Rajarambapu Institute of Technology, Rajaramnagar

Department of Computer Science and Engineering

Project Synopsis

Area of the Project	DEEP LEARNING AND MACHINE LEARNING
Title of the project	A comparative analysis of crime prediction using various deep learning techniques.
Project Guide Name	Prof. Mr. T. S. Ruprah
Team Leader's Name	Sayma Tamboli
Group Number	13 (DIV. B)

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Project Guide

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Introduction

Nowadays, weapon detection is a very serious and intense issue as far as the security and safety of the public in general. Weapon detection is the identification of irregular, unexpected, unpredictable, unusual events or items, which is not considered as a normally occurring event or a regular item in a pattern or items present in a dataset and thus different from existing patterns. A crime is an action which constitutes an offence and is punishable by law. Analysing and identifying the hidden crime patterns are the major problems to the police department as there are voluminous data of crime exist.
So, we need some methodologies to help the investigation bureau in solving the crimes. Different object detection models are available but in case of weapons detection it is difficult to detect the weapons of distinctive size and shapes along with the different colors of the background. Object detection uses feature extraction and learning algorithms or models to recognize instances of various category of objects.
In this system we can also generalized other objects and outdoor scenes. Our proposal aims at smoothing and reducing the labour 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). Proposed idea focuses on accurate weapon detection and classification.

Literature Survey

Several weapon detection algorithms have been developed and studied over the years. Each of them consists of different types of methods and techniques and has its own pro and con. Recently in the literature, many works use deep convolutional neural networks (e.g. AlexNet [12], GoogleNet [13], VGG-Net [8]) for detecting and locating objects with class-specific bounding boxes. Typically a CNN consists of multiple convolution layers, followed by ReLU (Rectified Linear Units), pooling layers, and fully connected layers. The activations which are generated by the last layers of a CNN can be used as a descriptor for object detection and classification. Razavian et al. [14] employed the activations generated by the fully connected layers as region descriptors. Babenko et al. [15] demonstrated that such activations can be even used for image retrieval tasks, and they named such descriptors as neural codes. Later, they established that such descriptors perform competitively even if a CNN is trained for an unrelated classification task i.e. a CNN trained with ImageNet [11] dataset can be generalized to detect objects in MS-COCO [10] dataset. The deep learning algorithms have improved the image classification and object detection tasks in manifolds as compared to SIFT or other variants [16]. The algorithm proposed by Lee et al. [17] learns high-level features i.e. object parts from

natural scenes and unlabeled images. Simonyan and Zisserman et al. [8] investigated the depth of such algorithms on their accuracy and achieved state-of-the-art results. Girshick et al. [18] presented R-CNN (Region-based Convolutional Neural Network), which proposes regions before feeding into a CNN for classification. The network is a version of AlexNet, which has been trained using Pascal VOC Detection data [19]. The network contains a three-stage pipeline, thus making the training process slow. Since then, in terms of accuracy and speed, great improvements have been achieved. He et al. [20] proposed SPP-net, which is based on Spatial Pyramid pooling. The network improves the detection and classification time by pooling region features instead of passing each region into the CNN. Later, Girshik [21] proposed Fast R-CNN, which is similar to SPPnet but replaced SVM classifiers with neural networks. Ren et al. [9] introduced Faster R-CNN, a faster version of Fast R-CNN, which replaces the previous region proposal method with RPN (Region proposal Network), which simultaneously predicts object bounds and scores.

Problem Statement

In the current scenario of rapidly increasing crime, traditional crime-solving techniques are unable to deliver results. Thus, we have come up with a way to predict crime.

Objectives

1. To collect the dataset.
2. To train the dataset with proper algorithms.
3. To test the dataset with proper accuracy.
4. To detect the weapon from the given scene.
5. Comparative analysis with various models.

Proposed Methodology

1. Dataset

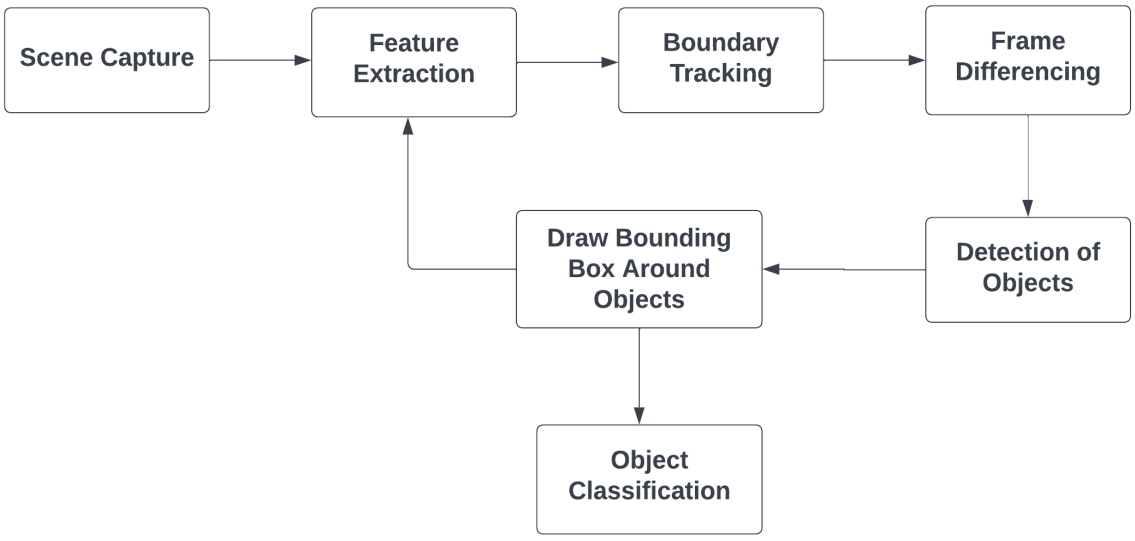
Raw images are not appropriate for analysis purposes and need to be converted into the processed format, such as jpeg, or jpg, for further analysis. The image size is reconstructed into a square image. The dataset is created by collecting the good pixel weapon images and making them ready for the creation of the dataset.

The position of the weapons will be marked in the images based on the three classes of weapons handgun, knife, and heavy gun. The coordinates for these markings will be generated for each image and stored in a text file. The classes for which the images will be marked and stored in a label file. This is used as the training dataset.

The classes used while labeling very fast inference time. It takes the entire image in a single instance and predicts the bounding box coordinates and class probabilities for these boxes. The biggest advantage of using YOLO is its superb speed its incredibly fast and can process 45 frames per second. Unlike other methods where images are scanned with a sliding window, in YOLO whole image is passed into a convolutional neural network and predicts the output in one pass.

2. Separation of the dataset into train and test data:

Once the image labeling process is completed, this complete data set is compressed into a zip file and uploaded into google drive. The dataset uploaded is then divided into 70% training data and 30% testing data and the images are separated into different folders which can be used for training the model.



3. Algorithms

YOLOv3 (You Only Look Once, Version 3) is a real-time object detection algorithm that identifies specific objects in videos, live feeds, or images. In YOLOv3, the feature extraction and object localization were unified into a single monolithic block.

Region-based Convolutional Neural Network (RCNN) is an object detection method based on visual information of images. The network first computes the region proposal (i.e. Possible locations of objects), and then it feeds the proposed regions into the CNN for classification. For each object proposal, the network does a CNN pass without sharing the computations, thus making the network slow

In order to speed up the method, a faster version of the R-CNN algorithm known as Fast R-CNN [21] was introduced. During CNN will be passed, this algorithm shares the computations when there are overlaps between the proposals, resulting in faster detection. Since the algorithm processes images by resizing them into a fixed shape, the detection time is approximately the same for all the images. It takes approximately 2 s to detect objects including the time taken to propose regions.

Schedule / Time Frame

Activity	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Gathering information about the project.											
Gather information about the algorithm and data structure.											
Synopsis Writing											
Programming											
Implementation											
Testing											
Comparison											

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