Kathan Trivedi

STUDENT, MASTER OF SCIENCE IN INFORMATION TECHNOLOGY

Weapon Classification Using Bounding Box Regression Algorithms

Crime rates are increasing at a very high rate globally. The use of weapons in schools, airports, and streets is gaining popularity. To prevent this we have a surveillance system that is monitored by security officers and requires constant observation. This is a tiresome job and involves human errors regardless of the significance of the problem. Thus, it becomes immensely paramount to develop an automatic system to take precautionary measures.

This research studies different machine learning algorithms for weapon detection and classification from images and videos. We have classified the data into four segments: (1) Knife (2) Pistol (3) Rifle (4) Grenade. We have developed a supervised learning model consisting of around 5000 training images with manual labeling of each image. Due to the lack of images for every class, the images are selected from the internet manually. This study involves both single-stage (YOLOv4-Darknet, and RetinaNet) and two-stage detectors (Convolutional Neural Network (CNN), FRCNN, and MRCNN) to predict the potential threat from the given input and identify the particular weapon with a bounding box. The training of the model involves pre-processing of images and extraction of various features of the image. Extracted features are then passed through convolutional layers to predict the output. Different performance metrics such as F-measure, accuracy, recall, and precision is used to compare the performance of both single and two stage detectors.

The result of this study will help the government to establish an automated and reliable surveillance system. Future research directions include building and enhancing the model that can detect and classify the weapon from the grayscale images as well. The enhanced model can further be used for other classification problems for better accuracy.

Research Advisor: Dr. Baidya Saha, Assistant Professor