# Crime Identification System for Campus Safety and the Threat of Suspicious Student Conduct

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**Abstract**

Ensuring campus safety is of paramount importance for educational institutions. With the increasing prevalence of crime and the potential threat of suspicious student conduct, there is a need for an effective crimes identification system. This paper aims to propose a comprehensive system that utilizes advanced technologies, such as video surveillance, data analytics, and behavioral monitoring, to detect and mitigate potential threats on campus. The proposed Crimes Identification System (CIS) integrates various components to enhance campus safety. These cameras capture real-time footage that is then processed using advanced video analytics algorithms. The algorithms analyze the footage for suspicious activities, unusual behavior patterns, or known criminal profiles. The system incorporates a centralized monitoring and alert system that notifies security personnel immediately upon detecting any suspicious behavior or potential threats. This enables a swift response to mitigate the risks and ensure the safety of the campus community.

*Keywords*: Campus safety, Suspicious student conduct, Behavioral monitoring, Threat detection

## 1. Introduction

In the 21st century, school crime has become a serious problem and now the number of school crimes keeps increasing. Especially among secondary school and university students. Suppose the student should learn and study in a safety environment, but due to the stress and did not have proper way to release it. Students might do illegal activities to release stress. According to [1] stated that increased stress among university students leads to several problems with their academic performance, including depression, a lack of interest in going to class, difficulty understanding the material, and suicidal thoughts because of low self-esteem. And might lead student to do illegal activities such as substance abuse, vandalism, and more [2].

Crime identification system refers to the methods and processes used by law enforcement agencies to identify and track criminal activity [9]. This can include various technologies such as biometric identification, facial recognition, and fingerprint analysis, as well as more traditional methods like eyewitness testimony and forensic analysis [3]. For now, crime identification systems have become more advanced, the AI technology combine with security camera. The accuracy of AI surveillance hugely improved compared to traditional security cameras. AI algorithms can analyze and process vast amounts of data from security cameras in real-time, making it easier to identify potential security threats and respond quickly. Also, AI surveillance have better object recognition, AI-powered cameras can detect specific objects and recognize patterns, such as vehicles or individuals, which can help identify potential security risks [4].

The research of Kakadiya proposed that using the AI (artificial intelligence) with the CCTV (Closed circuit television system) for detection of dangerous weapon and illegal items. Kakadiya trained the AI surveillance by using the CNNs (Convolutional Neural Network) algorithm and found out the result is very high accuracy. Convolutional Neural Networks (CNNs) are a type of

deep learning algorithm that have several benefits which perform well in image and video recognition. CNNs have automated feature extraction which is able to automatically extract relevant features from an image or video, reducing the need for manual feature engineering. Below figure is the example result that AI surveillance using CNNs algorithm [5].

## 2. Literature Reviews

Campus safety is an important issue for educational institutions all around the world. With developments in technology and data analytics, crime identification systems have become important resources for improving campus security. The purpose of this literature review is to investigate existing studies on crime detection systems for campus safety and their effectiveness in reducing criminal activity [6].

Developing a prototype crime identification system is a difficult and time-consuming procedure that involves careful planning, research, and implementation [10]. These systems are critical tools for improving law enforcement's ability to detect and capture offenders. Based on the material supplied by researcher Kranthi Kumar, this article covers the essential stages required in developing a prototype crime detection system. These phases will include a variety of topics, such as technology selection, system development, testing, and implementation [7].

Another popular supervised learning method is Support Vector Machines (SVM), which is particularly successful for classification problems. SVM is frequently used to determine an ideal hyperplane in the feature space that successfully divides different groups or categories. When dealing with non-linear correlations and complex feature interactions, k-NN is extremely helpful. It has adaptable categorization boundaries and can adjust to changing crime patterns and distributions. Although k-NN is simple to build and provides relatively accurate results, it may encounter challenges when dealing with high-dimensional data or inconsistent class distributions. Choosing a suitable value for k and maximizing the distance measure are essential parts of effectively implementing k-NN [8].

Table 1. Comparison of the current Facial Emotion Recognition system [7]

| Name | Version Type | Accuracy | Feature extraction Algorithm |
|---|---|---|---|
| *YOLOv3* | 320 | 33.50% | Convolutional Neural Networks |
| *FaceVideo* | API v1.0 | 48.35% | Convolutional Neural Networks |
| *Cognitive Services: Face* | API v1.0 | 52.61% | N/A |
| *YOLOv4* | N/A | 43.8% | Convolutional Neural Networks |

The comparison results are shown in Table 1 of current Facial Emotion Recognition system.

## 3. Methodology

A crime identification system is a multidisciplinary effort that use technology to detect and understand criminal activity based on behavioral and visual indicators [11]. A mix of quantitative methods, historical research, and questionnaire methodology will be used to create an effective crime identification system.

Quantitative research methods can be used to collect and analyze numerical data on illegal items with different objects. This data can then be used to train machine learning algorithms that can recognize items and classify whether it whether is illegal item or not in real-time. In this project, MS COCO will be used to perform object identification. MS COCO (Microsoft Common Objects in Context) is a large-scale image dataset containing 328,000 images of everyday objects and humans. MS COCO dataset was created by Microsoft to train and evaluate many state-of-the-art object detection and segmentation models. The images were collected from the internet and are of different sizes and qualities. MS COCO is a widely used dataset in the field of object recognition and has been used for training and evaluating deep learning models for crime identification systems.

In the structure of the crime identification system, historical research methodologies are also used to understand the cultural and social variables surrounding criminal activities and how they have appeared through different behavioral and visual indicators. This technique can give important insights into the evolution of criminal patterns and law enforcement strategies by evaluating historical criminal cases and researching how crime has been investigated and documented.

## 4. Analysis and Discussion

An online survey was used to gather information from a sample of 100 university students for the purpose of this study. The participants were chosen at random from a broader group of college students from different universities. The purpose of the questionnaire was to collect necessary data about the research subject and the application of crime identification system technology in the educational field. The data gathered will be carefully examined in order to reach relevant conclusions and learn insightful information. It is anticipated that the sample size of 100 students will give an accurate representation of how students view and feel about the use of crime identification system technology in the educational setting.

Furthermore, the survey results revealed that 9% of respondents were unaware of the campus safety risks.

This research emphasizes the need to raise awareness and give information about campus safety measures, processes, and resources. It is critical that all members of the campus community are well-informed and prepared to deal with possible safety issues.

## 5. Synthesis

### 5.1. System Architecture Design

The system will required import some library to build up the object identification. The required essential library is IPython.display, cv2_imshow, Image, and %matplotlib inline. To make a successful detection, the system will adjust the screen to 640*480 to make sure the system go smoothly, when the resolution raised up it will cause the system crash down due to the limitation of the hardware

The "yolov4-csp.weights" neural network model was trained and tested using the MS COCO dataset. The authors used a convolutional neural network (CNN) to get an accuracy of 0.67002. This pre-trained model is intended to accurately recognize and categorize objects in pictures or video frames. Darknet is a framework for both training and running pictures or video frames through learned neural networks. It is a popular open-source deep learning framework for applications like object recognition and categorization. The Crime Identification System may use the power of the "yolov4-csp.weights" model for item recognition and classification by loading it into Darknet.

After loading the model, the next step is to define a function that identify the object based on the classification. The “darknet_helper” will help the system enable to detect the object, it will scan the object and find out the object feature to compare with the system database, then it will provide the result to inform the user the object name. Furthermore, it encodes the data from the image path by changing the picture's colour to RGB from BGR using cv2.COLOR_BGR2RGB. This extracts the RGB data from the images and places it in the encoded List array. After the image’s encoding procedure is complete, the camera is turned on to capture the real image from reality and compare it to the make image.

### 5.2. User Interface Design and System Flow


Fig. 1. Example of Illegal Object Detected

Firstly, the user will operate the system, the system will start scanning once detected the object. When the system detects an illegal object (Fig. 1), the system will proceed to next step.


Fig. 2. Alert Sound Occur when Detect Illegal Object

Thus, the system will perform alert sound when detected an illegal object (Fig. 2).

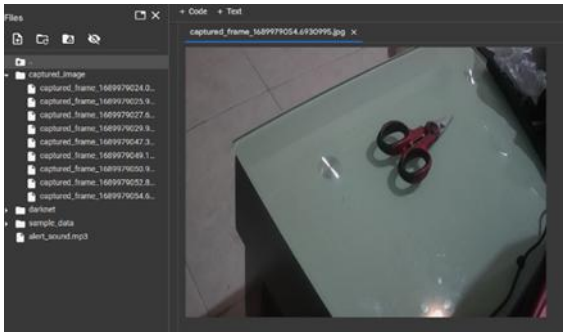

Fig. 3. Illegal Object Record

The system will immediately capture the image as evidence and store it in the database (Fig. 3).

## 6. Evaluation

System testing is conducted to ensure that the system works as intended.

### 6.1. Results and summary of the Usability Testing

After conducting usability testing on the Crime Identification System, the following results have been gathered:

- Accuracy of Object Detection
  Participants noted that the accuracy of the system varied depending on the lighting conditions, camera angle, and facial expressions of the individuals in the video clips. Some participants also reported that the system had difficulty recognizing more subtle or nuanced emotions.
- User Interface Design
  Several participants commented the system did not have GUI and make the system become not user friendly. Hence, the GUI will bring into future development.
- Respond Time
  Some participants expressed dissatisfaction and reduced efficiency because the system was slow to respond to their instructions.

## 7. Conclusion

In conclusion, the development of the Crime Identification System has been successfully achieved, meeting the aims and objectives outlined during the initial planning phase. This system is developed using Python and its libraries, including the cv2 library for image processing and analysis. Additionally, the development process incorporates the Rapid Application Development methodology to ensure a responsive and efficient approach.

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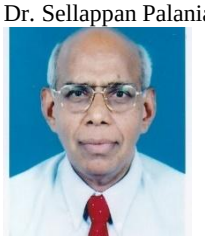

He is a Professor at Help University, Malaysia. He received the Ph.D. degree in Interdiscplinary Information Science from Universiti of Pittsburg. He has more than 40 years of teaching experience, authored several IT/CS books, published more than 100 journal/ conference papers and keynote speaker in conferences His research areas include machine learning, artificial intelligence, data science and cybersecurity.

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