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COURSE UNIT: MACHINE LEARNING

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Project Concept Proposal

Title: Predictive Resource Allocation Using Population Forecasting in Uganda

1. Background & Problem Statement

Uganda's districts showcase big variations in population size, density, and socio-economic conditions. Limited resources, such as healthcare facilities, schools, and infrastructure, must be allocated efficiently to prevent strain on services and promote better utilization. With each year that pass, the district's population keeps on changing; hence, having insight into the future populations can guide policymakers and planners in distributing resources effectively.

2. Objective

The project aims to:

1. Forecast future population trends per district using historical data.
2. Predict districts at risk of resource strain based on forecasted population and socio-economic indicators.

3. Dataset

- **Source:** [DHS Quickstats Subnational Uganda \(CSV\)](#)
- **Content:** District-level population and socio-economic indicators spanning 1988–2018.

4. Methodology

1. **Data Preprocessing**
 - Clean data, handle missing values, and organize by district and year.
2. **Population Forecasting**
 - Apply models to predict future population trends per district.
3. **Resource Risk Prediction**
 - Use forecasted population as input to a classification model or rule-based system to categorize districts by resource strain risk:
 - Low risk
 - Medium risk
 - High risk
4. **Validation & Evaluation**
 - Train models on historical data (1988–2013) and test on recent years (2014–2018).
 - Metrics:
 - MAE/RMSE for population forecasts.
 - Accuracy/F1-score for resource risk classification.
5. **Visualization & Output**

- Maps highlighting districts by predicted risk level.
- Tables showing forecasted population and resource demand estimates.

5. Expected Impact

- Provides forward-looking insights for resource allocation in healthcare, education, and infrastructure.
- Help to identify high-risk districts before resource strain occurs.
- Supports evidence-based decision-making for sustainable planning and efficient use of limited resources by the planning entities.

6. Timeline

Phase	Duration	Key Tasks
Data preprocessing	1 week	Clean, structure, and organize data
Population forecasting	2 weeks	Train models and forecast population
Resource risk prediction	1 week	Classify districts based on forecasted demand
Evaluation & visualization	1 week	Validate models, create maps and charts
Report & presentation	1 week	Prepare final report and presentation