



# Automated Road Accident Detection using AI

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**ABSTRACT:** Effective detection and response systems are necessary to lessen the impact of road accidents, which continue to be a major source of death and illness worldwide. An artificial intelligence (AI)-based road accident detection system that can recognize and react to traffic accidents instantly is presented in this research. Our system processes data from several sensors and cameras to detect accidents with high accuracy and low latency by using deep learning algorithms and advanced computer vision techniques. Through the use of a variety of datasets and real-world scenarios, we assess the system's effectiveness and show how it may improve road safety, streamline emergency response, and provide insight into urban traffic management. The suggested approach offers scalable and dependable ways to lower the frequency and severity of traffic accidents, marking a substantial breakthrough in the application of AI for intelligent transportation systems (ITS)

**Keywords:** Accident detection, alert system, heartbeat sensor , accelerometer, Bluetooth, Android application.

## I. INTRODUCTION

Every year, or several times a year, we all hearing that deaths due to accidents [1]. India has topped the list of nations with the most road fatalities every year since 2009, when the World Health Organization released its first Global Status Report on Roads [2]. Many accident victims are unable to get a timely medical assistance and prevent additional injuries because of a lack of emergency medical services in the accident spot. This issue is typically happen due to incomplete information being sent to the emergency personnel regarding the accident, such as the scene's location rescue authorities [3]. When an accident occurs, a significant quantity of vibration is produced. The vibration sensor detects this and relays the information to the microcontroller. The microcontroller instantly notifies the victim's designated crisis contacts of an alarm [2]. Over the past few years, a lot of research has been done on accident detection and alert systems. Three primary components comprise the Telematics model, which has been proposed by research in this field [4]. The system's goals are to use a GPS receiver to track the car, communicate location data by SMS to the vehicle owner's mobile number, and send position data via GPRS to the telematics operator server. The primary goal is the improve the signal to send the message quickly to their neighbours and hospital authorities to make the person alive. There are lots of studies about preventing or detecting the car accidents. Most of them includes sensing objects which might cause accident or statistics about accidents. In this study, a system which detects happening accidents will be studied. The system will collect necessary information from neighbor vehicles and process that information using machine learning tools to detect possible accidents. Machine learning algorithms have shown success on distinguishing abnormal behaviors than normal behaviors. This study aims to analyze traffic behavior and consider vehicles which move different than current traffic behavior as a possible accident. Results showed that clustering algorithms can successfully detect accidents. The problem of deaths and injuries as a result of accidents is to be a global phenomenon. Traffic safety has been a serious concern since the start of the automobile age, almost one hundred years ago. It has been estimated that over 300,000 persons die and 10 to 15 million persons are injured every year in road accidents throughout the world. Statistics have also shown that mortality in road accidents is very high among young adults that constitute the major part of the work force. In order to overcome this problem, there is need of various has road safety strategies and measure. Losses in road accidents are unbearable, to the society as well as a developing country like us. So, it has become an essential requirement to control and arrange traffic with an advanced system to decrease the number of road accidents in our country. By taking simple precautions, based on prediction of a sophisticated system may prevent traffic accidents. Moreover, to tackle this situation where every day so many people were killed in a traffic accident. and day by day this rate is getting increased. The implementation of machine learning is a functional and a

great approach to take an accurate decision with the experience to manage the current situation and the findings of the analysis part which we are suggested to traffic authorities.

### **1.1. OUTLINE OF THE PROJECT**

Road accidents remain one of the leading causes of fatalities worldwide, with delayed emergency response playing a crucial role in the severity of injuries and loss of lives. Traditional accident detection methods rely on manual reporting, emergency calls (e.g., 911), or witness intervention, often leading to significant delays in providing medical assistance and managing traffic congestion. Additionally, existing traffic management systems lack real-time accident detection capabilities and do not optimize emergency response routes, further worsening the situation. This project introduces a Smart Traffic Accident Detection and Automated Emergency Response System utilizing deep learning-based object detection to address these challenges. The system leverages YOLO (You Only Look Once) algorithm, a state-of-the-art object detection model, to identify accidents in real time through traffic camera footage. Once an accident is detected, the system analyses vehicle damage and determines the severity of the crash using AI-driven assessment techniques. Automated alerts, including accident location and affected vehicles, are instantly sent to emergency responders, hospitals, and traffic control centers. By combining artificial intelligence, computer vision, and real-time monitoring, this system aims to significantly reduce emergency response time, enhance accident detection accuracy, and improve overall traffic management. The proposed solution not only enhances road safety but also supports smart city initiatives by integrating intelligent transportation systems with automated emergency response mechanisms.

## **II. LITERATURE SURVEY**

### **1. AI and IOT Based Road Accident Detection and Reporting System**

Road accidents are increasing daily as the number of automobiles rises. An annual global death toll of 1.4 million and an injury toll of 50 million are reported by the World Health Organization (WHO). The absence of medical assistance at the scene of the accident or the lengthy response time during the rescue effort are the main causes of mortality. We can reduce delays in a rescue operation that has the potential to save many lives by using a cognitive agent-based collision detection and smart accident alarm and rescue system. To gather and send accident-related data to the cloud or server, the suggested system consists of a force sensor, GPS module, alarm controller, ESP8266 controller, camera, Raspberry Pi, and GSM module. The accident is then verified using cloud-based techniques for deep learning. accident is then verified using cloud-based techniques for deep learning. When the deep learning module notices an accident, it immediately alerts all nearby emergency services, including the hospital, police station, mechanics, etc.

### **2. Road Accident Detection System Using AI**

Effective detection and response systems are necessary to lessen the impact of road accidents, which continue to be a major source of death and illness worldwide. An artificial intelligence (AI)-based road accident detection system that can recognize and react to traffic accidents instantly is presented in this research. Our system processes data from several sensors and cameras to detect accidents with high accuracy and low latency by using deep learning algorithms and advanced computer vision techniques. Through the use of a variety of datasets and real-world scenarios, we assess the system's effectiveness and show how it may improve road safety, streamline emergency response, and provide insight into urban traffic management. The suggested approach offers scalable and dependable ways to lower the frequency and severity of traffic accidents, marking a substantial breakthrough in the application of AI for intelligent transportation systems (ITS).

### **3. Smart Traffic Accident Detection and Automated Emergency Response System Using Yolo Algorithm**

Road accidents remain a significant global concern, causing millions of fatalities and injuries annually. According to the World Health Organization (WHO), approximately 1.35 million people die each year due to road traffic crashes, with an additional 20-50 million suffering non-fatal injuries. The timely detection of accidents and rapid emergency response are critical to reducing the severity of injuries and saving lives. Traditional methods of accident detection, such as manual reporting by witnesses or emergency calls (e.g., 911), are often delayed, leading to slower response times and increased traffic congestion. With the advent of Artificial Intelligence (AI) and computer vision, real-time accident detection systems have emerged as a viable solution to this problem. This paper presents an Accident Detection and Alert System that leverages YOLOv11, the latest version of the YOLO algorithm, for real-time accident detection through traffic surveillance cameras. The system integrates AI-driven object detection, severity assessment, and automated alert mechanisms to reduce emergency response times and improve road safety. Additionally, this paper

addresses human-centric considerations, including ethical concerns, user interface design, and the role of human oversight in AI-based decision-making.

### III. IMPLEMENTATION

#### EXISTING SYSTEM

- In the existing system, accident detection mainly depends on manual surveillance or delayed human reporting.
- Some modern systems use deep learning models such as YOLOv8 to detect vehicles and possible collision patterns from video footage.
- However, these systems often suffer from limited accuracy in complex traffic scenarios and lack proper integration with alert and notification services.
- Real-time emergency communication is not efficiently handled, leading to delayed responses. As a result, accidents may go unnoticed for critical periods.

#### 3.1. DISADVANTAGES OF EXISTING SYSTEM

- Manual monitoring dependency
- Limited detection accuracy
- No real-time alerts
- Delayed emergency response
- Poor system integration

#### 3.2. PROPOSED SYSTEM

- The proposed system introduces an intelligent accident detection framework using the YOLOv11 deep learning model. Users upload traffic or surveillance videos through a Flask-based web application.
- The system extracts video frames and analyzes them using YOLOv11 to detect accident-related events such as collisions or abnormal vehicle movements.
- When an accident is detected, an alert sound is generated, and an automated SMS notification is sent to higher officials or emergency responders.
- This system ensures faster detection, higher accuracy, and minimal human intervention.

#### 3.2.1. ADVANTAGES

- High detection accuracy
- Automated accident identification
- Real-time alert generation
- Instant SMS notification
- Faster emergency response

**BLOCK DIAGRAM**



**IV. MODULES DESCRIPTION**

**1. User Interface Module**

The User Interface Module provides an interactive web interface for users to interact with the system. It is developed using HTML, CSS, and JavaScript to ensure a simple and user-friendly experience. This module allows users to upload videos and view accident detection results.

**2. Video Upload Module**

The Video Upload Module allows users to upload traffic or surveillance videos to the system. The Flask backend securely receives and stores the uploaded files on the server. These videos act as the input for the accident detection process.

**3. Video Preprocessing Module**

The Video Preprocessing Module prepares the uploaded video for analysis by performing necessary processing operations. It ensures that the video format, resolution, and frame rate are suitable for further processing. This step improves the efficiency and accuracy of the detection model.

**4. Frame Extraction Module**

The Frame Extraction Module converts the uploaded video into individual image frames using OpenCV. These frames allow the system to analyze the video content step by step. Each extracted frame is then forwarded to the deep learning model for accident detection.

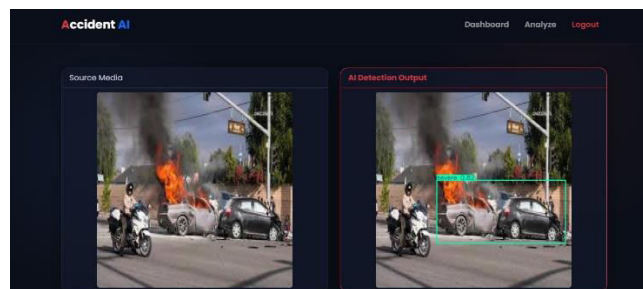
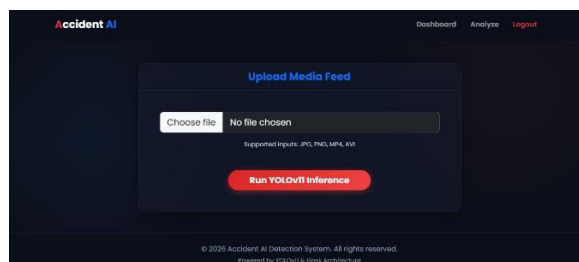
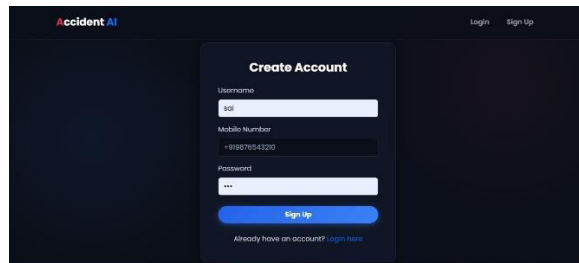
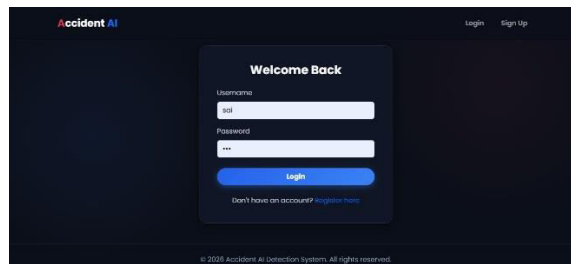
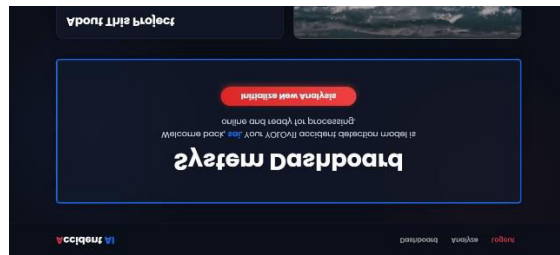
**5. YOLOv11 Accident Detection Module**

This module uses the YOLOv11 deep learning model to detect accident-related events from video frames. The model identifies vehicles and analyzes collision patterns or abnormal movements. It performs fast and accurate object detection to recognize potential accidents.

### 6. Accident Decision Module

The Accident Decision Module evaluates the detection results produced by the YOLOv11 model. It checks whether the confidence score exceeds a predefined threshold value. If the condition is satisfied, the system confirms that an accident has occurred.

### VI. OUTPUT SCREEN





## VII. CONCLUSION

The integration of YOLOv11 in accident detection and alert systems represents a significant advancement in road safety and traffic management. By enabling real-time accident detection and automated emergency responses, this technology has the potential to save lives and reduce the economic impact of road accidents. However, the success of such systems depends not only on the technical capabilities of the AI model but also on addressing human-centric concerns such as privacy, bias, and user interface design. As AI and computer vision technologies continue to evolve, systems like the one proposed in this paper will play a crucial role in building safer and smarter cities.

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