Team Name : **Dev nexus Spectra**

Team Leader Name : **Anirban Ghosh**

Problem Statement : **Robust Change Detection, Monitoring, and Alert System on User-Defined AOI Using Multi-Temporal Satellite Imagery**

Team Members

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Brief about the Idea:

We propose a **robust, scalable, and automated platform** for detecting and monitoring **anthropogenic land changes** using **~5 m resolution multi-temporal satellite imagery from Bhoonidhi**.

Users can **define Areas of Interest (AOIs)** through a user-friendly WebGIS interface and receive **real-time alerts** for significant **human-induced changes**—such as **urbanization, deforestation, or infrastructure growth**.

Our intelligent pipeline incorporates **cloud and shadow masking**, and **isolates anthropogenic patterns** by filtering out **natural or seasonal fluctuations** like vegetation cycles, floods, or snow cover—ensuring high relevance and accuracy of alerts.

The platform offers **GIS-ready outputs**, historical trend visualizations, and supports **decision-making** for urban planners, environmental agencies, and disaster response teams.

Opportunity should be able to explain the following

1. How is it Different?

Unlike most existing systems, our platform provides:

- **User-defined AOI monitoring** (instead of generic region-wide systems)
- **Intelligent separation of human-induced vs. natural changes**
- **Real-time analysis** using near-daily Bhoonidhi imagery
- **Cloud & shadow masking** for reliable and noise-free insights

2. How Does It Solve the Problem?

We directly address the limitations of traditional systems by:

- **Automating the full change detection pipeline** (no manual post-processing)
- Using **AI-enhanced models** to detect only **meaningful, anthropogenic shifts**
- Providing **GIS-ready outputs** and **alert mechanisms** for timely action
- Supporting **high-resolution, multi-temporal monitoring** that adapts over time

3. Unique Selling Proposition (USP)

Our USP is a **user-personalized, real-time, intelligent monitoring platform** that combines:

- 📍 **Custom AOIs**
- ☁️ **Robust cloud & shadow masking**
- ⚡ **Automated real-time alerts**
- 🧠 **AI-based anthropogenic change detection**
- 🗺️ **GIS-compatible, decision-ready outputs**

List of features offered by the solution

🔍 AOI-based monitoring
Users can define custom **Areas of Interest (AOIs)** with **customizable alert thresholds** for precise tracking.

⚡ Real-Time Change Detection
Detect significant land-use changes instantly using high-resolution Bhoonidhi imagery.

☁️ Cloud & Shadow Masking
Eliminate noise using **automated masking**, ensuring cleaner, more accurate analysis.

🧠 Natural vs. Anthropogenic Change Differentiation
Focus only on **human-driven changes** by filtering out seasonal/natural effects.

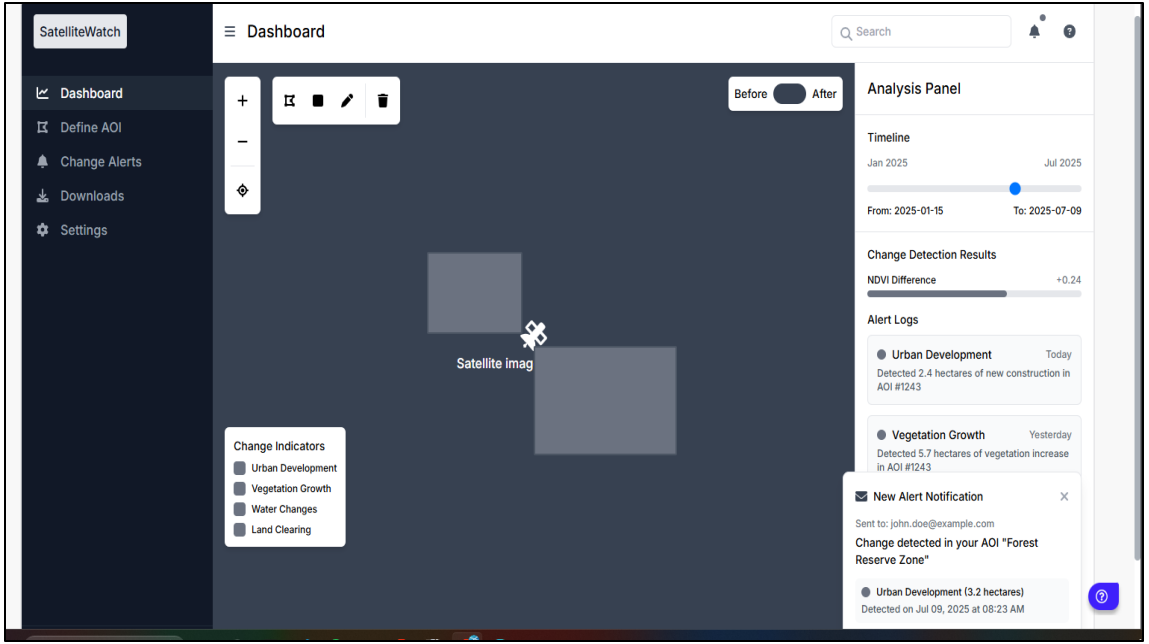
📥 GIS-Compatible Outputs
Export results in Shapefile, **GeoTIFF**, or **GeoJSON** formats for downstream GIS tools.

🗺️ User-Friendly WebGIS Interface
A clean, intuitive WebGIS portal for AOI selection, visualization, and result downloads.

🚨 Real-Time Alerts
Get email or dashboard alerts when major changes occur in your AOI.

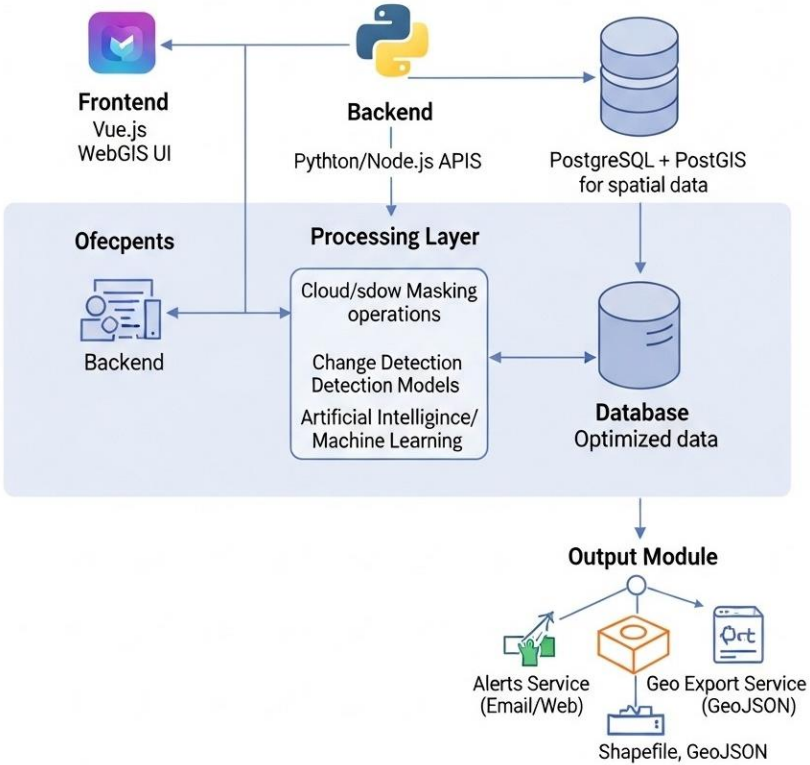
📈 Time-Series Visualization
View and compare historical changes over time for better trend analysis.

Process flow diagram or Use-case diagram



1. User defines AOI
2. Satellite Imagery Fetched (Bhoonidhi)
3. Preprocessing
   - Cloud & shadow masking
   - Normalization
4. Change Detection Engine
   - AI-based classifiers (Anthropogenic vs vs Natural)
5. Alert Generator
   - Real-time email/web alerting
6. Visualization + Downloads
   - WebGIS interface
   - Exports (Shapefile, XeoJSON

Architecture diagram of the proposed solution



Technologies to be used in the solution

Frontend: Vue.js, Bootstrap, OpenLayers

Backend: Node.js, Python

GIS Server: GeoServer

Database: PostgreSQL + PostGIS

Processing: Python (Rasterio, NumPy, Scikit-learn), cloud masking tools

Deployment: Docker, AWS/GCP (optional)

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THANK YOU