SCMS School of Engineering & Technology

Department of Computer Science and Engineering

Road Accident Detection & Alert System

❖ PROJECT GUIDE :

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10/03/2025

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INTRODUCTION

- A system designed to detect road accidents in real-time using AI and computer vision.
- The system triggers emergency alerts and provides location-based notifications to reduce response time.

PROBLEM STATEMENT

•Delay in emergency response leads to casualties.

•Lack of automated systems for real-time accident detection.

•Need for an integrated system that provides real-time alerts and assistance.

SIGNIFICANCE & MOTIVATION

•Faster Response**:** Reduces time taken to alert emergency services.

•Automated Detection**:** Uses AI for accurate accident identification.

•Integration with Emergency Services**:** Notifies authorities with location details.

OBJECTIVES

Develop an AI-Based Accident Detection System

- Implement computer vision techniques and deep learning models to accurately detect accidents in real-time.
- Utilize video surveillance and image processing for effective monitoring.

Integrate an Alert Mechanism for Immediate Emergency Response

- Automate emergency notifications to authorities and nearby responders.
- Use API-based messaging solutions like Twilio for instant alerts.

Capture Accident Images and Store Them for Analysis

- Enable automatic image capturing upon accident detection.
- Store captured images securely in an external database for further evaluation.

Implement Google Maps Integration for Precise Location Tracking

- Use GPS-based tracking to pinpoint the exact accident location.
- Display accident locations on an interactive map for better response coordination.

LITERATURE REVIEW

Existing Research and Technologies

1. AI-Based Vehicle Detection

Author: K. Patel (IEEE, 2022)

Key Insights:

- AI models enable real-time vehicle recognition in traffic surveillance.
- Machine learning improves accuracy in accident detection.

Relevance to Our Project:

- Supports our approach of using AI for real-time accident identification.
- Justifies the use of computer vision techniques for accident analysis.

2. OpenCV and TensorFlow for Image Classification

Author: R. Mehta (Springer, 2023)

Key Insights:

- OpenCV and TensorFlow are widely used for image processing tasks.
- Convolutional Neural Networks (CNNs) improve object detection in real-world environments.

Relevance to Our Project:

- Reinforces our use of CNNs for accurate accident recognition.
- Highlights OpenCV’s efficiency in real-time video processing.

3. **Automated Emergency Communication Systems**

   Author: S. Lee (ACM, 2021)

   Key Insights:

   - Emergency response systems often lack automation, causing delays.
   - API-based messaging solutions improve response times.

   Relevance to Our Project:

   - Justifies the integration of Twilio API for instant accident notifications.
   - Confirms the importance of automated emergency alerts for faster assistance.

METHODOLOGY

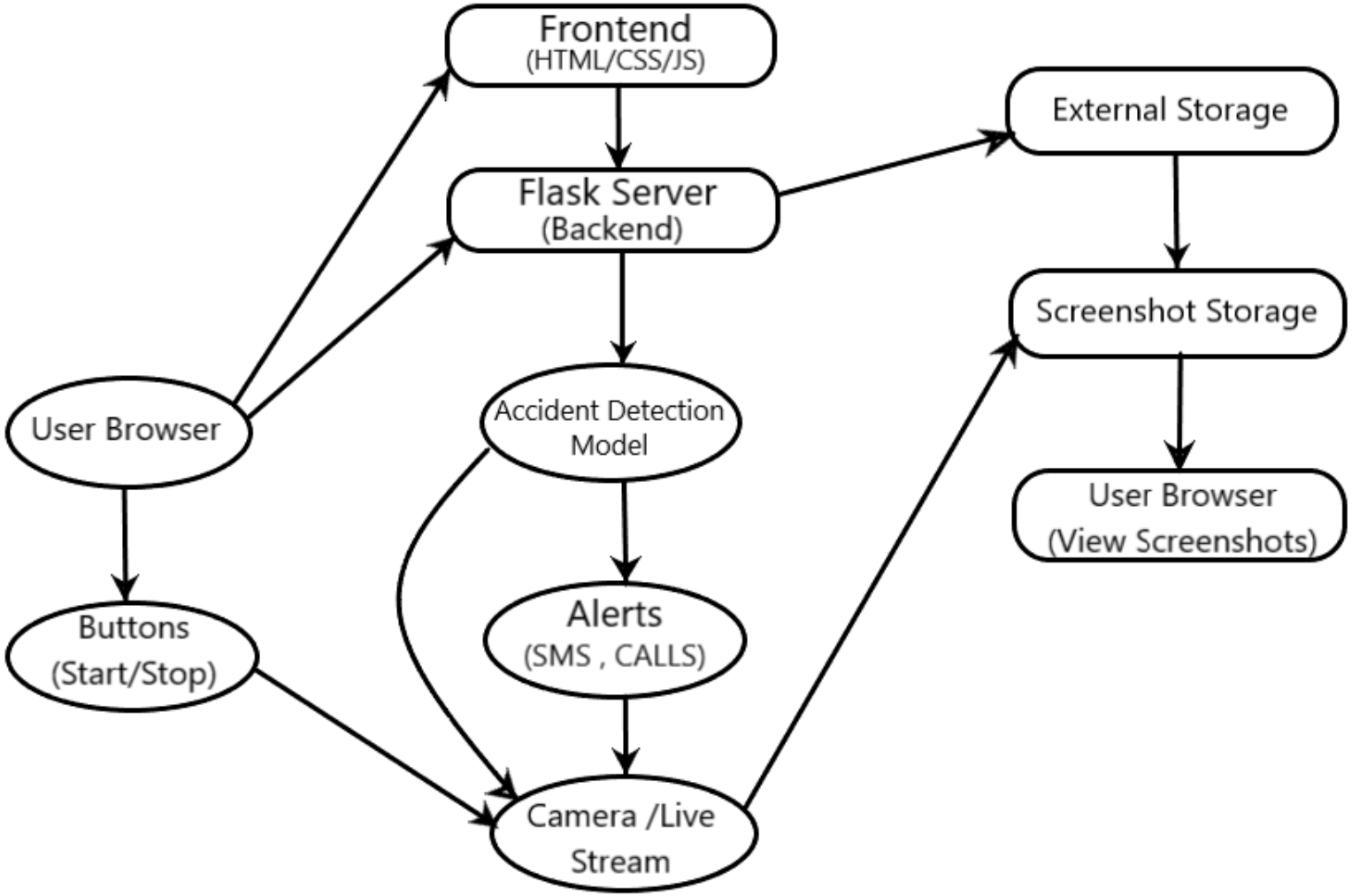
Approach and Workflow:

- AI Model Training – CNN (Convolutional Neural Networks) to classify accident and non-accident images.
- Image Processing – OpenCV detects crashes in real-time by analyzing video frames.
- Communication – Twilio API sends SMS and initiates calls to emergency contacts for immediate response.
- User Interface – Flask-based web application provides a monitoring dashboard for real-time tracking.
- Data Logging – Captures accident screenshots for documentation and future analysis.

Technologies Used:

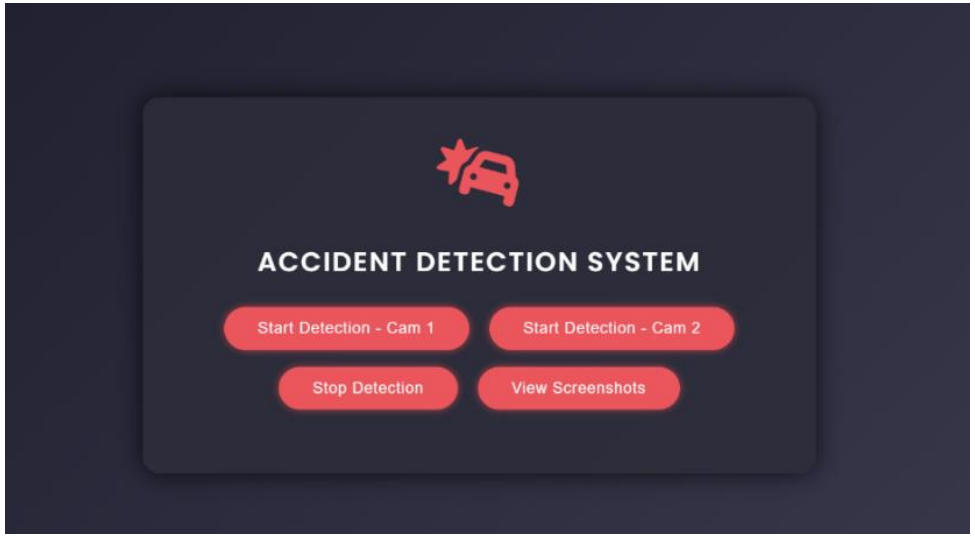
- AI Model & Processing – CNN, OpenCV
- Backend – Flask
- Communication – Twilio API
- Data Logging – Image Storage System

SYSTEM ARCHITECTURE DIAGRAM:

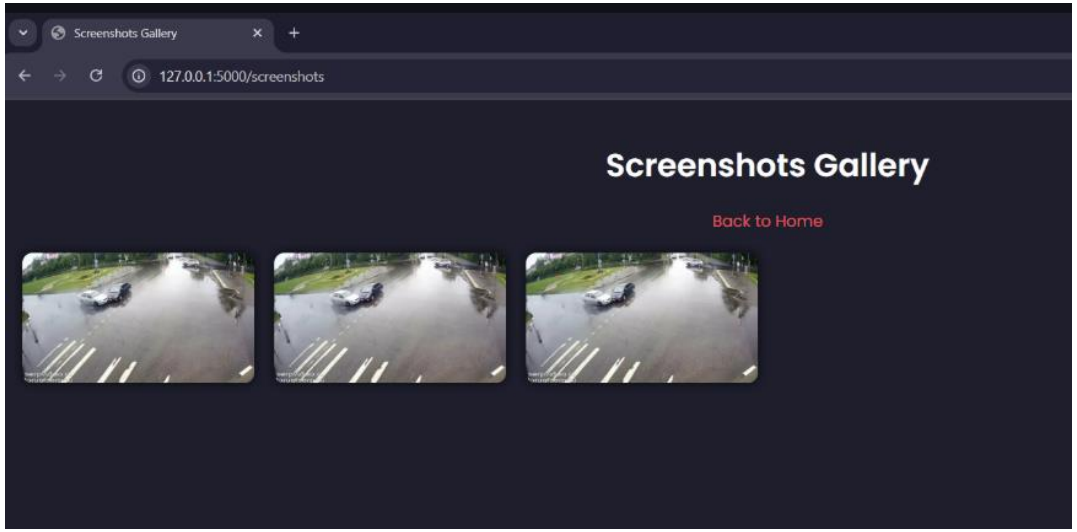


IMPLEMENTATION

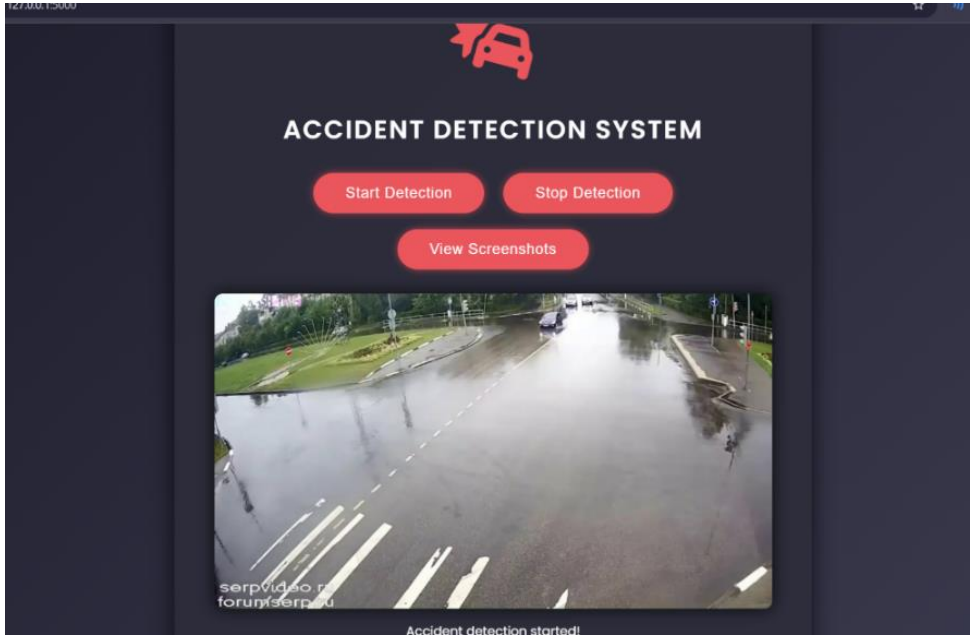
- **AI-Powered Detection:** Real-time accident detection using a trained CNN model**.**
- **Instant Alerts:** Automated emergency calls and SMS notifications via Twilio API**.**
- **Audio & Visual Cues:** Triggers an audio alert and captures accident screenshots for documentation.
- **User Control:** Start/Stop detection functionality for flexible monitoring.
- **Web-Based Interface:** Flask-powered dashboard for live video monitoring and accident alerts.



Front-End



Crash-Screenshots



Start-Detection

FUTURE SCOPE

- • Enhance accuracy with more training data.
- • IoT-based sensors for more precise accident detection.
- • Multi-type accident detection capabilities.
- • Reduce Processing overhead and to provide fast and smooth video relay.
- • To integrate an accident log and auto-email system.

CONCLUSION

- Successfully implemented AI-based accident detection.
- Immediate emergency alerts improve response time.
- Future advancements can make the system even more robust.
- This project successfully detects accidents in real-time and sends alerts.
- It provides quick emergency responses by notifying predefined contacts.
- The system can be further enhanced with AI-based improvements and more model training.

Final Thought: This can be a life-saving technology for road safety.

REFERENCES

TensorFlow & Keras Documentation

- TensorFlow: https://www.tensorflow.org/
- Keras: https://keras.io/

OpenCV Library for Image Processing

- OpenCV Documentation: https://docs.opencv.org/

Twilio API Documentation

- Twilio Messaging API: https://www.twilio.com/docs/sms

Research Papers on AI-Based Accident Detection

- AI-Based Vehicle Detection (IEEE): https://ieeexplore.ieee.org/document/8944469
- Automated Emergency Communication Systems: https://dl.acm.org/doi/10.1145/2345396.2345449