Auralite
Multi-Modal Illegal Mining Detection System

Harnessing advanced technology for environmental protection.

Team Members

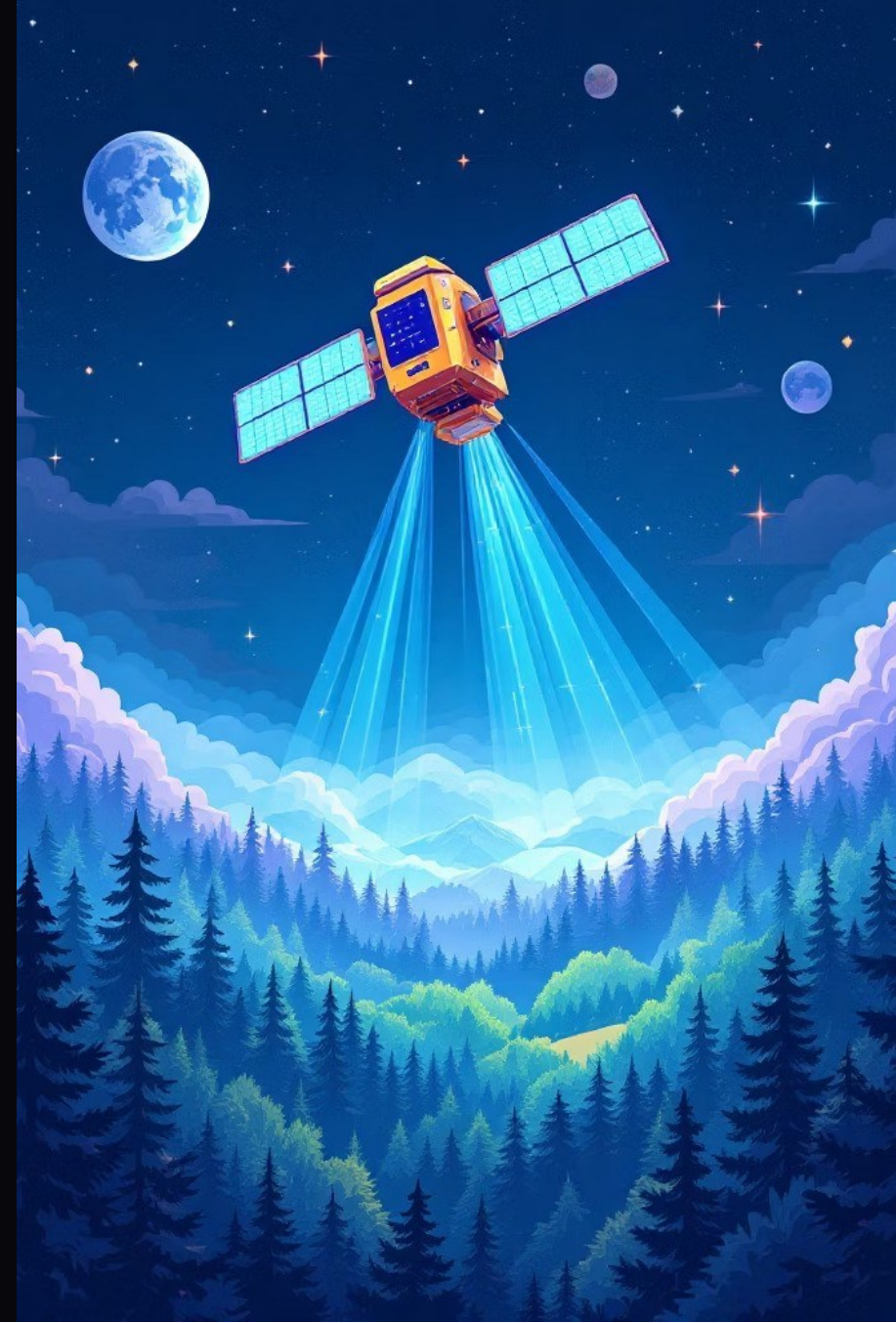**Saravanakumar M B** - ML & Data Modeling
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Cap Analysis & User Persona

The Environmental Problem: The Hidden Scars of Illegal Mining

- Rapid vegetation loss

- Night-time industrial activity

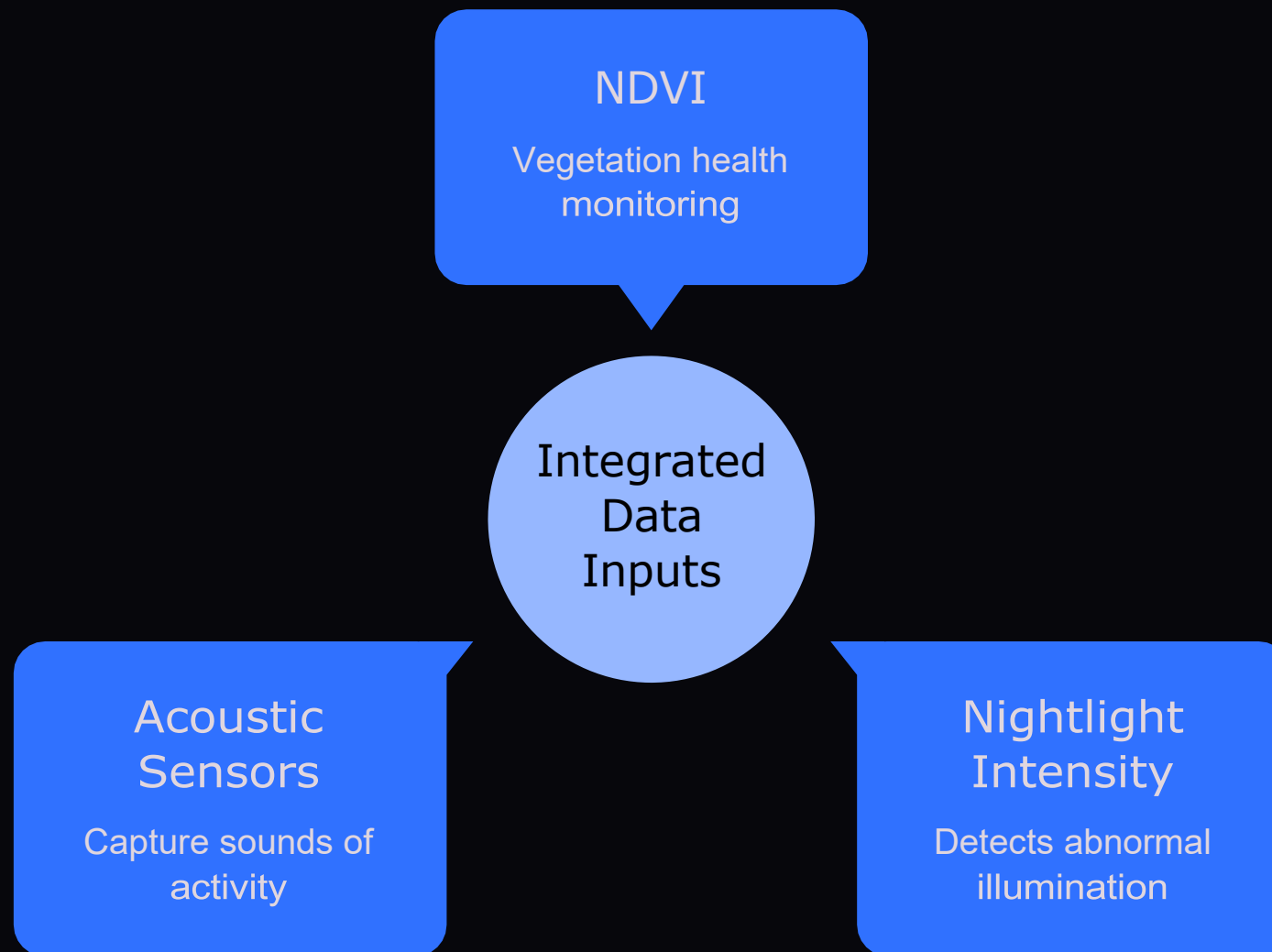- Soil degradation and erosion

- Irreversible ecological imbalance

Illegal mining devastates ecosystems, leading to biodiversity loss and long-term environmental damage.

User Persona: Forest Department Officer / Environmental Regulator

- Timely early-warning alerts for emerging threats

- Accurate geo-tagged evidence for enforcement

- Intuitive AI-powered monitoring dashboard

- Scalable detection across vast, vulnerable zones

Solution Architecture: Data Flow

NDVI
Vegetation health monitoring

Integrated Data Inputs

Acoustic Sensors
Capture sounds of activity

Nightlight Intensity
Detects abnormal illumination

Auralite integrates multiple data streams to provide a comprehensive view of potential illegal mining activities, moving beyond single-source limitations.

- **NDVI (Vegetation Health Monitoring)**

  Detects sudden decline in greenery, indicating deforestation or land disturbance.

- **Nightlight Intensity (VIIRS Data)**

  Identifies unusual nighttime industrial activity, often a hallmark of covert operations.

- **Acoustic Sensors**

  Captures spikes in heavy machinery and drilling frequencies, signaling active operations.

Tech Stack & Feasibility Strategy
Robust Tech Stack

Auralite leverages cutting-edge technologies to deliver accurate, real-time illegal mining detection.

Tools	Platforms	Frameworks	Hardware
• Python • TensorFlow • Scikit-learn	• Google Earth Engine • VIIRS Satellite Data	• Flask (Backend) • React (Frontend)	• IoT Acoustic Sensors • Edge Computing Devices

Feasibility Strategy

Our approach ensures practical implementation and robust performance in real-world scenarios.

→ **Modular Architecture**

Designed for easy deployment and adaptability across various environments.

→ **Proven ML Algorithms**

Utilizes advanced models like Isolation Forest and DBSCAN for reliable detection.

→ **Integrated Data Sources**

Seamless integration with existing satellite data for comprehensive coverage.

→ **Scalable Cloud Infrastructure**

Built on a flexible cloud foundation to handle growing data and user demands.

→ **Cost-Effective IoT Sensors**

Efficient deployment of IoT acoustic sensors for broad and affordable monitoring.

Impact & Scalability

Auralite delivers tangible results, significantly enhancing monitoring efficiency and environmental protection, while offering robust scalability for future growth.

Key Impact Metrics

94%
Detection Accuracy

Precision in identifying illegal mining sites.

24
Response Time

Hours for real-time alerts after activity detected.

10K+
Area Coverage

Sq km monitored per single deployment.

60%
Cost Efficiency

Reduction in manual monitoring costs.

500+
Environmental Protection

Hectares of illegal mining prevented annually.

Scalability & Future Potential

Multi-Region Deployment

Seamless operations across diverse geographies and time zones.

System Integration

Effortlessly connects with existing forest department and regulatory platforms.

Terrain Adaptability

Optimized for varied landscapes, from dense forests to mountainous regions.

Expandable Network

Easily grow monitoring coverage with additional IoT acoustic sensors.

International Adoption

Potential for global application in critical environmental protection efforts.