Department of Computer Science & Engineering and Information Technology

Major Project Proposal (2024-25)

Group No.	57

1. **Project Title:**

   VigilEyeX: An AI-powered system for real-time monitoring and ensuring public safety.

2. **Team Members:**

S. No.	Roll No.	Name	Mobile No.	Proficiency
1.	211193	Aayush Sharma	8580754652	Data Science
2.	211106	Parth Sharma	9720436699	Artificial Intelligence
3.	211194	Aditya Singh	9660012465	Information Security

3. **Name of Supervisor (s): Dr. Rakesh Kanji** (Assistant Professor (SG)), Computer Science

4. **Work Distribution** (*clearly state the distribution of work among team members.*)

S. No.	Roll No.	Work Distribution
1.	211193	• Lead the design and architecture of the LSTM and MobileNet models. • Oversee model training, optimization, and performance tuning. • Supervise system integration with Raspberry Pi for real-time operation. • Prepare and finalize project documentation and presentations.
2.	211106	• Design and develop the system's user interface. • Integrate sensors and cameras with the Raspberry Pi. • Maintain the system, resolving any bugs or issues. • Assist in final system testing and real-world deployment.
3.	211194	• Lead the data collection and preprocessing efforts. • Conduct model testing and validation on various datasets. • Develop backend systems for real-time data handling on Raspberry Pi. • Assist in preparing technical documentation and reports.

5. **Problem Statement** (*serves as a basis of your project and should comprise of max. 500 words spread over at least two paragraphs*)

In contemporary societies, the rapid escalation of violent incidents poses significant challenges to public safety and security. Despite advancements in technology, existing systems often fall short in providing real-time and effective detection of violent behaviors. Traditional violence detection systems typically rely on static cameras and manual monitoring, which limits their ability to respond promptly and adapt to varying scenarios.

To address this critical gap, we propose a novel solution leveraging advanced machine learning techniques and real-time image processing. Our project aims to develop an intelligent violence detection system that utilizes deep learning models, specifically Long Short-Term Memory (LSTM) networks combined with MobileNet, to analyze video streams and detect violent activities in real-time. Unlike conventional methods, which are often reactive and dependent on pre-set parameters, our approach seeks to offer dynamic, real-time analysis by processing video feeds from multiple sources, such as security cameras and mobile devices.

The core of our system involves deploying a Raspberry Pi as an edge device capable of processing video streams locally. This hardware choice ensures that our system can be implemented in a variety of environments, including public spaces and private establishments, without the need for extensive infrastructure. The use of LSTM networks allows the system to understand temporal sequences in video data, improving its ability to identify violent behaviors that occur over short periods. Meanwhile, MobileNet provides efficient feature extraction capabilities, crucial for maintaining high performance on limited hardware resources.

Our solution not only aims to enhance the accuracy of violence detection but also focuses on minimizing false positives by integrating a real-time feedback loop that adjusts the detection thresholds based on observed behavior patterns. This adaptive capability ensures that the system remains effective in diverse scenarios, from crowded public events to quieter, less dynamic environments.

By advancing the state of real-time violence detection through the use of modern machine learning techniques and compact, deployable hardware, our project addresses a pressing need for more responsive and adaptive security solutions. The proposed system promises to significantly improve the ability to prevent and respond to violent incidents, ultimately contributing to safer communities and more secure environments.

6. **Main Objectives** (*mention at least three objectives*)

1) **Develop a Real-Time Detection System:** Create a robust system that can accurately identify violent behaviour from video streams in real time using Convolutional Neural Networks (CNNs) and Long Short-Term Memory (LSTM) networks.

2) **Optimize for Raspberry Pi:** Adapt and optimize the machine learning models to run efficiently on a Raspberry Pi, ensuring that the system operates within the hardware constraints of this low-power computing platform.

3) **User Interface Development:** Create an intuitive interface for security personnel to monitor alerts, review incidents, and manage the system effectively.

4) **Enhance Detection Accuracy:** Refine machine learning models to minimize false positives and ensure high accuracy in detecting violent behaviour.

5) **Ensure System Scalability:** Build a system that can be deployed in various environments, such as public spaces and workplaces, with adaptability to different security needs.

7. **Resources Required** (*mention software, hardware, and other resources*)

Category	Description	
Software Resources	• Raspbian OS	Version: latest stable version
	• Python	Version: 3.8 or later
	• TensorFlow/Keras	Version: 2.6 or later
	• OpenCV	Version: 4.5 or later
	• ImageZMQ	Version: latest stable version
	• NumPy	Version: 1.21 or later
	• PyCharm or VS Code	Version: latest stable version
Hardware Resources	• Raspberry Pi 4 Model B (4GB RAM) • MicroSD Card (32GB minimum) • Raspberry Pi Camera Module V2 • External Storage (e.g., USB drives)	
Others	• Version Control System (e.g., GitHub, GitLab) • Technical Documentation (e.g., user manuals, API documentation)	

8. **Project Plan** (*please update the provided Gantt Chart according to your project work plan, breaking down the proposed work into phases and tasks along with their timelines for the entire academic year 2024-25.*)

Activity	Year 2024					Year 2025				
	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
Literature Review	█	█	█							
Analysis and Requirements	█	█	█							
Project Design and Architecture		█	█	█	█					
Implementation		█	█	█	█	█	█	█	█	
Testing and Validation			█	█	█	█	█	█	█	
Documentation and Write-up		█	█	█	█	█	█	█	█	█

Signatures (*please also mention the name of team members and supervisor (s) with date*)

Aayush Sharma　　　　　**Parth Sharma**　　　　　**Aditya Singh**

(Name of Member 1)　　　　(Name of Member 2)　　　　(Name of Member 3, if any)

Dr. Rakesh Kanji

(Name of Supervisor)　　　　　　　　(Name of Co-Supervisor, if any)

Date of Submission: 21 August 2024