Group 3 Members

Project Title

Sudan Food Insecurity and Displacement Early-Warning Model

Background & Rationale

Sudan is experiencing a protracted humanitarian crisis driven by conflict, displacement, economic stress, and climate shocks.

Existing information systems largely provide **reactive snapshots**, limiting the ability of humanitarian actors to anticipate deterioration and allocate scarce resources proactively.

This project addresses that gap by developing a **forward-looking, data-driven early-warning prototype** that integrates food security and displacement signals across administrative levels.

Project Goal

To deliver a **decision-ready early-warning prototype** that enables humanitarian decision-makers to anticipate food insecurity deterioration and displacement pressure, understand underlying risk drivers, and support prioritization for anticipatory action.

Key Objectives

1. **IPC Food Insecurity Forecasting (State Level)**
    - Predict one-month-ahead IPC Phase 3+ (IPC3+) outcomes using regression and classification approaches.
    - Flag states at risk of meaningful deterioration (greater than 2%-point increase in IPC3 and above).
2. **Displacement Pressure Monitoring & Hotspot Intelligence**
    - Rank states by current IDP pressure.
    - Identify localities contributing most to displacement concentration and hotspot formation.
3. **Risk Diagnostics & Driver Analysis**
    - Integrate multi-sector signals (conflict, displacement, prices, rainfall, population exposure).

- Provide interpretable insights into the main drivers of elevated humanitarian risk.

Data & Methodology (Summary)

- **Data sources:** IPC food security data, displacement/IDP datasets, conflict events, market prices, rainfall, and population data.
- **Approach:**
  - Data cleaning, harmonization, and panel construction (state/locality–month).
  - Exploratory data analysis.
  - Feature engineering.
  - Supervised modeling (regression and classification) with time-based train/test splits.
- **Outputs:** Monthly rankings, risk flags, hotspot indicators, and feature-importance diagnostics

Intended Users & Stakeholders

- Humanitarian organizations (e.g., UN agencies, INGOs)
- Government counterparts involved in food security and displacement response

Expected Outputs

- One-month-ahead early-warning signals for food insecurity deterioration
- State-level displacement pressure rankings
- Locality-level hotspot and concentration indicators
- Visual dashboards and geospatially ready outputs to support planning and targeting

Decision-Ready Framing

This project constitutes a **decision-ready prototype**: it already produces actionable early-warning signals and diagnostic insights for strategic planning and anticipatory action.

Advanced components such as probabilistic uncertainty bounds, formal spatial clustering, and response-rule optimization are identified as **planned extensions**, building directly on the established analytical backbone rather than indicating gaps in the core system.