



Wildlife Poaching Risk Prediction and Detection Using Satellite AI

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Abstract: Wildlife poaching is one of the major threats to biodiversity and endangered animal species across forest environments. Traditional monitoring systems based on manual patrolling and static surveillance methods are often slow and ineffective in large geographical regions. This paper proposes a Wildlife Poaching Risk Prediction and Detection System using Satellite AI. The proposed framework integrates satellite imagery analysis, environmental monitoring, machine learning algorithms, and YOLO-based suspicious activity detection for intelligent wildlife monitoring. The system supports automated risk prediction, dashboard-based monitoring, and alert generation for wildlife authorities. The framework aims to improve forest surveillance efficiency and support proactive wildlife conservation strategies.

Keywords: Wildlife Conservation, Satellite AI, Machine Learning, YOLO, Risk Prediction, Real-Time Monitoring

I. INTRODUCTION

Illegal wildlife poaching continues to threaten biodiversity and ecological balance across the world. Animals such as elephants, rhinos, tigers, and rare bird species are continuously affected by illegal hunting and wildlife trafficking activities. Existing wildlife monitoring systems mainly depend on manual patrolling methods, which are limited by delayed response time and insufficient monitoring coverage in remote forest environments.

Recent developments in Artificial Intelligence, Machine Learning, satellite imaging, and computer vision technologies provide new opportunities for intelligent wildlife monitoring systems. AI-powered monitoring frameworks can analyze environmental information, identify suspicious activities, and improve surveillance efficiency across large geographical regions.

The proposed framework combines satellite-based risk prediction and real-time suspicious activity detection using machine learning and YOLO-based object detection techniques. The system helps wildlife authorities monitor vulnerable forest regions more efficiently and supports proactive wildlife protection strategies.

Wildlife conservation has become increasingly important due to rapid environmental degradation and illegal hunting activities. Forest departments often face difficulties in monitoring large geographical areas continuously because of limited manpower and harsh environmental conditions. Intelligent monitoring systems can help improve forest security by providing continuous surveillance and faster response mechanisms.

The use of satellite technology allows authorities to monitor remote forest regions where human patrolling is difficult. Combining Artificial Intelligence with satellite monitoring helps in identifying abnormal patterns and improves decision-making for wildlife protection.

II. LITERATURE SURVEY

[1] Enhancing Wildlife Protection: Poacher Detection Using Machine Learning Models.

This paper uses machine learning models such as SVM, Random Forest, Decision Tree, and CNN for detecting illegal poaching activities using wildlife image datasets.

[2] Poaching Hotspot Identification Using Satellite Imagery.

This work uses satellite imagery and environmental analysis for identifying poaching-prone forest regions and generating environmental heatmaps.

[3] AI for Wildlife Conservation and Poaching Prevention.

The proposed framework uses YOLO and Faster R-CNN models for suspicious human activity detection and



automated wildlife monitoring.

[4] LORAX: An AI Powered Wildlife Poaching Detection System.

This framework combines drones, IoT sensors, and AI-based surveillance systems for real-time wildlife monitoring.

[5] Illegal Hunting and Poaching Detection Using AI in Amazon Rainforest Birds.

Machine learning algorithms such as Random Forest, Neural Networks, and Gradient Boosting were used for gunfire detection and suspicious activity monitoring.

The literature survey indicates that most existing systems focus separately on prediction or suspicious activity detection. The proposed framework integrates both approaches within a unified intelligent wildlife monitoring system. Existing research shows that AI techniques are highly effective in environmental monitoring and object detection applications. Deep learning models have shown better accuracy in identifying humans, vehicles, and suspicious movements in wildlife protection zones.

Researchers have also explored the use of remote sensing technologies for detecting environmental changes and forest disturbances. These technologies provide valuable information for identifying vulnerable wildlife regions and improving conservation planning.

III. PROPOSED SYSTEM

The proposed system combines satellite imagery analysis, environmental monitoring, machine learning algorithms, and YOLO-based object detection techniques for intelligent wildlife monitoring. Satellite imagery and environmental datasets are analyzed to identify high-risk forest regions. YOLO-based surveillance models are used to detect suspicious human activities in protected wildlife zones.

The system also supports automated alert generation and dashboard-based monitoring for wildlife authorities. The proposed framework improves monitoring efficiency and reduces dependency on continuous manual surveillance methods.

The proposed framework is designed to provide continuous monitoring support for wildlife authorities through intelligent automation. The integration of prediction and detection modules improves both preventive and reactive wildlife protection mechanisms.

The system architecture supports scalable monitoring across multiple forest regions and allows centralized management of surveillance information. Automated alert generation helps authorities respond quickly to potential threats and suspicious activities.

IV. METHODOLOGY

Image preprocessing techniques help improve satellite image quality and increase detection accuracy during model training. Feature extraction methods are important for identifying meaningful environmental patterns from large datasets.

Machine learning models are trained using historical records and environmental parameters to improve prediction efficiency. Real-time surveillance analysis helps detect unauthorized movement and improves monitoring reliability.

A. Data Collection

Satellite imagery, environmental information, historical poaching records, forest region maps, and surveillance camera feeds are collected from wildlife monitoring sources.

B. Data Processing

Environmental and geographical datasets are cleaned, normalized, filtered, and organized into structured formats for analysis.

C. Data Preparation

Satellite images are resized, enhanced, and converted into suitable formats using preprocessing techniques such as normalization and feature extraction.



D. Feature Extraction

Environmental parameters such as forest density, water sources, animal movement zones, and human settlement proximity are extracted for prediction analysis.

E. Modelling

Random Forest and YOLO-based models are used for poaching risk prediction and suspicious human activity detection.

F. Dashboard Integration

A centralized dashboard displays monitoring logs, suspicious activity reports, and automated alerts for wildlife authorities.

The proposed workflow improves forest monitoring efficiency and supports proactive wildlife conservation using intelligent AI-based surveillance techniques.

V. EXPECTED RESULTS

The proposed framework is expected to improve wildlife monitoring efficiency by combining prediction and detection techniques within a single intelligent system. AI-based monitoring can reduce manual surveillance workload and improve suspicious activity tracking in forest regions.

The framework supports proactive wildlife conservation and helps wildlife authorities improve monitoring efficiency in vulnerable forest environments. The proposed system can also improve resource allocation and reduce illegal poaching activities using intelligent AI-based surveillance techniques.

The framework is expected to enhance situational awareness for forest departments and improve monitoring performance in remote areas. Intelligent surveillance systems can reduce response delays and improve early threat identification.

The use of AI-based monitoring may also help reduce operational costs associated with manual forest patrolling and traditional surveillance systems.

VI. APPLICATIONS

- Wildlife conservation and forest monitoring.
- Suspicious activity detection in protected forest areas.
- Environmental monitoring and biodiversity protection.
- Intelligent surveillance for wildlife authorities.
- Automated alert generation for forest security systems.

The system can support anti-poaching operations in wildlife sanctuaries and national parks. It may also assist researchers in analyzing wildlife movement patterns and environmental changes.

Apart from wildlife protection, similar AI-based monitoring systems can be adapted for border surveillance, disaster monitoring, and forest fire detection applications.

VII. FUTURE SCOPE

Future improvements may include drone-based surveillance integration, thermal imaging support, cloud-based wildlife monitoring systems, and real-time GPS tracking for intelligent forest management.

Future systems may include advanced sensor integration for environmental monitoring and automated animal identification. Real-time drone communication systems can further improve coverage in dense forest regions.

AI models may also be improved using advanced deep learning techniques for better prediction accuracy and faster suspicious activity detection.



VIII. CONCLUSION

The proposed Wildlife Poaching Risk Prediction and Detection System using Satellite AI provides an intelligent and scalable solution for wildlife conservation and forest monitoring. By integrating satellite analysis, machine learning, and real-time suspicious activity detection techniques, the framework improves monitoring efficiency and supports proactive wildlife protection strategies. The proposed system can help wildlife authorities monitor large forest regions more effectively and improve wildlife conservation planning.

Future systems may include advanced sensor integration for environmental monitoring and automated animal identification. Real-time drone communication systems can further improve coverage in dense forest regions.

AI models may also be improved using advanced deep learning techniques for better prediction accuracy and faster suspicious activity detection.

Fig 1. Proposed Poaching Risk Workflow



TABLE I. COMPARISON OF EXISTING AND PROPOSED SYSTEM

Feature	Existing	Proposed
Monitoring	Manual	AI-Based
Prediction	Limited	Satellite AI
Alerts	Partial	Automated
Coverage	Low	Large Forest Areas
Detection	Delayed	Real-Time

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