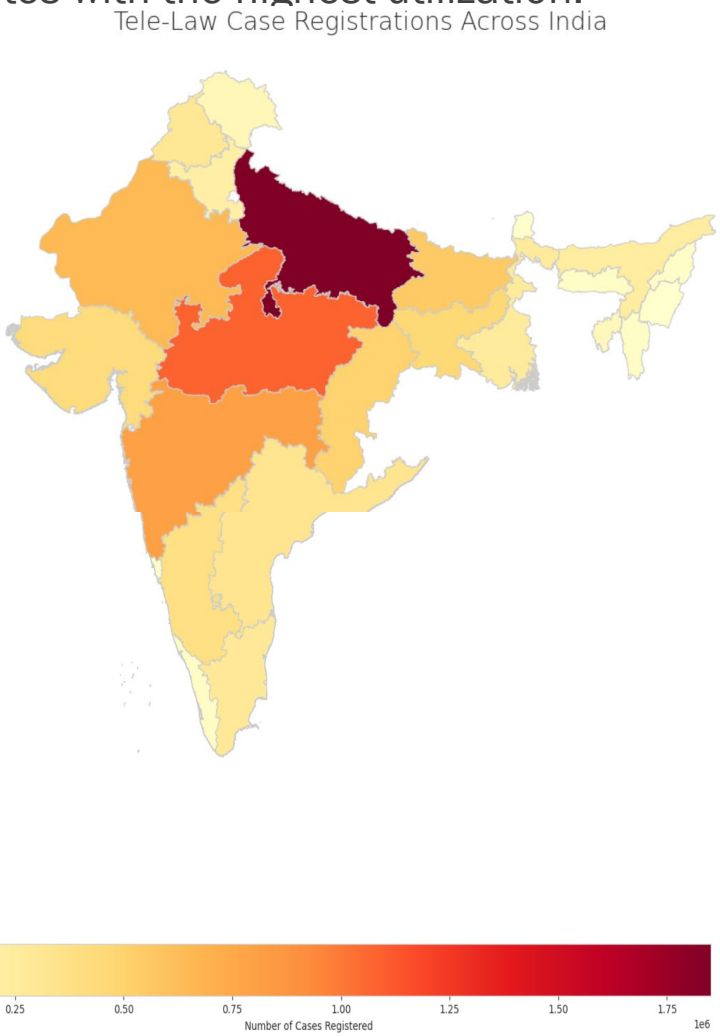
RESULT - GEOGRAPHIC DISPARITY (MAP VIEW)

- The choropleth map provides a clear visual representation of case concentration across India, highlighting the states with the highest utilization.



•**Color Gradient:** The index shows a range of colors from light yellow to dark red.
•**Value Representation:** Each color corresponds to the total number of Tele-Law cases registered in a state.
•**Scale:**
•**Lighter colors** (like yellow) represent a lower number of cases (around 250,000).
•**Darker colors** (like dark red/maroon) represent a higher number of cases (around 1,750,000 or more).

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CONCLUSION

- This analysis effectively highlights key disparities in Tele-Law service utilization. The findings show a clear gender gap favoring male beneficiaries and a high concentration of service uptake in a few states. While caste representation is somewhat balanced, outreach to ST communities could be improved. A key challenge was normalizing for the varying number of CSCs per region, which was addressed by calculating cases per CSC. These insights are vital for policymakers to develop targeted strategies, improve outreach, and ensure the Tele-Law program provides equitable legal access to all citizens.

FUTURE SCOPE

- **Incorporate Additional Data Sources:** Enhance the analysis by integrating socio-economic data, local events calendars, and legal aid awareness campaign data to uncover deeper correlations.
- **Optimize and Expand Analysis:** Expand the system to cover a more granular, district-level analysis across all regions to pinpoint specific areas needing intervention.
- **Advanced Machine Learning:** Implement predictive models (e.g., time-series forecasting) to forecast future case volumes and help with resource allocation.
- **Integration of Emerging Technologies:** Develop an interactive, web-based dashboard for real-time data exploration and consider edge computing for localized data processing in the future.

REFERENCES

•**Dataset:** District-wise Tele-Law Case Registration and Advice Enabled Data. Sourced from Open Government Data (OGD) Platform: https://www.data.gov.in/

•Data set link: https://www.data.gov.in/resource/district-wise-tele-law-case-registration-and-advice-enabled-data-fy-2021-22-2024-25

•**Geographic Data:** India State GeoJSON file from https://github.com/geohacker/india

THANK YOU

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