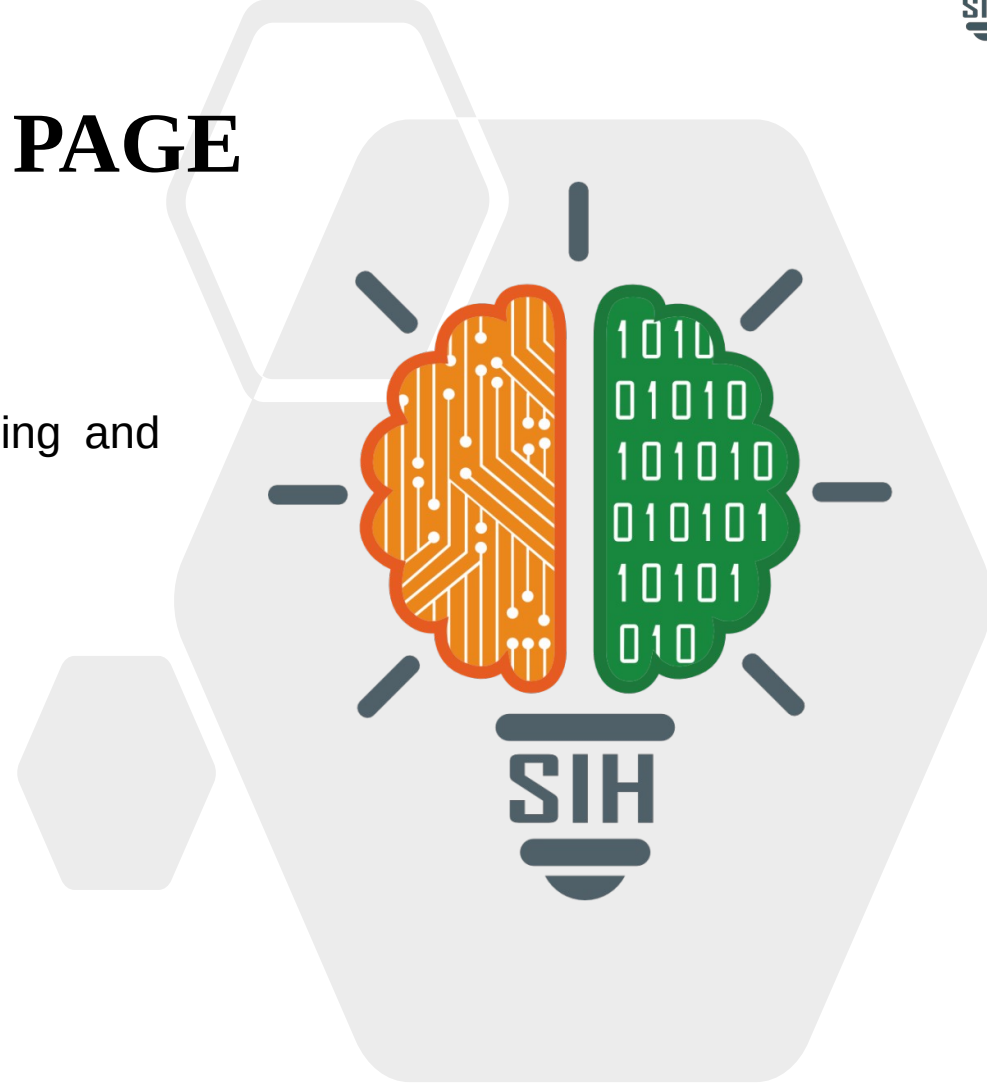




TITLE PAGE

- **Problem Statement ID** – SIH26001
- **Problem Statement Title-** AI-Based Early Warning and Landslide Risk Monitoring System in NER
- **Theme-** Disaster Management
- **PS Category-** Software
- **Team ID-** 38
- **Team Name-** Quantum Coders



AI-Based Landslide Early Warning System

Proposed Solution

Software-only AI/ML platform that predicts landslide risk across NER using rainfall, terrain slope, soil-moisture & historical landslide data.

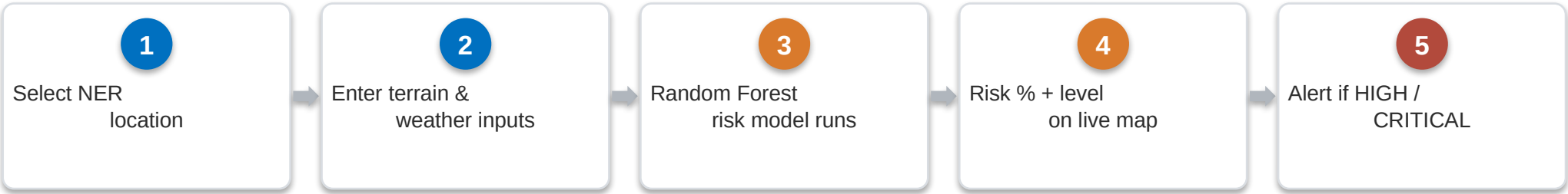
How it addresses the problem: turns scattered regional data into hyperlocal risk alerts sent as SMS, human-like AI voice calls & map warnings — even with no internet.

Innovation: adds evacuation-route & nearest-shelter guidance, not just a warning — a gap in most existing landslide tools.

Why We're Different

Existing Tools	Our System
Generic / global data	NER-specific GSI & ISRO landslide data
Dashboard alerts only	SMS + AI voice call + live map
Needs internet	Works over basic SMS network too
Warning only	+ Evacuation route & shelter guidance

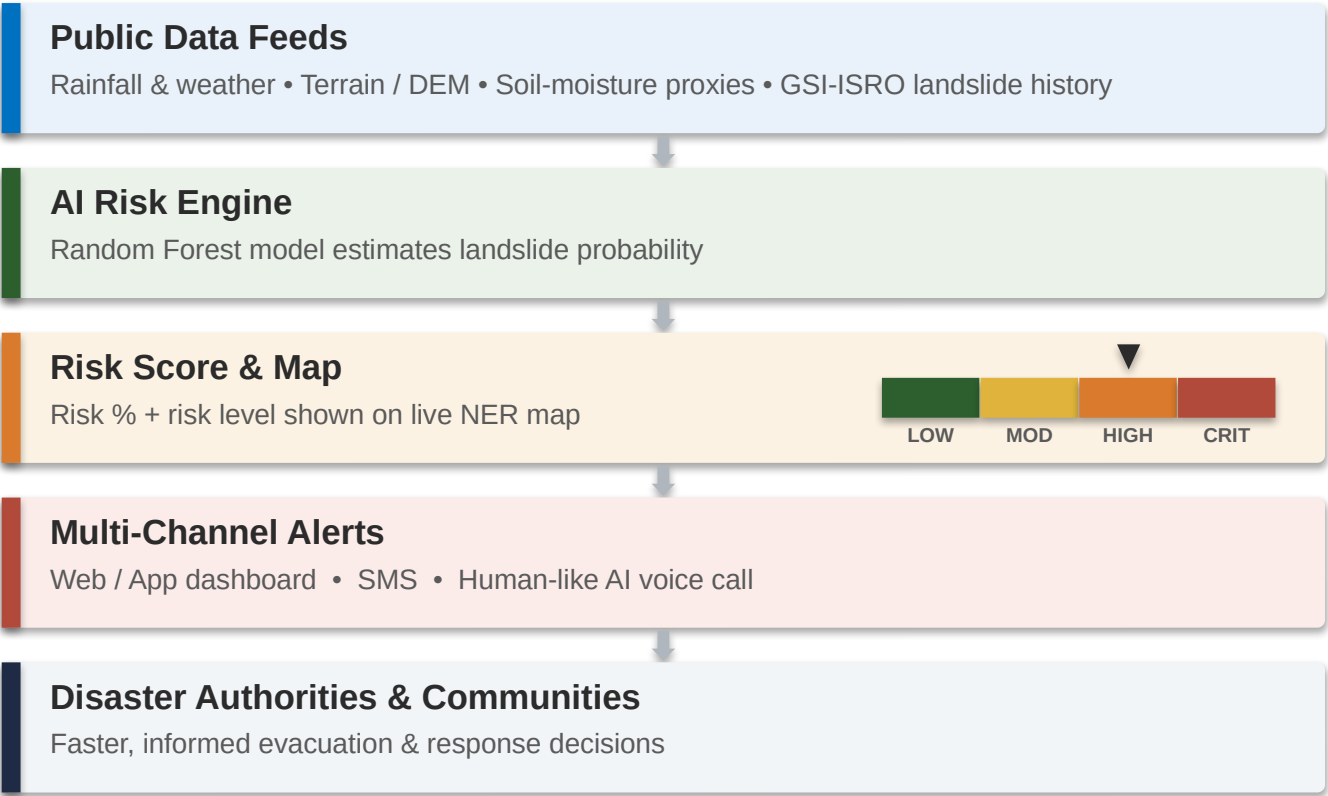
How It Works



Technologies Used (100% Software)

- AI / ML:** Python, Scikit-learn, Random Forest (the model that predicts risk)
- Data Sources:** GSI & ISRO/NRSC landslide + rainfall data, IMD weather, elevation maps (DEM) — no physical sensors
- Backend:** FastAPI / Node.js — the engine that connects everything
- Database:** PostgreSQL + PostGIS — stores & searches map/location data
- Frontend:** React + Leaflet/OpenStreetMap — the interactive map users see
- Evacuation Routing:** OpenStreetMap route to the nearest safe shelter when risk is HIGH/CRITICAL
- Alerts Engine:** SMS gateway + human-like AI voice-call API + Web/App push

Methodology — How It Works End-to-End



100%

Software-only

zero hardware cost

4

Free public data sources

GSI · ISRO/NRSC · IMD · OSM

Fast Build

Buildable & deployable

within the SIH timeline

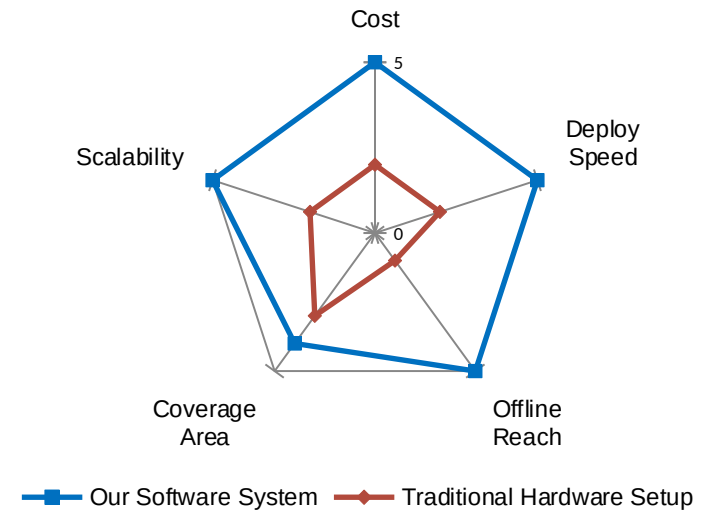
Feasibility

- **Existing Technology:** AI/ML, GIS, satellite & rainfall data are all free and readily available.
- **No Hardware Dependency:** Purely software — no sensor procurement, installation or maintenance.
- **Scalable:** Cloud-hosted — pilot in a few NER districts, then expand statewide.

Viability

- **Real-Time Monitoring:** Continuously updated landslide-risk scores as new data arrives.
- **Actionable Alerts:** SMS + AI voice calls reach people even in low-connectivity NER villages.
- **Long-Term Value:** Reduces loss of life, infrastructure damage & emergency-response costs.

Our Approach vs. a Traditional Hardware/Sensor System



* Team's comparative self-assessment (1 = low, 5 = high)

IMPACT

1

Saves Lives

Earlier warnings enable timely evacuation in high-risk NER slopes.

2

Protects Infrastructure

Reduces risk to roads, bridges & critical facilities before damage occurs.

3

Improves Disaster Resilience

Supports faster, better-informed disaster-management decisions.

BENEFITS

4

Hyperlocal Alerts

Identifies the exact high-risk NER location, not just a broad region.

5

Works Without Internet

SMS + AI voice calls reach communities with no data connectivity.

6

Cost & Resource Saving

Helps authorities prioritize preventive action and emergency resources.

Why This Matters: Mizoram alone recorded 12,385 landslide events between 1998–2022 — the highest of any Indian state — and Arunachal Pradesh has 16 highly-exposed districts, the most in the country. (Source: ISRO Landslide Atlas of India)

1. Geological Survey of India (GSI) — National Landslide Forecasting Centre

Landslide forecasting, risk analysis, rainfall/weather inputs, remote sensing & AI-based techniques.

2. ISRO — Landslide Atlas of India

~80,000 mapped landslides (1998–2022) — used for our satellite/remote-sensing risk-inventory component.

3. NRSC / ISRO — Landslide Early Warning

Rainfall forecast + landslide forecast + hybrid satellite monitoring approach.

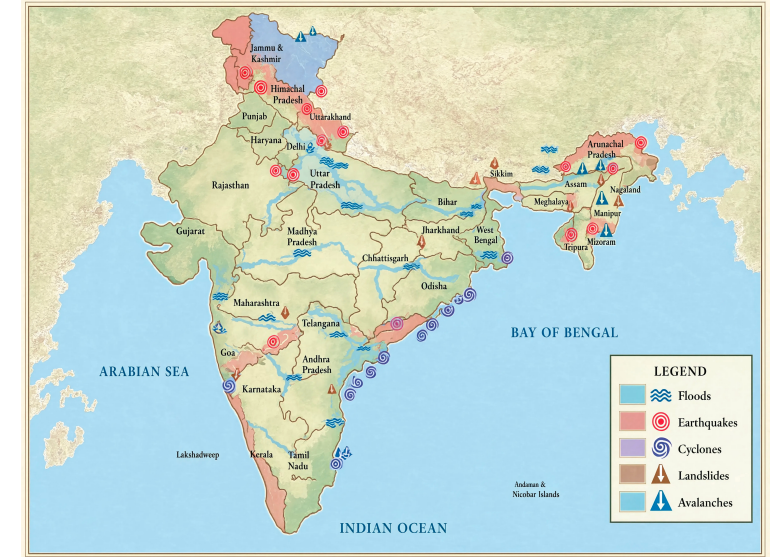
4. GSI — Landslide Monitoring & Early-Warning Activities

Reference for instrument-based ground-displacement + rainfall monitoring concepts.

NER Districts with Highest Landslide Exposure — ISRO Landslide Atlas of India



Number of highly-exposed districts per state (of 147 nationwide)



Competitive Research: We reviewed existing open-source landslide-prediction projects. Most rely on generic/global data, offer dashboard-only alerts, and have no offline reach or local-language voice guidance. This directly shaped our focus on NER-specific data, SMS + AI voice alerts, and evacuation guidance.