



**SRI MANAKULA VINAYAGAR  
ENGINEERING COLLEGE**  
**(An Autonomous Institution)**

**GEN AI BASED SATELLITE WITH SECURED  
COMMUNICATION**

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# INTRODUCTION

**SpaceLink is an advanced satellite payload designed for real-time environmental monitoring with secured communication. Unlike traditional satellites, it can be built and launched within an hour, ensuring instant deployment. Equipped with multiple sensors, it detects environmental threats like floods, storms, and gas leaks, enabling rapid response. With its high-speed data relay and secured transmission, SpaceLink revolutionizes disaster management and climate monitoring from space.**



## EXISTING SYSTEM

■ Traditional satellites take years for development and launch, making them ineffective for immediate disaster response.

■ The high cost and complex integration process limit accessibility and prevent rapid deployment.

■ Slow data transmission affects real-time monitoring, while weak encryption makes satellites vulnerable to cyber threats.

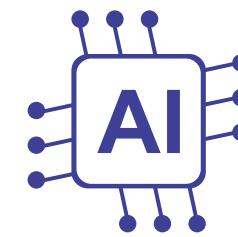


## Proposed System



### Instant Deployment

A satellite payload that can be built and launched within an hour for immediate applications.



### AI-Powered Analysis

LSTM-based AI model processes real-time sensor data to predict environmental threats.



### Secured Communication

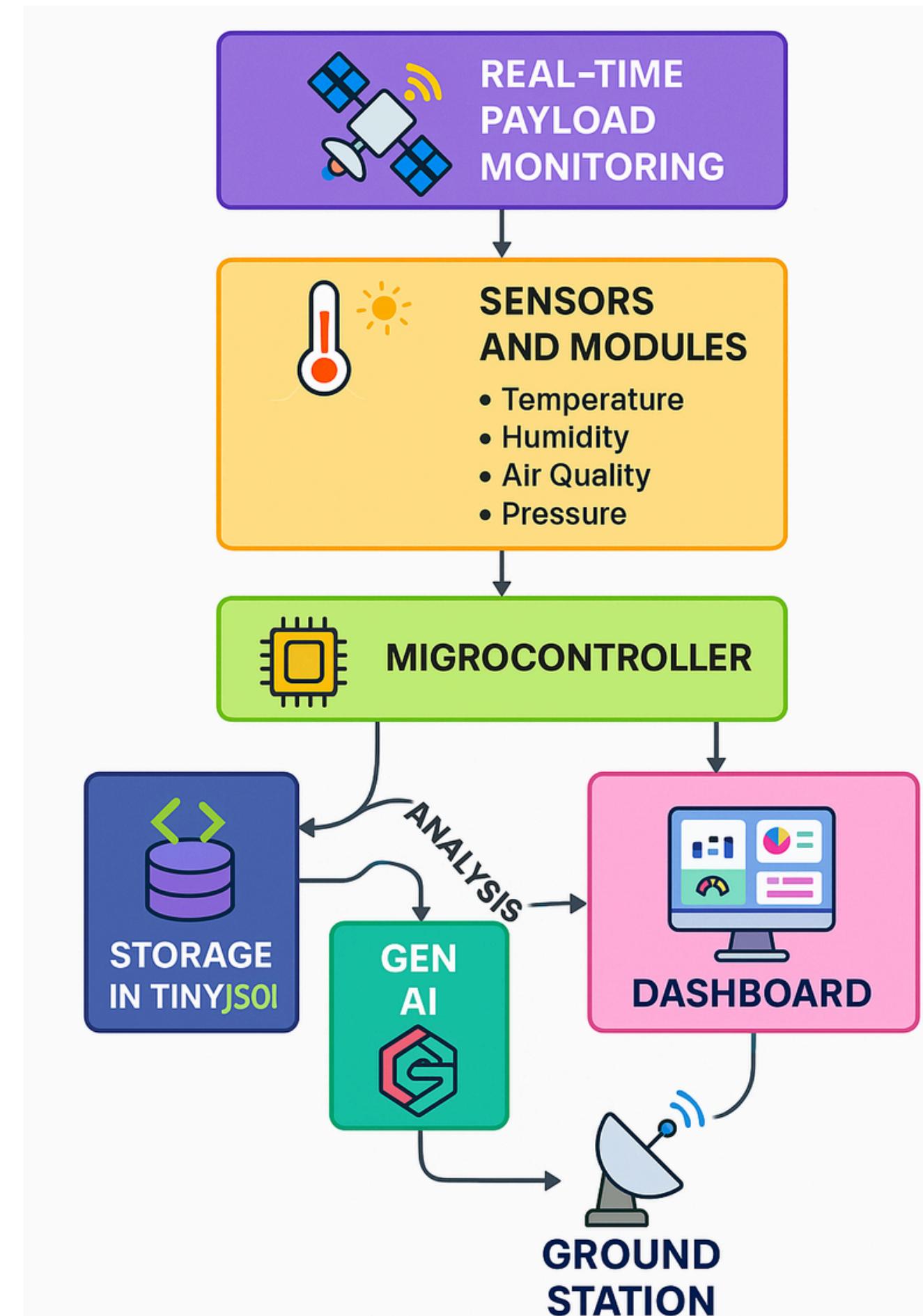
Advanced encryption ensures safe and reliable data transmission.



### Automated Alerts & Response

AI-driven system provides real-time warnings and intelligent decision-making support.

# Architecture Diagram



# Workflow

## DATA COLLECTION

Sensors provide users with real-time information about their surroundings, improving their ability to make informed decisions.

## DATA TRANSMISSION

The collected data is securely transmitted to ground stations via encrypted communication channels, ensuring real-time access to critical information.

## AI PROCESSING

The LSTM-based AI model processes the data to detect patterns and predict environmental threats. The system continuously learns from new data to improve its accuracy.

## Threats Detection & Alerts

When a risk is detected, automated alerts are generated. Authorities receive real-time notifications, along with recommended preventive actions.

## LangChain Chatbot Interaction

The chatbot enables users to interact with the system for detailed insights. Users can query environmental conditions, threat levels, and suggested actions, receiving intelligent responses in real-time.

## Decision-Making & Action

AI-driven insights help authorities take immediate action, such as evacuation planning and resource allocation, ensuring efficient disaster management.

# Minimum Viable Product (MVP) - SpaceLink

- **Core Functionality:** Satellite payload with essential sensors (Temperature, Pressure, Humidity) and a microcontroller for real-time data collection.
- **AI & Data Processing:** LSTM-based AI model for environmental threat prediction and LangChain AI for automated alerts.
- **Power & Operation:** Battery-powered system with solar charging for continuous operation.
- **Communication & Security:** Basic RF/LoRa module for secured real-time data transmission.



# Applications

1

## Disaster Management

Detects and predicts floods, storms, and gas leaks for early warnings

2

## Climate Monitoring

Tracks temperature, humidity, and atmospheric changes in real time.

3

## Environmental & Industrial Safety

Monitors air quality and detects harmful gases to assess pollution and prevent industrial hazards.

4

## Military & Security:

Can be used for secure satellite communication and surveillance.

# Advantages



1

## Rapid Deployment

**Can be built and launched within an hour, ensuring immediate response to environmental threats.**



2

## Real-Time Monitoring

**Continuously collects and analyzes data for instant detection of disasters like floods and gas leaks.**



3

## AI-Driven Predictions

**LSTM-based AI model enhances accuracy in forecasting threats and automating decision-making.**



## Secure Communication

**Encrypted data transmission ensures safe and reliable communication between the satellite and ground stations.**



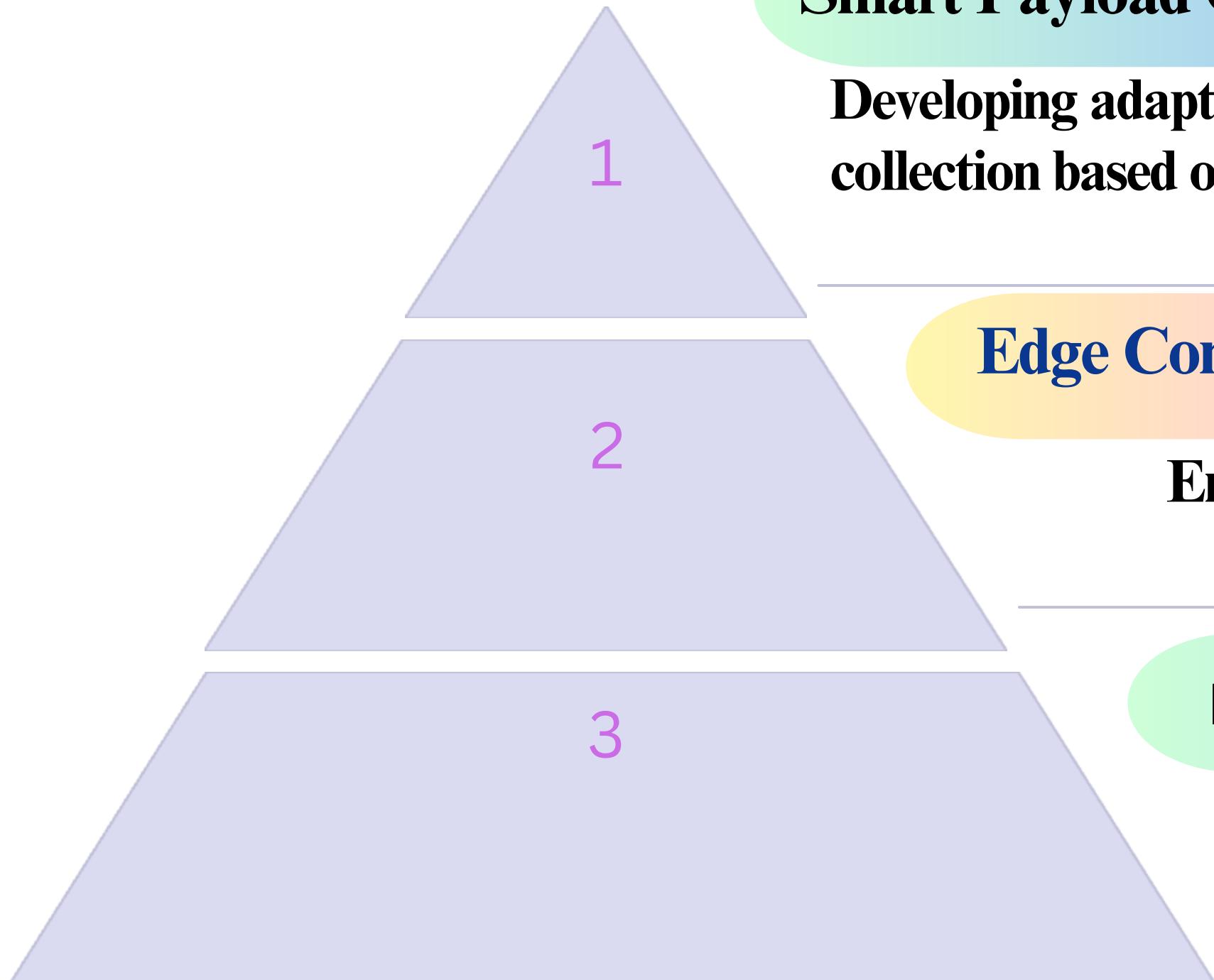
## Multi-Purpose Functionality

**Supports disaster management, climate monitoring, pollution tracking, and industrial hazard assessment.**

## CONCLUSION

SpaceLink transforms satellite-based monitoring with rapid deployment, real-time analysis, and AI-driven predictions. Its advanced sensors, secure communication, and intelligent automation enable accurate disaster forecasting and quick response, making it a game-changer in environmental and industrial safety.

# Future Work



## Smart Payload Optimization

Developing adaptive sensor payloads that dynamically adjust data collection based on environmental conditions for better efficiency.

## Edge Computing Integration

Enabling faster onboard data processing to reduce reliance on ground stations.

## Multi-Satellite Network & Security

Expanding coverage with interconnected satellites and strengthening communication with quantum encryption.

A photograph of a space shuttle, likely Endeavour, positioned on a launch pad at night. The shuttle is white with gold thermal insulation on its nose and wings. It is mounted on a mobile launcher platform with various equipment and cables visible. The background is a dark, star-filled sky.

THANK YOU