



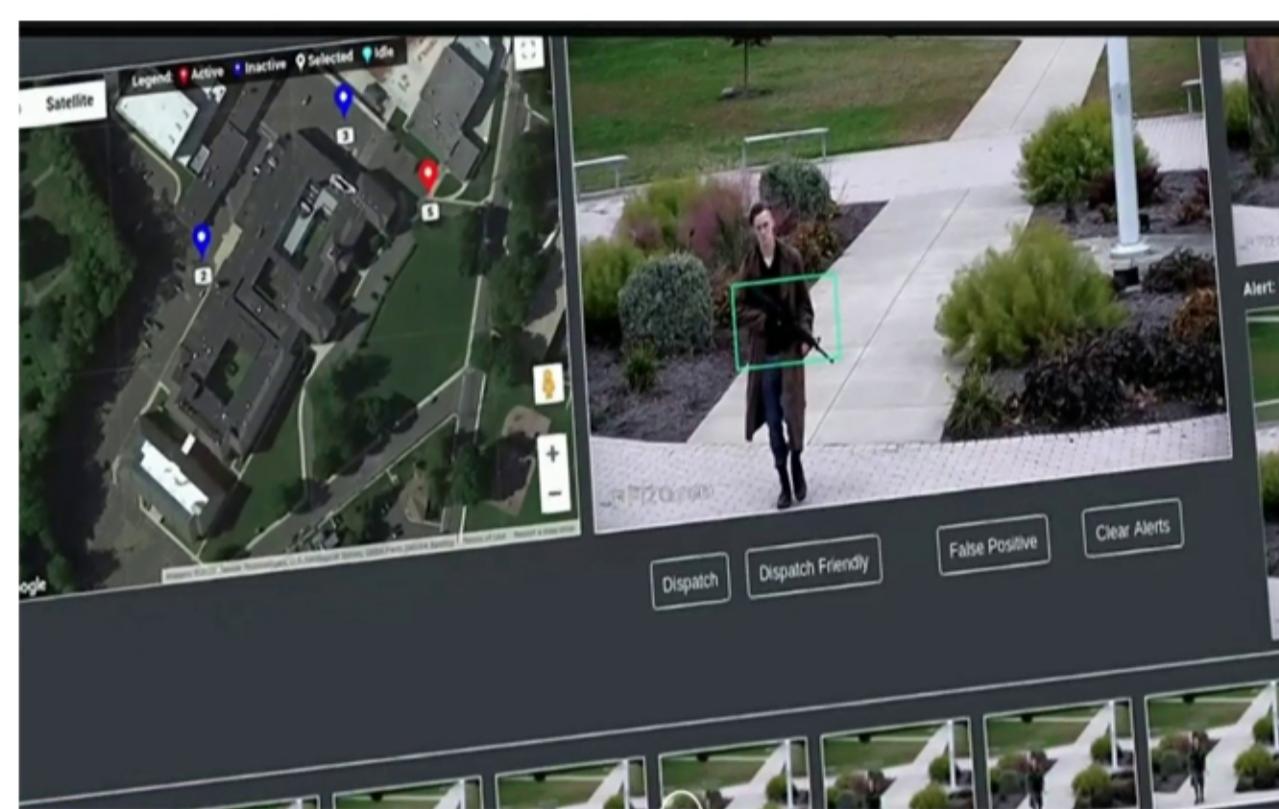
Abstract

Preserving humans' life and valuables is the top requirement for any society. Due to the existing of so many criminals or menacing tactics, it is almost impossible to discern them by visual ability, as they easily hide inside large crowds. For this, the developers and the police are working to secure it both technically and realistically. Because security alone is unable to deal with such matters. Due to modern technology, the current era, to the researchers' background in computer science, we can work to create a detection system for surveillance.

In this project, we will develop an intelligent system that is able to detect both a human and some weapons that are used by criminals. The detected weapons are guns, rifles, and knives. After the detection of one of the weapons, an alarm will be raised. system can be used in public places. using modern machine learning technologies for object detection to achieve that goal.

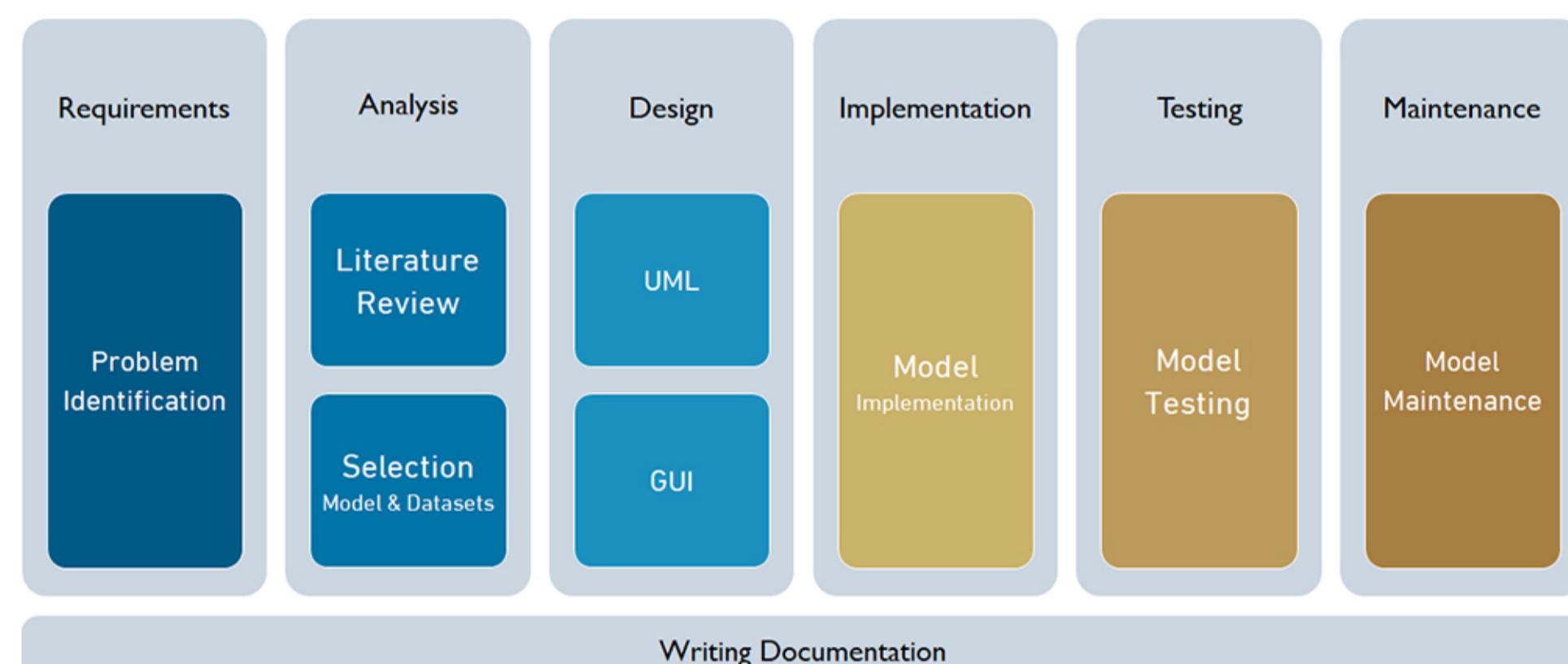
Introduction

Create a system connected to a camera that can identify the criminal who enters public places, by identifying if he is carrying a gun, trifle, or a knife. and to give a warning to all those present in and warn them.



Methodology

In this project, we carefully looked for requirements, we decided that the best approach to the development is primary Waterfall Methodology, introduced final characteristics of each phase of methodology were determined based on changes during the project



Background

Image Classification

Definition:
predicting the class of one item in a picture

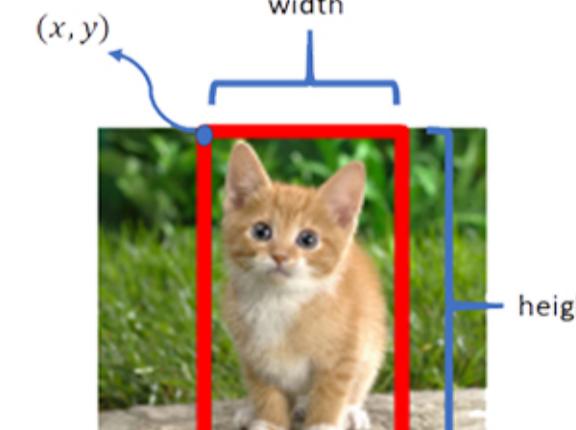


Input:
a single-object image, such as a photograph, is utilized.

Output:
a class label is created

Object Localization

Definition:
Determine the presence of items in a photograph and use a bounding box to pinpoint their location.

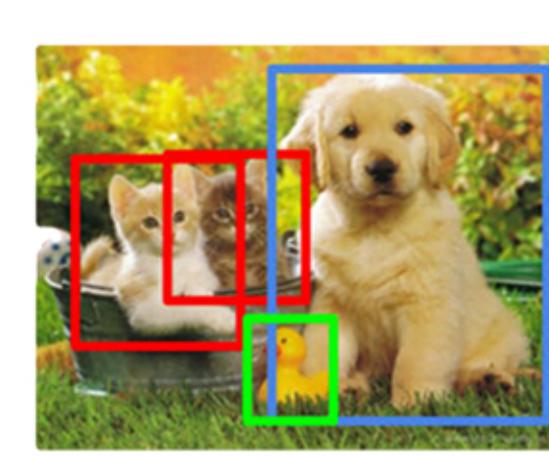


Input:
an image with one or more things, such as a photograph, is utilized.

Output:
one bounding box (specified by a point, width, and height)

Object Detection

Definition:
Using a bounding box, determine the presence of things in an image and the types or classes of the objects discovered

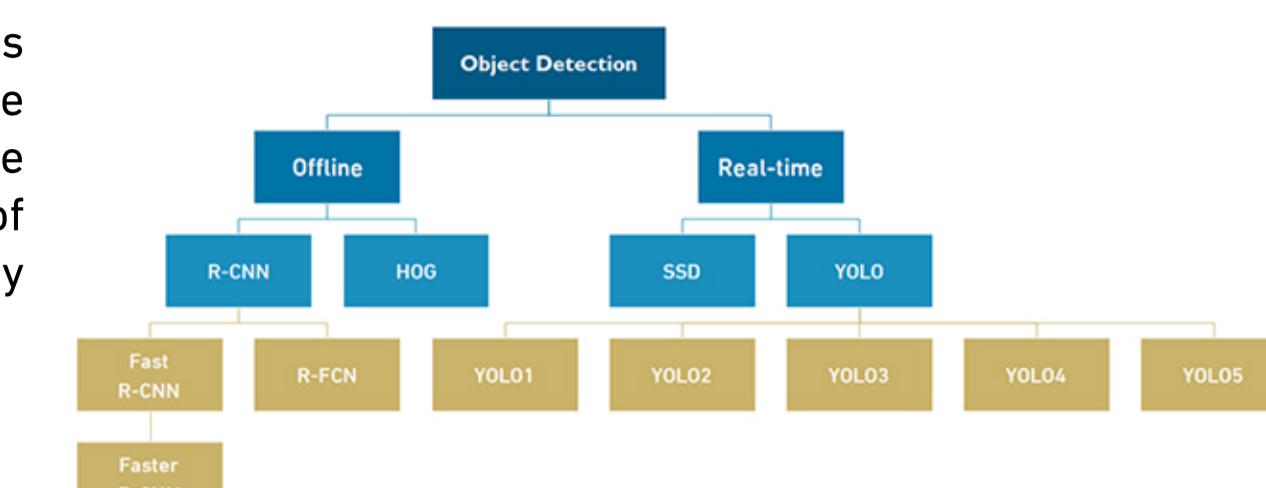


Input:
an image with one or more things, such as a photograph, is utilized

Output:
one or more bounding boxes

Classification of Object Detection Algorithms

Object Detection algorithms have two main types, Real-time is fast inference while maintaining a base level of accuracy, While Offline mainly depends on performance



Open-source Datasets

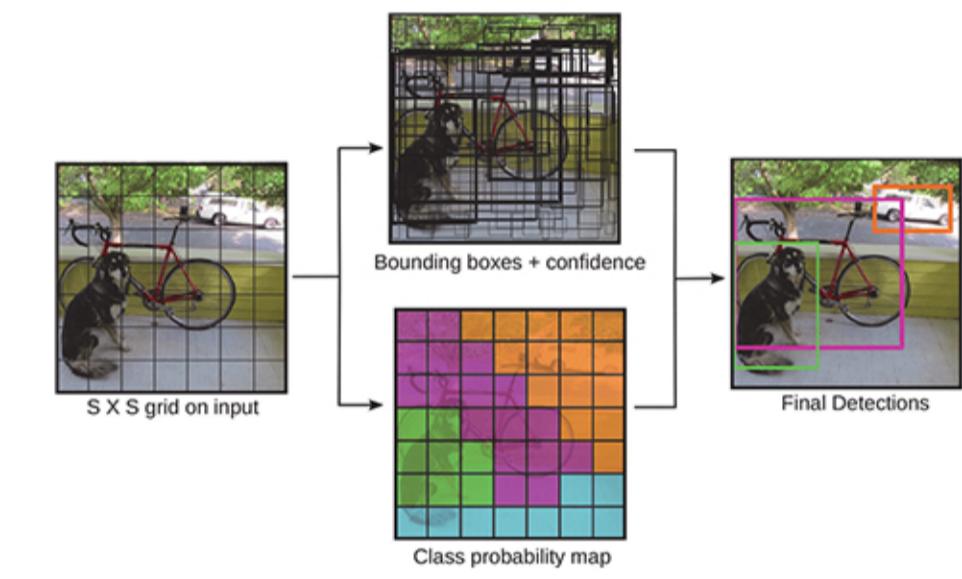
We searched for open-source datasets and filtered them to the ones in this report. Types of databases: Gun, Rifle, Knife, People. Most of Datasets used to create a model form YOLO (You Only Look Once)

Dataset	Gun	Rifle	Knife	People	Total
Crime Detection	2000	-	1050	100	3150
Weapon detection	10770	187	7140	-	18097
Weapon Classification	315	-	12900	-	13215
Handgun Dataset	1900	-	-	-	1900
Knife Dataset	-	-	500	-	500
Total Datasets					36862

You Only Look Once (YOLO)

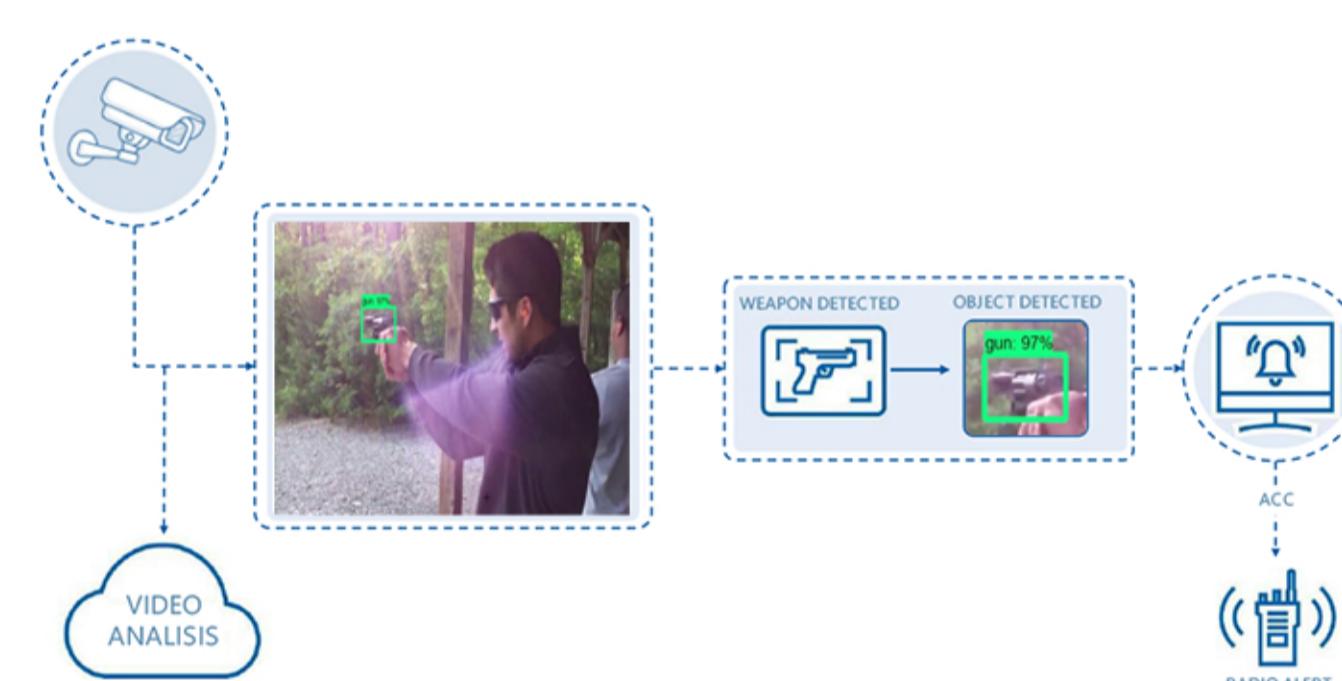
A single neural network is used in an object detection method. In contrast to several other object detection algorithms that do a bit-by-bit scan of the picture.

Compared to other region proposal classification networks (fast RCNN) which perform detection on various region proposals and thus end up performing prediction multiple times for various regions in an image, Yolo architecture is more like FCNN and passes the image. This the architecture is splitting the input image in $N \times N$ grid and for each grid generation 2 bounding boxes and class probabilities for those bounding boxes. this project, we will use YOLO v5

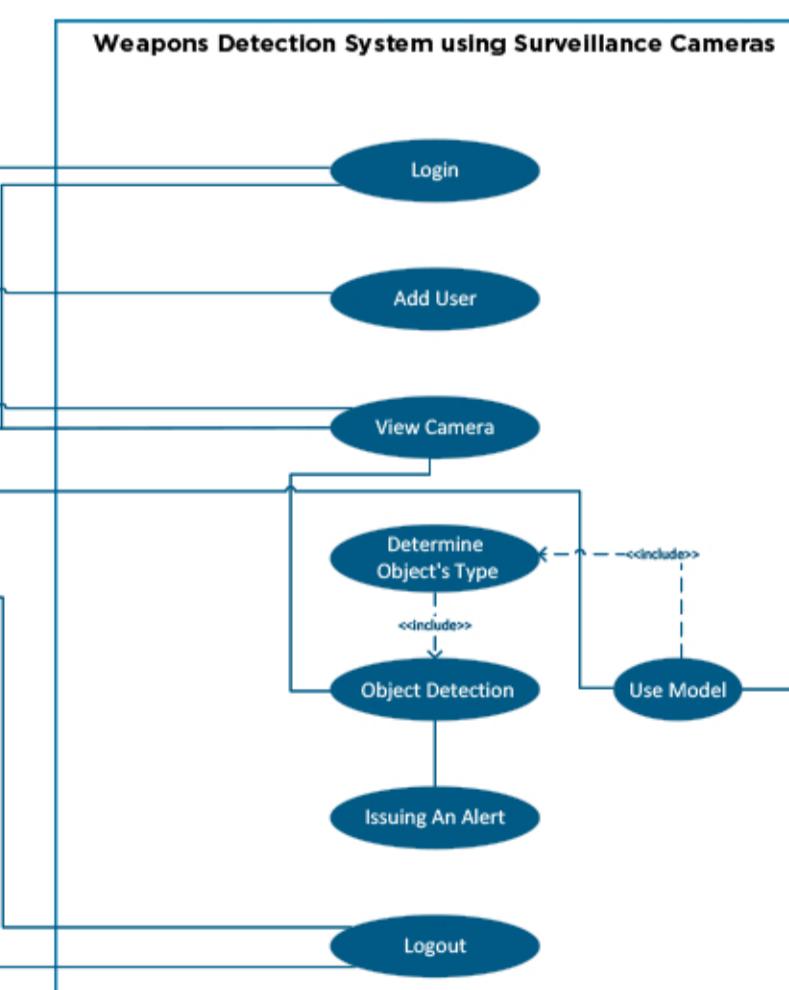


Diagrams

Activity



Use Case



Conclusion & Future Work

Nowadays, with the accessibility of huge datasets, quicker GPUs, advanced machine learning algorithms, and better calculations, we can now effectively prepare PCs and develop automated computer-based system to distinguish and identify the danger of weapon risks on a site with high accuracy.

Our project can be used in the future to serve the following ideas:

- Detect persons and crowd, then system will report places with high crowd.
- Detect if a person wears or misplaces a face mask or not.
- Detection of smoking and report the place of a smoker.

References

- [1] J. Brownlee, "A Gentle Introduction to Object Recognition With Deep Learning," Machine Learning Mastery, May 21, 2019. <https://machinelearningmastery.com/object-recognition-with-deep-learning/> (accessed Oct. 10, 2021).
- [2] A. Choudhury, "Top 8 Algorithms For Object Detection," Analytics India Magazine, Jun. 16, 2020. <https://analyticsindiamag.com/top-8-algorithms-for-object-detection/> (accessed Oct. 10, 2021).
- [3] J. Du, "Understanding of Object Detection Based on CNN Family and YOLO," J. Phys. Conf. Ser., vol. 1004, p. 012029, Apr. 2018, doi: 10.1088/1742-6596/1004/1/012029.
- [4] Weapon detection datasets. ARI-DaSCI, 2021. Accessed: Sep. 28, 2021. [Online]. Available: <https://github.com/ari-dasci/OD-WeaponDetection>