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Research Paper

# AI-BASED HUMAN ACTIVITY RECOGNITION FOR SURVEILANCE

[1]Mrs. D. Madhuri, [2]Kancharlapalli Gayathri,[3] Juturi Nagarjuna, [4] Narra Mahesh

[1]Assistant Professor, Dept of Computer Science and Engineering, St. Ann's College of Engineering and Technology, Chirala-523187, India.

[2,3,4]U. G Student, Dept of Computer Science and Engineering, St. Ann's College of Engineering and Technology, Chirala-523187, India.

***ABSTRACT-*** ***This project presents an AI-Based Human Activity Recognition for Surveillance System that automatically identifies and monitors human activities using Artificial Intelligence (AI), Machine Learning (ML), and Computer Vision techniques. Developed using Python, Flask, HTML, CSS, Javascript, SQLite, OpenCV, TensorFlow and YOLO, the system provides an interactive web interface with secure user authentication, real-time video processing, activity detection, and surveillance monitoring. The platform analyzes video frames captured from CCTV cameras or uploaded video files to recognize activities such as walking, running, standing, sitting and suspicious behavior. It uses deep learning models to classify human actions accurately and generate real-time alerts for abnormal activities. Designed for educational and research purposes, this platform demonstrates how AI-powered surveillance can enhance public safety, improve security management.***

***KEYWORDS: Artificial Intelligence (AI), Machine Learning (ML), Deep learning, Computer Vision, Human Activity Recognition (HAR), Python, Flask Framework, OpenCV, Real-Time video Processing, Activity Detection.***

## INTRODUCTION

Artificial Intelligence (AI) has become a key technology in modern surveillance systems due to rapid advancements in Machine Learning(ML), Deep Learning(DL),Computer Vision, and image processing techniques. Traditional surveillance systems mainly depend on continuous human monitoring, which is time-consuming, labor-intensive, and prone to errors when analyzing large volumes of video footage. AI-powered human activity recognition systems overcome these limitations by automatically detecting, tracking, and classifying human actions in real time. Researchers have developed intelligent surveillance solutions that utilize

deep learning models, convolutional neural networks(CNNs), OpenCV, and YOLO-based object detection algorithms to recognize activities such as walking, sitting, standing, running, and other suspicious behaviors from CCTV cameras and recorded videos. Modern surveillance applications also integrate real-time alert mechanisms, activity logs, and visual analytics to improve security monitoring and decision-making. However, many existing surveillance systems primarily focus on object detection and basic motion tracking, while lacking accurate human activity recognition, abnormal behavior analysis, intelligent event prediction, and user-friendly monitoring interface.

## RELATED WORK

Several researchers have contributed to the development of AI-based Human Activity Recognition(HAR) systems with the aim of improving surveillance accuracy, security monitoring, and real-time monitoring. Early surveillance systems primarily relied on traditional image processing techniques, motion detection methods, and manual observation to identify human activities. Although these systems provided basic monitoring capabilities, they often required continuous human supervision, had limited accuracy in complex environments, and were unable to recognize multiple human activities efficiently. With the advancement of Artificial Intelligence(AI), Machine Learning(ML), Deep Learning(DL), Computer Vision, and Convolutional Neural Networks(CNNs), modern human activity recognition systems have become more intelligent and efficient. These systems can analyze large volumes of real-time video data, identify different human activities, and generate accurate recognition results. It also helps in surveillance, public safety, security monitoring, and smart city applications.

## EXISTING SYSTEM

Existing Human Activity Recognition system mainly rely on traditional CCTV cameras, video surveillance systems, and motivation detection techniques to monitor human activities. Users can observe live video streams and recorded footage, but these systems primarily capture and display video without automatically recognizing human activities or suspicious behavior. Most existing system require users to manually monitor video feeds and provide limited intelligent analysis.

## PROPOSED SYSTEM

The proposed system implements an AI-Based Human Activity Recognition for Surveillance system that automatically recognizes human activities using Artificial Intelligence (AI) and Machine Learning (ML). It collects real-time video data from

CCTV cameras or uploaded video files, detects human movements such as walking, running, sitting, standing, fighting, and abnormal activities, and classifies them using deep learning models to provide accurate activity recognition and intelligent surveillance monitoring. It is developed using Python, Flask, HTML, CSS, JavaScript, SQLite, OpenCV, and TensorFlow to create a responsive and user-friendly web application. Secure user authentication allows authorized users to access the surveillance system. The platform supports real-time human activity recognition from CCTV cameras. It stores detected activities and generates activity logs for future analysis and monitoring.

## SYSTEM ARCHITECTURE

The architecture of the AI-Based Human Activity Recognition for Surveillance system that consists of a web user interface, Flask backend, SQLite database, OpenCV module, deep learning model, activity recognition module, and dashboard. Users upload video files or monitor live CCTV camera feeds through the web interface, which are processed by the Flask application. The backend extracts video frames, performs preprocessing, and sends them to the deep learning model for activity recognition. The model detects and classifies human activities

Such as walking, running, sitting, standing, fighting, and other suspicious behaviors with high

Accuracy. The activity recognition module analyzes and organizes the detected activities, while the alert module identifies abnormal behavior and provides instant security notification.

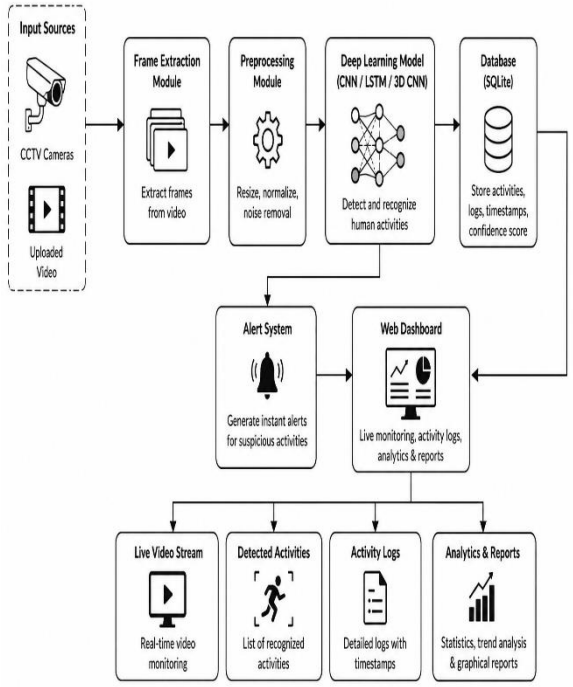



**Fig 1: System Architecture**

## METHODLOGY DESCRIPTION

The methodology of the Smart AI – Based Human Activity Recognition for Surveillance system is designed to accurately recognize and monitor human activities using AI, ML, Computer Vision techniques. The system follows a structured workflow that begins with user registration and login, allowing authorized users to access the surveillance platform through a

responsive web interface developed using HTML, CSS, and JavaScript. When a user uploads a video or connects a live CCTV camera, the request is sent to the flask backend, which coordinates the video processing, frame extraction, and activity recognition process.database, video processing module, and deep learning model. And generates accurate surveillance results with real-time security alerts.

## RESULTS AND DISCUSSION

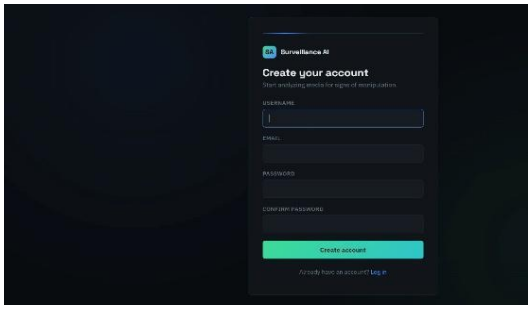



**Fig 1: Home Page**

The Home Page is the main entry point of the AI-Based Human Activity Recognition For Surveillance system. It introduces the platform and its AI-powered human activity detection and surveillance features. Users can access options such as Login, Sign Up, and Get Started to securely access and begin using the application.

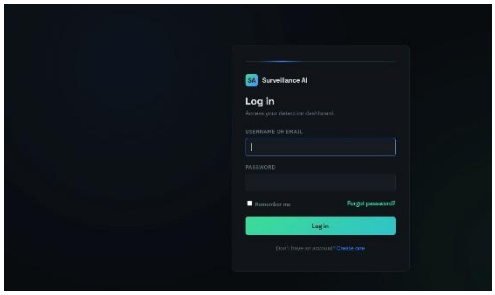



**Fig 2: Login Page**

The Login Page allows registered users to securely access the AI-Based Human Activity Recognition for Surveillance system.

Users enter their email address and password to authenticate their account and access the surveillance dashboard and activity monitoring features.

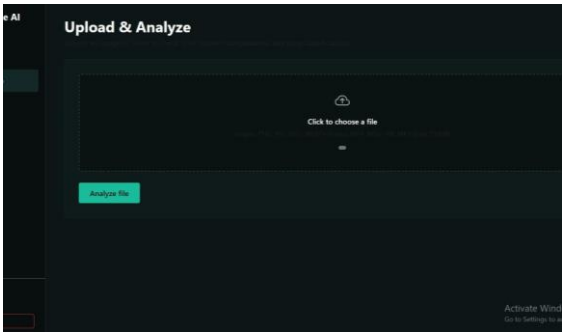



**Fig 3: Dashboard**

The AI Activity Recognition Interface enables users to upload a video or connect a live CCTV camera and receive AI-generated activity recognition results. It provides real -time information on detected human activities, identified persons, suspicious behavior, confident scores, and surveillance insights in a simple and easy-to-understand format. The interface is interactive, user friendly, and helps improve security monitoring, public safety, and surveillance management.

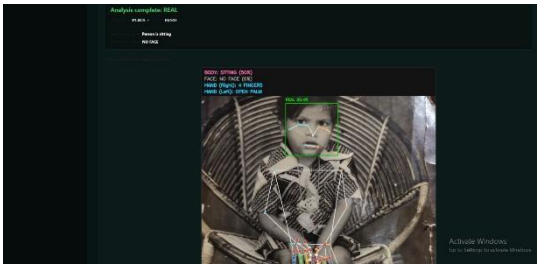


**Fig 4: Upload and Analyze**

The Analyze and Upload page allows users to upload video files for human activity recognition. After uploading, the system analyzes the video using AI models and detects human activities to generate accurate surveillance results.

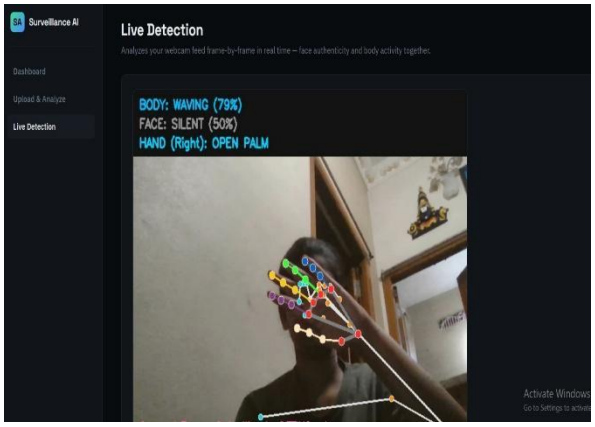



**Fig 5: Live detection**

The Live Detection page enables users to monitor real-time CCTV camera feeds for human activity recognition. The system continuously analyzes live video streams, detects human activities, and displays instant surveillance results with real-time alerts.

## CONCLUSION

The AI-Based Human Activity Recognition for Surveillance system successfully recognizes and monitors human activities using AL, ML, and Computer Vision. It provides real-time activity detection, intelligent surveillance monitoring, suspicious activity identification , and an interactive web based platform for effective security management.

## FUTURE SCOPE

The Smart AI-Based Human Activity Recognition for Surveillance system can be enhanced with multilingual and voice based interaction to improve accessibility for users from different regions. The platform can integrate advanced Machine Learning (ML) and Deep Learning (DL) models to increase activity recognition accuracy and provide more reliable surveillance and security analysis.

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