Data Driven Policy Innovation – IIIT Bangalore

Modelling Approach, Rationale, and Policy Insights

Team OUTLIER

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Objective

- To leverage the **UDISE 2023–24 and 2024–25 datasets** for evidence-based decision-making in school education.
- Focus areas:
  - Teacher provisioning through **Pupil–Teacher Ratio (PTR)**.
  - Infrastructure quality through a composite **Infrastructure Index**.
  - Gender equity through **Gender Parity Index (GPI)**.
- Goal: Identify districts facing deficits and design actionable interventions for policy prioritization.

Modelling Approach

Dataset Preparation:

- School-level data merged across profile, facilities, teachers, and enrolment.
- Aggregated to the **district level**, ensuring comparability across years.
- Derived key ratios:

$$\text{PTR} = \frac{\text{Total Students}}{\text{Total Teachers}}, \quad \text{GPI} = \frac{\text{Girls Enrolled}}{\text{Boys Enrolled}}$$

- Created an **Infrastructure Index** as the average availability of electricity, library, ICT lab, and internet.

Purpose: To predict and interpret how infrastructure and gender parity affect teacher provisioning at the district level.

Modelling Rationale

- **Weighted Linear Regression (OLS):**
  - Interpretable and transparent.
  - Weighted by student population to give higher importance to large districts.
  - Result: $R^2 = 0.565$
- **Random Forest Regressor:**
  - Captures non-linear relationships and interactions.
  - Robust against multicollinearity and missing variables.
  - Result: $R^2 = 0.624$
- Both models validate that infrastructure and gender parity significantly influence PTR outcomes.

Analytical Highlights

- 2024–25 PTR distribution is moderate with an upper bound around **17.3**, indicating improved teacher availability.
- **66 districts** show severe infrastructure deficits (Infrastructure Index < 0.50).
- **138 districts** demonstrate persistent gender disparities (GPI < 0.90).
- Highest PTR districts include *Sahibganj (Jharkhand)*, *Pakaur (Jharkhand)*, and *Nuh (Haryana)*.

Key Recommendations

1. **Address Infrastructure Deficit in 66 Districts**
   - Prioritize electricity, libraries, ICT labs, and internet connectivity.
   - Implement a "Minimum Viable School" (MVS) checklist to ensure all schools reach baseline infrastructure levels.
2. **Promote Gender Parity in 138 Districts**
   - Incentivize girls' education through scholarships, bicycles, and transport facilities.
   - Conduct community outreach programs to reduce dropout rates among girls.
3. **Monitor Emerging PTR Hotspots**
   - Although no districts exceed PTR $= 35$ currently, continuous monitoring is essential.
   - Early intervention through temporary teacher redeployment and contract teacher pools in high-growth areas.

Policy Takeaways

- Data-driven metrics like **Infra Index, GPI, and PTR** can directly guide budget allocation and district prioritization.
- Continuous integration of UDISE datasets across years can track impact of interventions.
- The pipeline can be automated for annual dashboards and policy briefs.

Overall Message:

Investing in school infrastructure and gender equity delivers measurable improvements in education outcomes.

Thank You!

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