TITLE

IdeaSprint – National Innovation Challenge

Project Name : LULC Transition Intelligence

Team Name : Elite Developers

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College: MVRDegreeCollege

Event : Idea Sprint (E-summit)

Problem Statement

Rapid urban expansion driven by pilgrimage, tourism, and infrastructure

Existing LULC studies are coarse and map-centric

Lack pixel-level evidence and confidence metrics

Outputs are unsuitable for:

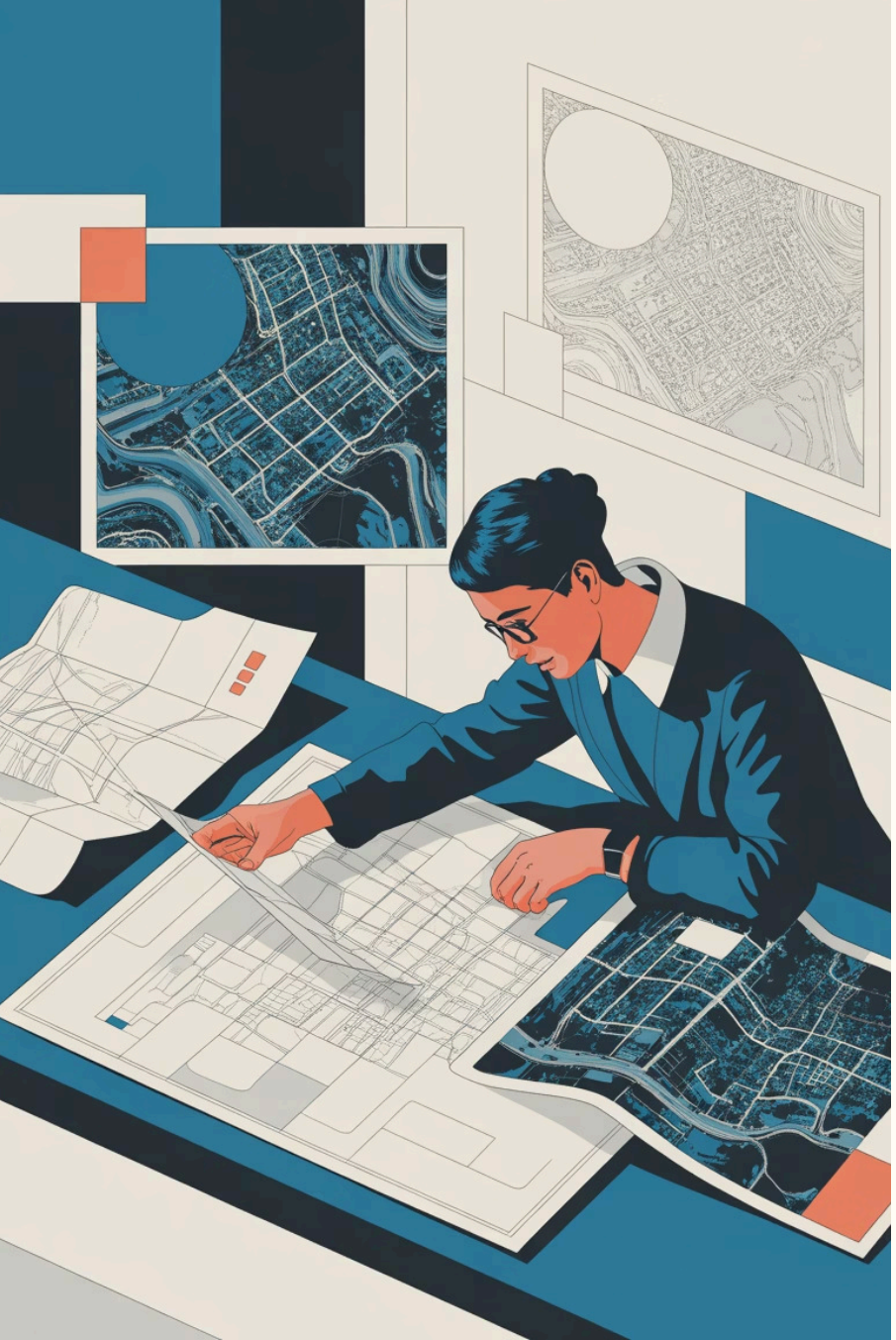
Policy decisions

Enforcement

Sustainability planning

Highlight :

Without confidence, land-use change cannot be trusted for governance



Solution Overview

AI-powered GeoAI platform for Tirupati

Pixel-level LULC classification

Pixel-wise change detection

Confidence-aware class-to-class transition analytics

Interactive, decision-ready dashboard

LULC Classes: Forest | Water Bodies | Agriculture | Barren Land | Built-up

Technical Architecture

Multi-temporal satellite data:

Sentinel-2 (10m resolution)

Landsat (30m historical archive)

Preprocessing:

Cloud masking

Atmospheric correction

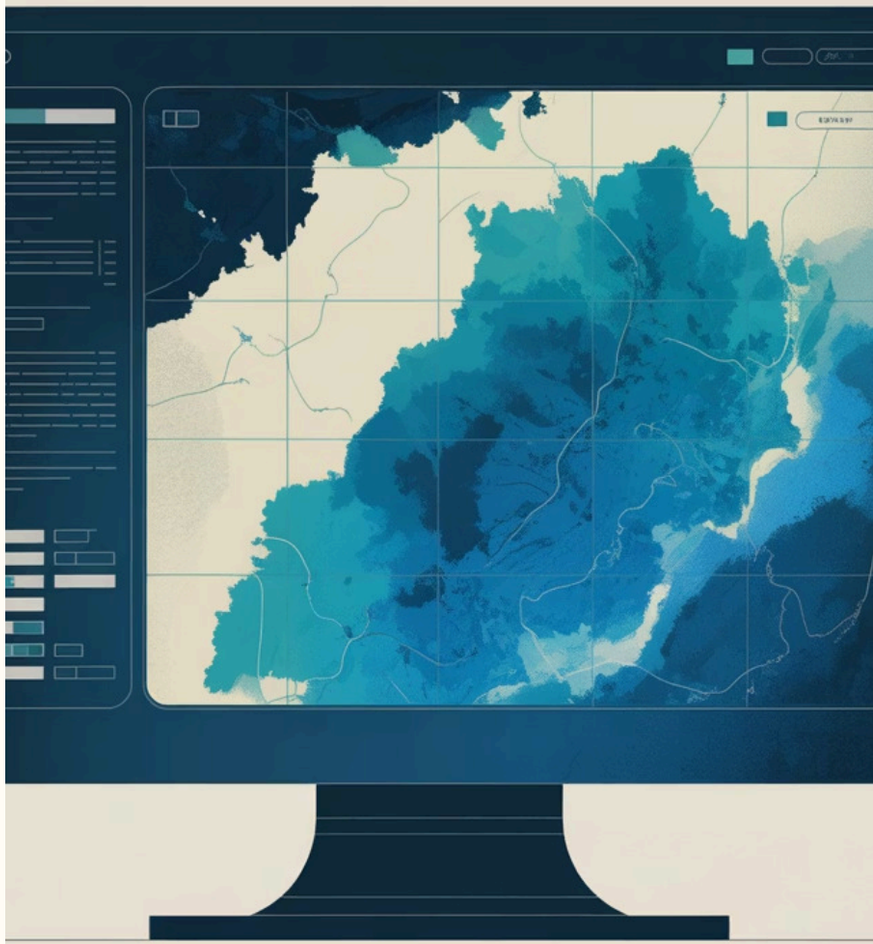
Temporal alignment

AI-based pixel-wise classification (two time periods)

Class-to-class transition matrix generation

Highlight :

All reported analytics maintain confidence above 90%



Implementation of TechnologyStack

Frontend:

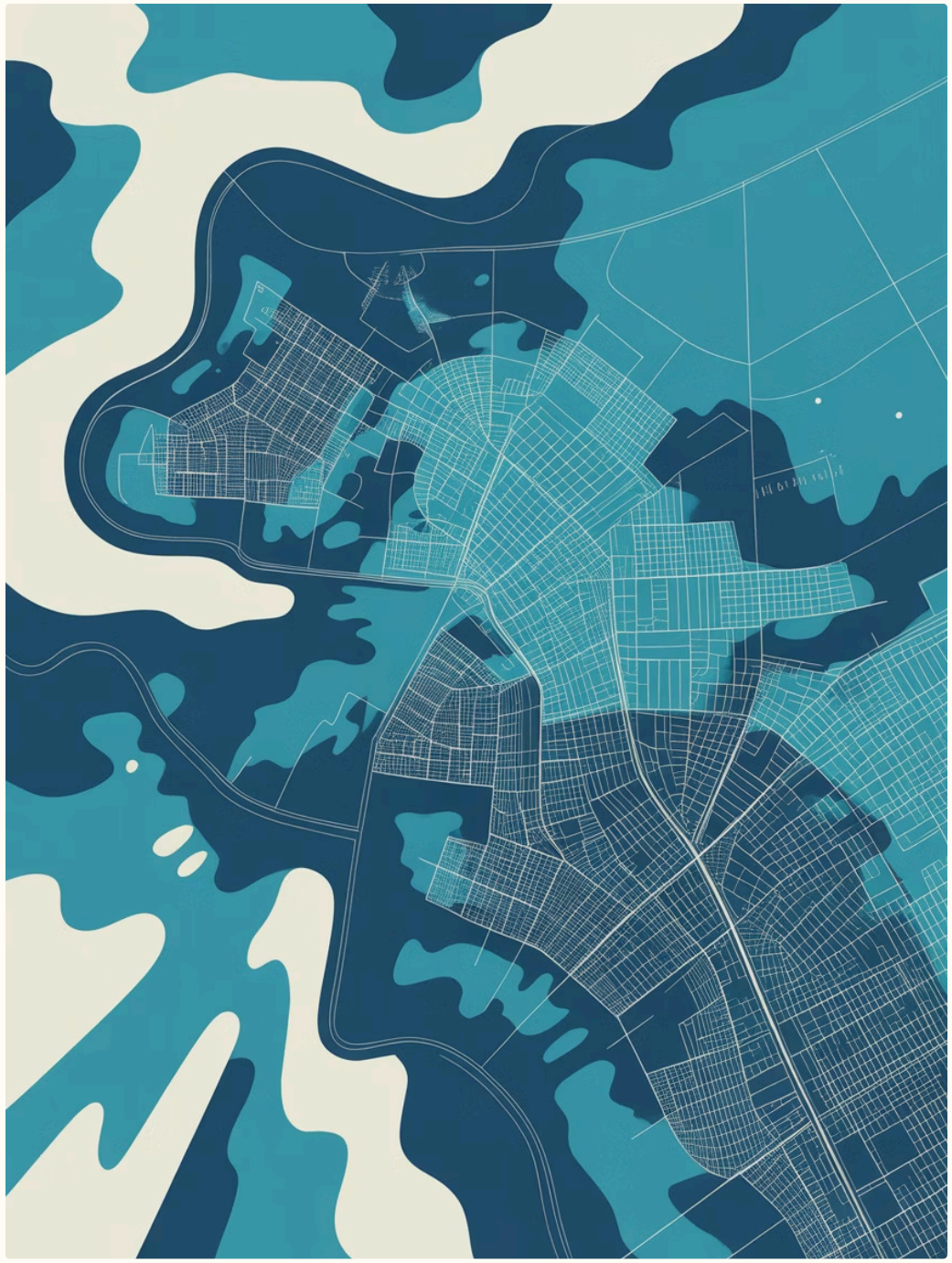
- React 18
- Tailwind CSS
- Framer Motion
- Recharts
- React Router DOM
- Shadcn/UI
- Lucide React
- React-Leaflet
- Leaflet.js

Backend

- Managed cloud backend
- Data management & processing logic
- Export workflows

Data & Outputs

- Sentinel-2 & Landsat satellite data
- CSV exports
- GeoTIFF classified maps
- Analysis reports (PDF / TXT)



Live Demo & Capabilities Decision-Ready Dashboard

Pixel-level LULC maps (multi-temporal)

Change detection overlays

Transition statistics:

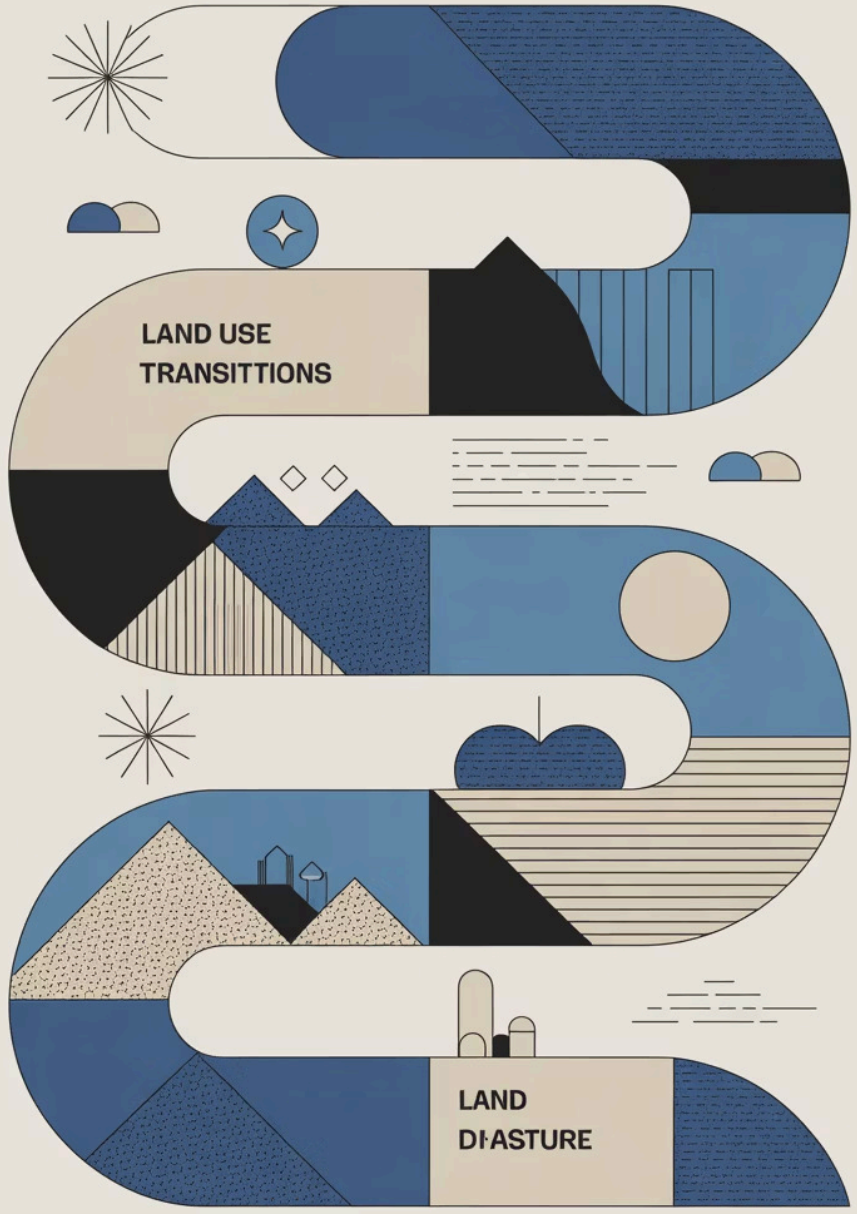
Area

Percentage change

Confidence values

One-click export for policy use

Key Insight: Transition matrices reveal directional patterns—whether development replaces agriculture, forests, or barren land—informing environmental impact assessments.



Impact & Scalability Urban Governance Impact Quantifies:

Urban expansion

Vegetation loss

Land transformation

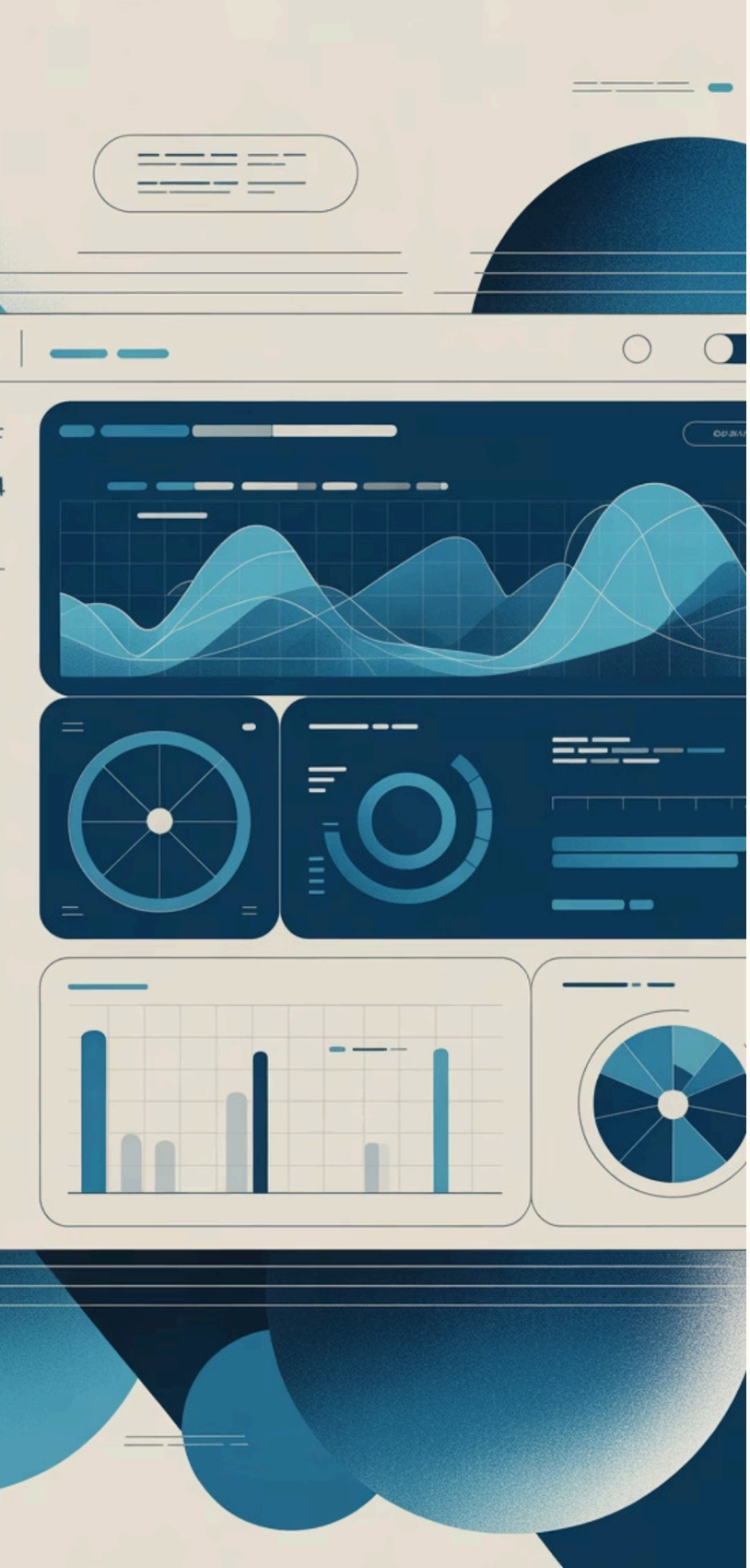
Enables evidence-based planning

High-confidence analytics for decision-making

Scalability

Fully replicable across districts & states

Aligned with Smart City & national geospatial initiatives



Interactive Web Dashboard for Decision Support

Interactive Maps

Zoom, pan, and explore classified land use across Tirupati with temporal slider controls

Transition Analytics

View class-to-class conversion matrices, area statistics, and temporal trends

Data Export

Download GIS-ready shapefiles, reports, and visualization assets for planning workflows

Layer Management

Overlay infrastructure plans, zoning boundaries, and environmental constraints

Alignment with Smart City Governance

SDG 11 Integration

Supports Sustainable Development Goal 11 through evidence-based urban planning and land use optimisation

Environmental Governance

Enables monitoring of green cover loss, water body shrinkage, and ecological footprint expansion

Infrastructure Planning

Identifies development corridors, service demand zones, and growth patterns for strategic investment

Regulatory Compliance

Tracks violations of land use regulations, protected area encroachments, and environmental clearances