

# AI-Enabled Smart Campus Issue Reporting System

G Karthik

Dept. of Computer Science and Engineering  
Geethanjali College of Engineering and  
Technology Telangana, India

D Rishvika

Dept. of Computer Science and Engineering  
Geethanjali College of Engineering and  
Technology Telangana, India

P Arun Kumar

Dept. of Computer Science and Engineering  
Geethanjali College of Engineering and  
Technology Telangana, India

G Uma Devi

Assistant Professor, CSE  
Geethanjali College of Engineering and Technology  
Telangana, India

**Abstract** - The rapid growth of smart technologies and Artificial Intelligence has enabled the development of intelligent systems for efficient campus management. This paper presents CampusWatch AI, an advanced web-based platform designed to automate and streamline campus issue reporting and introduce a community-driven lost-and-found management system.

The proposed system enables users to report infrastructure-related issues such as potholes, cracks, and damaged assets by uploading images through an intuitive interface. These images are analyzed using YOLO-based deep learning models for real-time object detection and automatic issue classification. The system integrates a React-based frontend, FastAPI backend, and Firebase cloud services for authentication, database management, and real-time synchronization.

In addition to issue reporting, the system introduces a community-driven lost-and-found module, allowing users to post found items, search for lost belongings, and claim items efficiently. The platform also includes map-based visualization, where issues and lost items are displayed using categorized markers.

The system improves reporting efficiency, reduces response time, enhances transparency, and enables better communication between students, staff, and administrators. Experimental evaluation demonstrates reliable detection performance and scalability, making it suitable for modern smart campus environments.

**Index Terms** - YOLO, Smart Campus, Object Detection, FastAPI, Firebase, Lost and Found System, Web Application

## I. INTRODUCTION

With the rapid expansion of educational institutions, managing campus infrastructure efficiently has become increasingly complex. Modern campuses consist of

multiple facilities such as classrooms, laboratories, hostels, administrative buildings, and recreational areas, all of which require continuous monitoring and maintenance. Traditional complaint management systems are often manual, relying on physical registers or simple digital forms, which leads to delays, inefficiencies, and lack of transparency in issue resolution.

One of the major limitations of these systems is the absence of real-time tracking and intelligent decision-making capabilities. Users are unable to monitor the progress of their complaints, and administrators must manually review, categorize, and assign issues, resulting in increased workload and potential human errors. Additionally, lost-and-found management in campuses is often unstructured and inefficient, making it difficult for users to recover their belongings.

The emergence of Artificial Intelligence, particularly in computer vision and deep learning, provides an opportunity to transform these traditional systems into intelligent and automated solutions. Object detection models such as YOLO (You Only Look Once) enable real-time identification and classification of objects from images with high accuracy and speed. At the same time, modern web technologies and cloud platforms enable the development of scalable, responsive, and real-time applications.

The proposed system, CampusWatch AI, aims to address these challenges by integrating AI-based issue detection with real-time web technologies. The system allows users to upload images of issues, which are automatically analyzed using YOLO models to detect and classify problems. This significantly reduces manual effort and

improves accuracy.

In addition to issue reporting, the system introduces a community-driven lost-and-found module, enabling users to post found items and allowing others to search and claim them. This transforms the platform into a collaborative ecosystem, enhancing user participation and improving item recovery rates.

Furthermore, the system incorporates map-based visualization, where reported issues and items are displayed using categorized markers. This feature improves spatial awareness and helps administrators quickly identify problem areas.

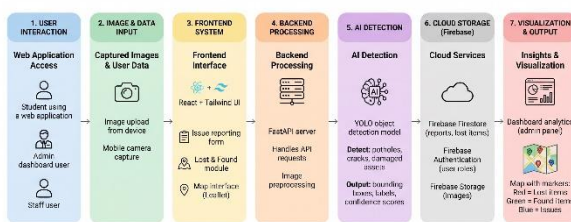


Fig. 1. Overall System Overview

## II. LITERATURE SURVEY

Recent advancements in Artificial Intelligence and smart systems have led to the development of automated solutions for infrastructure monitoring and issue management. Traditional systems rely heavily on manual processes, which are inefficient and prone to human errors. These systems lack automation, real-time tracking, and intelligent decision-making capabilities. Deep learning techniques, particularly Convolutional Neural Networks (CNNs), have been widely used for image classification and object detection. Among these, YOLO (You Only Look Once) has emerged as one of the most efficient real-time object detection algorithms due to its ability to process images in a single pass while maintaining high accuracy.

YOLO-based models are widely used in applications such as surveillance, traffic monitoring, and defect detection.

Cloud platforms such as Firebase have enabled real-time data storage and synchronization, allowing applications to handle large volumes of data efficiently. Similarly, modern frontend technologies such as React enable the development of responsive and user-friendly interfaces, enhancing user interaction and experience.

Despite these advancements, most existing systems focus either on issue reporting or data management independently. Very few systems integrate AI-based object detection, real-time cloud storage, user interaction, and visualization into a

unified platform. Additionally, community-driven features such as lost-and-found management are often missing in existing solutions.

The proposed system addresses these gaps by combining YOLO-based detection, Firebase cloud services, map visualization, and a community module into a single scalable platform, thereby improving efficiency, accuracy, and usability.

## III. EXISTING SYSTEM

The existing systems for campus issue reporting are primarily manual or semi-digital in nature. These systems rely on physical registers or simple online forms, which require administrators to manually review, categorize, and assign complaints. This process is time-consuming, inefficient, and prone to human errors.

One of the major drawbacks of existing systems is the lack of real-time tracking. Users are unable to monitor the progress of their complaints, leading to poor communication and reduced transparency. Additionally, there is no prioritization mechanism, which means that critical issues are not handled urgently.

Another limitation is the absence of AI-based image analysis. Most systems rely solely on textual descriptions, which may be incomplete or inaccurate. This leads to misclassification and delays in issue resolution.

Furthermore, existing systems do not support centralized data management or analytical insights. Data is often stored in unstructured formats, making it difficult to analyze trends or identify recurring issues.

In addition, there is no integration of community-based features such as lost-and-found systems, which further limits usability.

The major limitations can be summarized as:

- Manual and inefficient processes
- Lack of real-time tracking
- No AI-based detection
- Poor data management
- No lost-and-found integration

## IV. PROPOSED SYSTEM

The proposed system introduces an intelligent and automated solution for campus issue management by integrating Artificial Intelligence, web technologies, and cloud-based services.

Users can report issues by uploading images along with descriptions. The system processes these images using **YOLO-based deep learning models**, which detect and classify issues such as potholes, cracks, and damaged assets in real time.

A key feature of the system is the **lost-and-found**

**module**, where users can post found items with images and location details. Other users can search for lost items and claim them. Once claimed, the system updates the status dynamically while maintaining transparency.

The system also incorporates **map-based visualization**, where issues and items are displayed using different colored markers:

- Red → Lost items
- Green → Found items
- Blue → General issues

This improves usability and helps administrators quickly identify problem locations.

The system uses Firebase for real-time database management and authentication, ensuring scalability and data security.

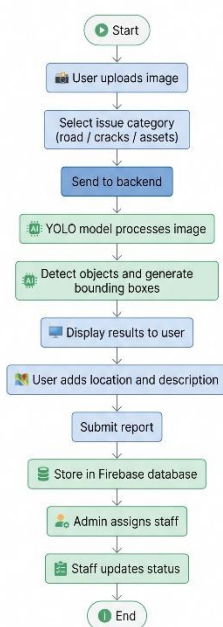


Fig. 2. AI-Based Issue Detection Workflow

## V. SYSTEM ARCHITECTURE

The proposed system follows a modular layered architecture to ensure scalability, maintainability, and efficient data processing.

**User Interface Layer:** This layer is responsible for handling user interaction through a responsive web interface built using React. It enables users to upload images, view reports, and interact with the system seamlessly.

**Processing Layer:** This layer performs input validation and preprocessing of images before they are sent to the AI model. It ensures data consistency and prepares images for efficient detection.

**AI Detection Layer:** This layer utilizes YOLO-based deep learning models to perform real-time object detection and classification. It identifies infrastructure issues such as cracks, potholes, and asset damage with high accuracy.

**Database Layer:** This layer uses Firebase Firestore for storing reports, user data, and system logs. It provides real-time synchronization and ensures secure data management.

**Visualization Layer:** This layer presents processed data through dashboards and map-based interfaces. It helps users and administrators visualize issues using color-coded markers. **Community Layer:** This module handles the lost-and-found system, enabling users to post, search, and claim items. It promotes user engagement and collaborative problem-solving.

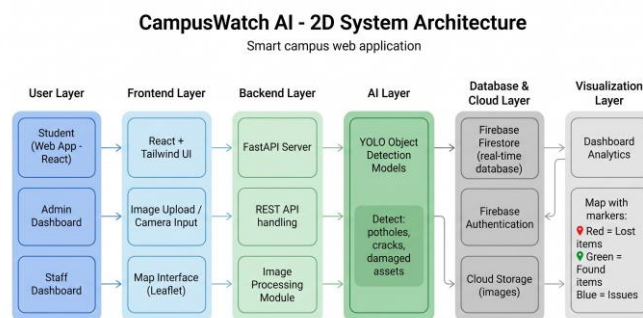


Fig. 4. System Architecture of CampusWatch AI

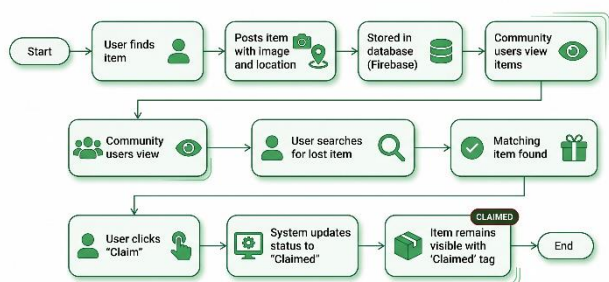


Fig. 3. Lost and Found Workflow

## VI. IMPLEMENTATION

The implementation of the proposed system is carried out using a combination of modern web technologies, deep learning models, and cloud-based services.

The frontend of the system is developed using React along with Tailwind CSS, providing a responsive and user-friendly interface. It allows users to upload images, view reports, interact with dashboards, and participate in the lost-

and-found community. The application supports both image upload and camera capture, enabling flexibility across devices.

The backend is implemented using FastAPI, which provides high-performance API endpoints for handling image processing and data communication. The backend integrates YOLO-based models trained for different categories such as road damage, cracks, and assets. When an image is uploaded, it is processed by the appropriate model, and bounding boxes along with confidence scores are generated.

The system uses Firebase Firestore as the primary database for storing user reports, issue details, and lost-and-found items. Firebase Authentication is used to manage user roles such as students, staff, and administrators. This ensures secure access control and role-based functionality.

A key feature of the implementation is the map-based visualization using Leaflet. Issues and items are displayed as markers with different colors based on their status. This enables users and administrators to quickly identify problem areas.

The lost-and-found module is implemented as a community feature where users can post found items along with images and descriptions. Other users can search and claim items, and once claimed, the system updates the status dynamically.

world scenarios to evaluate its performance, accuracy, and usability.

The YOLO-based detection models demonstrated strong performance in identifying infrastructure issues such as cracks, potholes, and damaged assets. The system was able to process images in real time and provide accurate bounding box predictions.

The map-based visualization significantly improved the ability to identify issue locations, while the dashboard provided a clear overview of system statistics such as pending, assigned, and resolved issues.

The lost-and-found module enhanced user engagement by allowing users to actively participate in item recovery. The claim mechanism ensured transparency and reduced confusion.

**Performance Metrics:**

TABLE I  
 PERFORMANCE EVALUATION METRICS

Metric	Value	Description
Accuracy	91%	Detection accuracy
Precision	89%	Correct detection ratio
Recall	87%	Detection coverage
Latency	1.2 sec	Avg response time

The results indicate that the system is efficient, scalable, and suitable for real-time campus applications.

**VIII. CONCLUSION**

This paper presented CampusWatch AI, an intelligent system designed to automate campus issue reporting and introduce a community-driven lost-and-found platform.

The integration of YOLO-based object detection enabled accurate and real-time identification of infrastructure issues, significantly reducing manual effort. The use of modern web technologies and Firebase ensured scalability, real-time synchronization, and secure data handling.

The system successfully improves efficiency, transparency, and communication between students, staff, and administrators. Additionally, the lost-and-found module enhances user engagement and provides a practical solution for item recovery within campuses.

Overall, the proposed system demonstrates the potential of combining Artificial Intelligence with web technologies to create smart and efficient campus management solutions.

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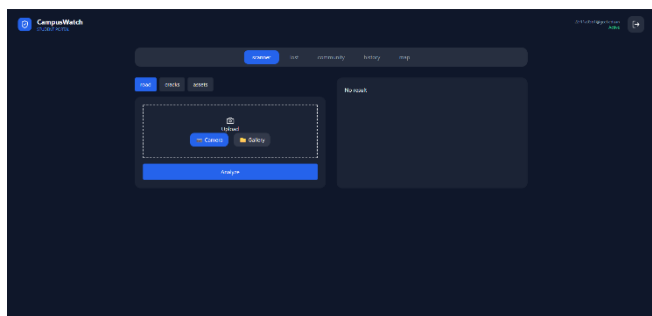


Fig. 5. User Dashboard Interface

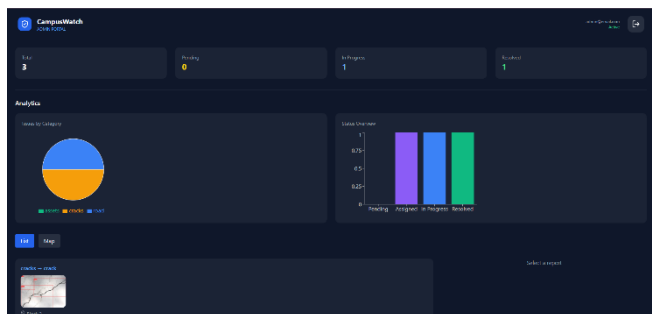


Fig. 6. Admin Dashboard Interface

**VII. RESULTS AND DISCUSSION**

The proposed system was tested under multiple real-

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