B. Tech PROJECT SUMMARY (MPS) SHEET

Title of project: A Comparative Analysis of Weapon Detection Using Various Deep Learning Techniques.

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Brief description:

Weapon detection is currently a very important and intensive issue in terms of public security and safety in general. Weapon detection is the identification of irregular, unexpected, unpredictable, unusual events, or items, which are not considered normally occurring events or regular items present in a pattern or dataset and thus different from existing patterns. Object detection uses feature extraction and learning algorithms or models to recognize instances of various categories of objects. Different object detection models are available but in the case of weapons detection, it is difficult to detect weapons of distinctive size and shapes along with the different colors of the background.

We know that crime is an action that constitutes an offense and is punishable by law. Analyzing and identifying the hidden crime patterns are the major problems for the police department as there are voluminous data on crime exist. So, we need some methodologies to help the investigation bureau in solving crimes. In this system, we can also generalize other objects and outdoor scenes. Our proposal aims at smoothing and reducing the labor of police while dealing with visual data (i.e., A police officer can use this method to detect objects from one scene, and automatically relate them to other similar scenes efficiently). The proposed idea focuses on accurate weapon detection and classification.

Objectives:

1. To collect the dataset.
2. To train the dataset with CNN-based object detection algorithms.
3. Test the system in a variety of environments and situations to ensure robust performance.
4. To detect the weapon from the given scene.
5. Comparative analysis with various models.

Outcomes:

1. An appropriate dataset was compiled using annotations and augmentations which eventually gave us a balanced dataset.
2. The suitable models we considered after initial analysis were YOLOv5, SSD, and R-CNN architecture.
3. YOLOv5 gave the best prediction accuracy among the two models.

Conclusion & Future Work:

For the implementation of this project, we used the existing technology and libraries available in the world of Image processing and Computer Vision Architecture. Since we had three models available, we were able to compare the performance of these models on our dataset. YOLOv5 gave the best prediction accuracy among the two models, although it was considerably slower than RCNN and SSD. The YOLOv5 model included an affine-tuning approach for the best optimization of the model's performance. The lower computation time of RCNN might be desirable for real-time use cases. It is also to be noted that the accuracy we received through R-CNN is not a fixed accuracy that will always be obtained. It primarily depends on the training set size and the variety of training images that are fed to the network.

The future work and evolved implementation of the project would be to deploy an end-to-end model where the surveillance camera directly sends the footage, in real-time to a cloud database. The software implementing the object detection model will extract the video from the database, read each frame of the video, and check if the positive class (one of the crime scenes, objects guns, pistols) is detected.

Screenshot of Working Model: (For Model-Based projects)

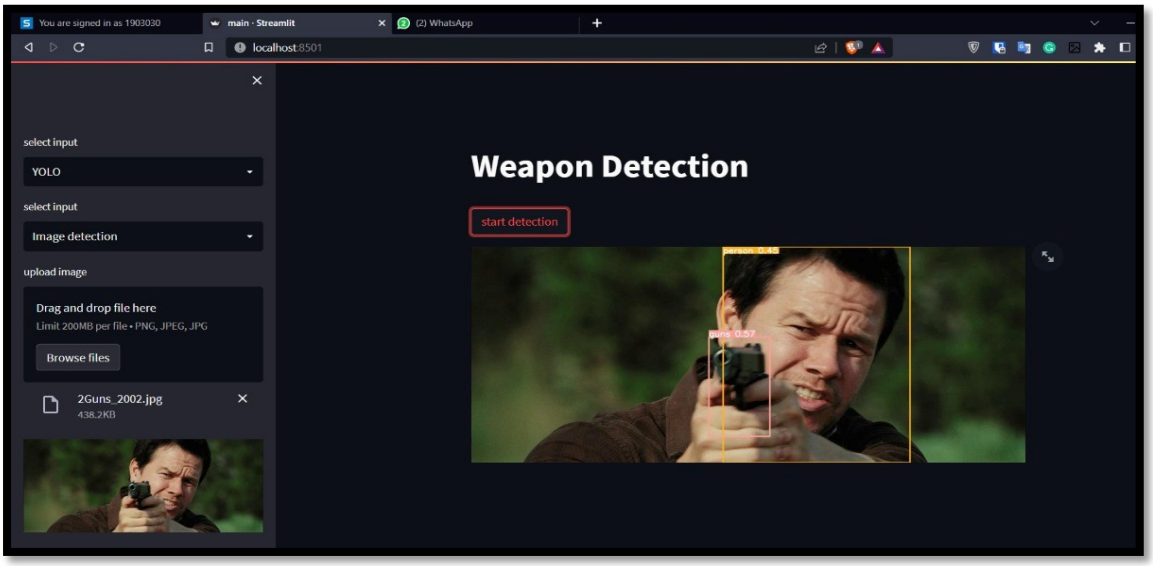
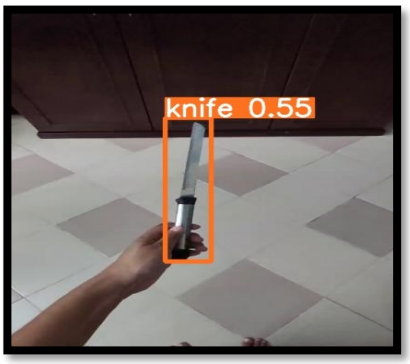


Fig.No.1 User Interface

Dean R & D

I. YOLOv5

II. RCNN



III. SSD

Signature of Supervisor/s: _____