# ROAD POTHOLE DETECTION USING YOLOV4 DARKNET

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**Abstract -** *Roads are connecting lines between different places and are used in our daily life. Road's periodic maintenance keeps them safe and functional, unlike which may increase the number of accidents. Detecting and reporting the existence of potholes to responsible departments can save the roads from getting worse in turn lowering the number of accidents. Many researches proposed these type of detection through frameworks like tensorflow and keras but the real game player is darknet with yolo. Darknet is written in C programming language and is known for its speed and accuracy.*

*In this project we are using darknet along with yolov4 to detect the potholes.*

***Key Words***: Pothole, detection, darknet, yolov4

## 1. INTRODUCTION

Roads are the arteries through which the economy pulses. By linking producers to markets, workers to jobs, students to school, and the sick to hospitals, roads are vital to any development agenda. According to an article published in "World Economic Forum" Since 2002, the World Bank has constructed or rehabilitated more than 260,000 km of roads. It lends more for roads than for education, health, and social services combined.

Poorly maintained roads are a fact of life in most developing countries including India. A well maintained road network is must for the well-being and the development of the country. The transportation through road is easy, favorable, versatile and speedier. So, it is necessary to create an effective road surface monitoring system. Automated Pothole detection is used to the pothole, its dimensions and place where it is located. All these information is sent to the database and the authorities can access the data to make visualizations and know the required resources to resolve the problem. The proposed solution to the road safety and monitoring is a cost effective, time saving, simpler and very accurate process.

**Implementation Process:**

**1. System:**

**1.1 Store Dataset:**

The System stores the dataset given by the user.

**1.2 Pre-processing**

We have to resize the images, because the image size captured and fed to the model is different. We used Gaussian blur method to remove the unwanted noise from the image.

**1.3 Model Training:**

The system takes the data from the user and fed that data to the darknet yolov4 model.

**1.4 Weights Generation:**

The weights get generated after every iteration, we have to choose the best weights out of the benchmark that we have set for model training.

**2. User:**

**2.1 Upload Dataset:**

The user can load the image he/she want to work on.

**2.2 View Dataset:**

After loading the image, the User gets the chance to view the image.

**2.3 Click detect:**

After clicking on the detect the model runs with the best weights and detects the pothole.

**2.4 Result:**

If a pothole is present in the image then it gets detected with the bounding box and the co-osrdinates of the detected part of the image are showed on the left side of the image.

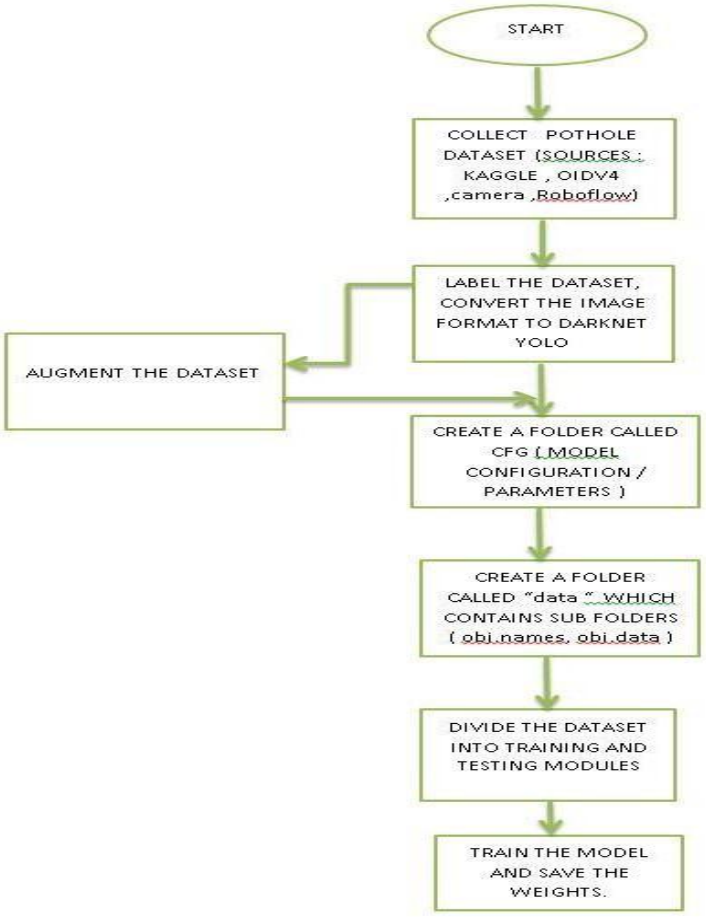



**Fig -1**: Flowchart for the execution of the project

Object detection is one of the widely used study along with deep learning, a subsidy of the computer vision that deals with detecting classes or instances such as humans, helmets, or potholes in digital images and videos.

Out of various pothole detection methods like vibration based, 3 D construction based methods we choose vision based approach as it give the result very accurate, cost and time consuming and on top of that all the process is simpler to use.

**Darknet Framework:**

Darknet is framework like tensorflow and keras, but much faster than these two in terms of object detection's speed and accuracy when combined with yolo. Its because the framework is written in C. It is open source and the documentation is simple to understand and work on.

**YOLOV4:**

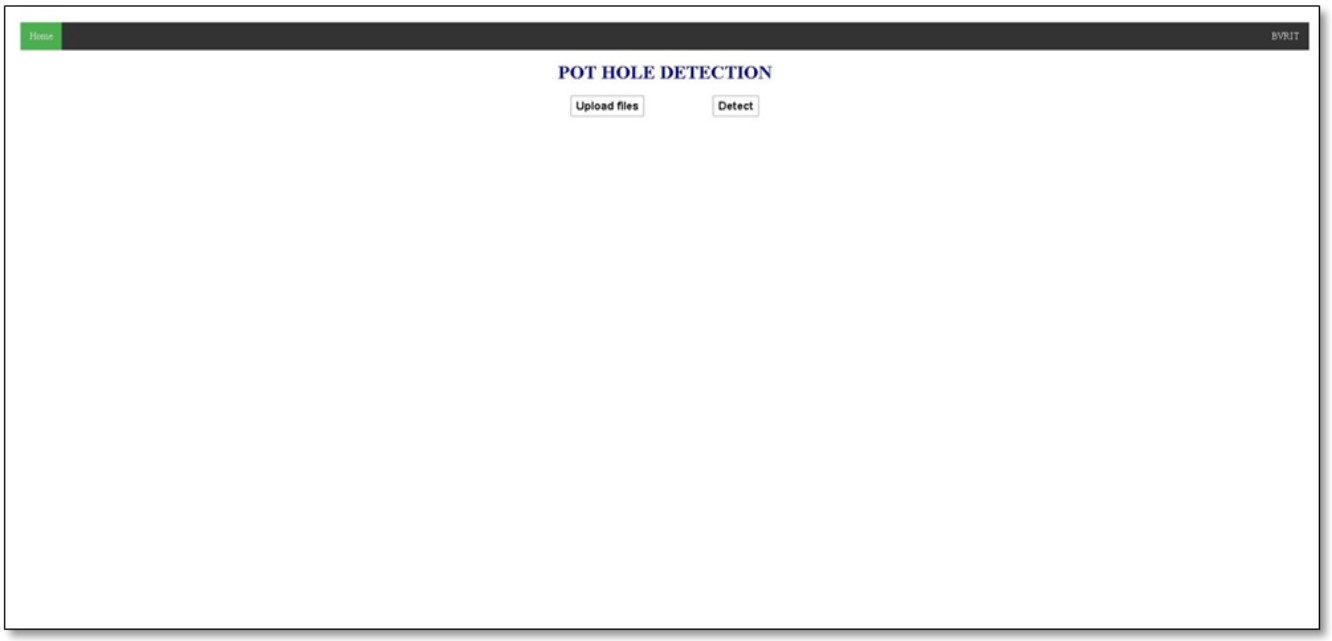
All the yolo models are object detection methods and they are trained and tested on COCO dataset which contains 80 object classes and are generalized on speed and accuracy. Here in our project we have used YOLOV4 as the object detection model as it out performs all its previous versions. The main reason being is the backbone used in Yolov4 is CSPDarknet53 which is a dense net, was designed to connect the Convolutional Neural Network (cnn) layers to elevate the vanishing gradient problem.

Yolov4 employs special features like "Bag of Freebies" and "Bag of Specials" which help in the data augmentation and improves the performances of the model.

In summary, YOLOv4 is a distillation of a large suite of techniques for object detection in computer vision. These techniques have been tested and improved to form the best real time object detector in the game, and it is lightweight and easy to use.

## 3. RESULTS

Most of the object detection tasks are measured by calculating mAP (mean average precision). mAP is the best known evaluation metric one case use in the computer vision models. The general definition for the Average Precision (AP) is finding the area under the precision-recall curve, and mAP is the average of AP.




**HOME SCREEN:**

**Fig-2:** Home Screen

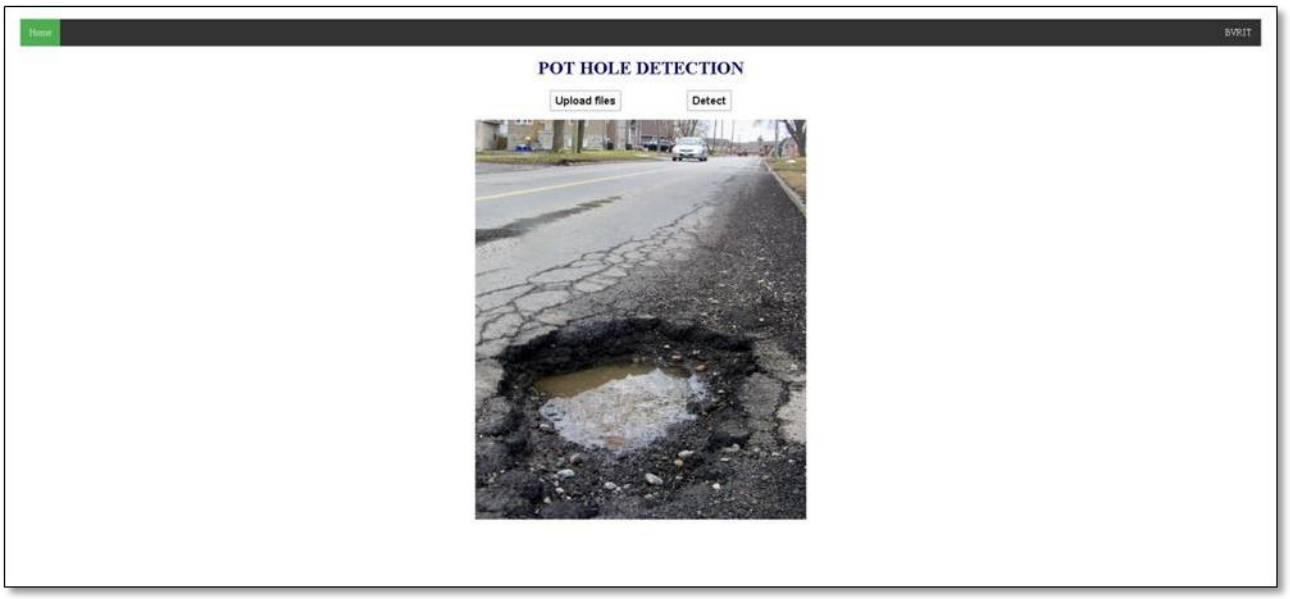
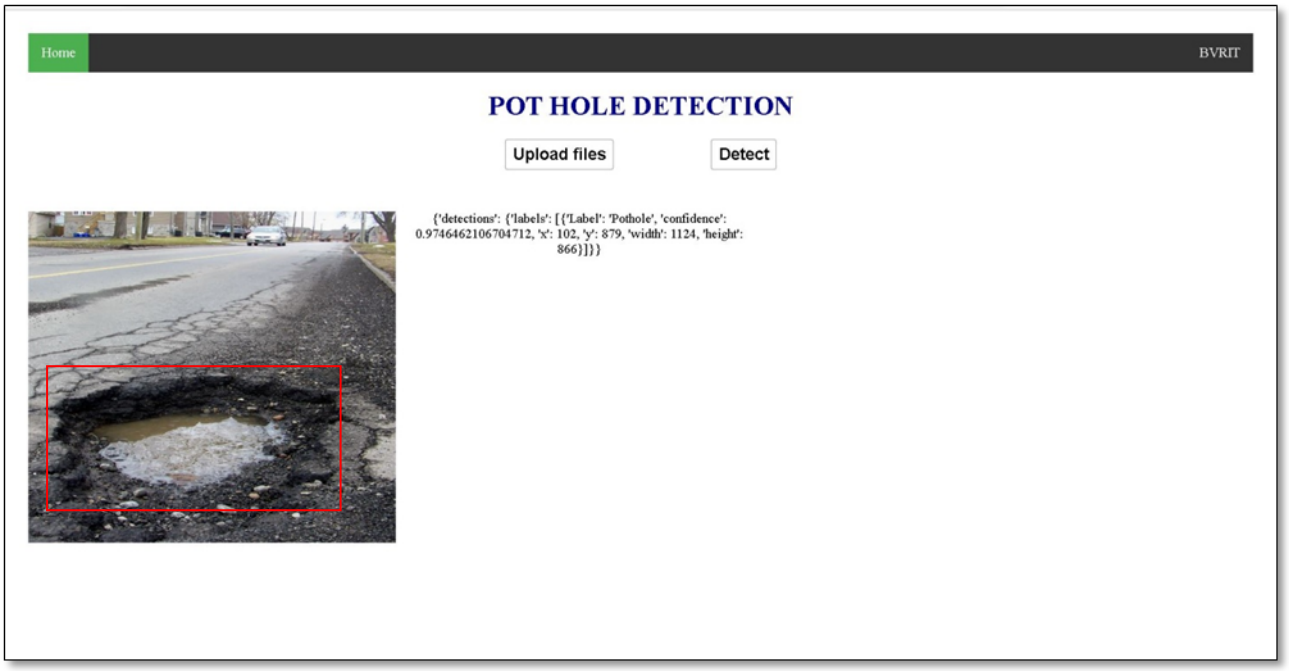



**Fig-3:** Uploading the Image




**CASE STUDY -1 :**

**Fig-4 :** Reviewing the Result

**CASE STUDY-2:**

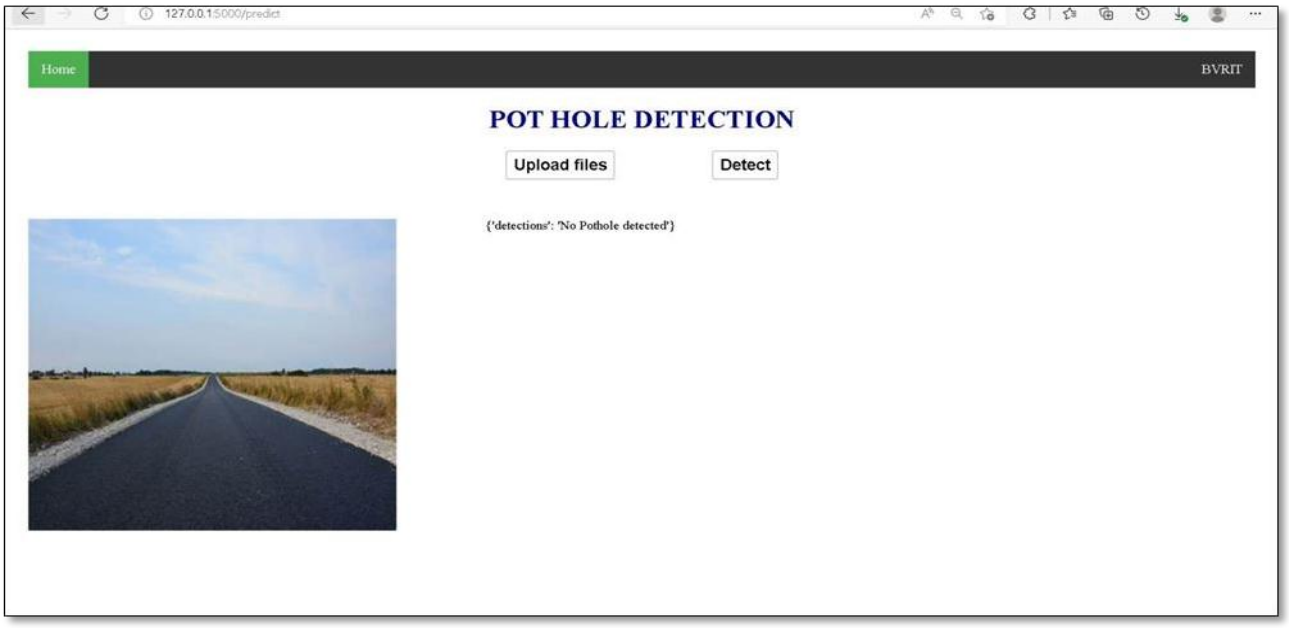



**Fig-5 :** Reviewing the Result 2

## 4. CONCLUSIONS

The work that is carried out by us in this paper helps the NHAI (National Highway Authorities of India) , the local

Governments to detect and maintain the potholes and the road surface at regulatory periods respectively. This will be a cost effective solution for the government to maintain the roads in a safer manner which in turn decreases the number of accidents and also increases the life-time of vehicles. The proposed methodology of detection using darknet and yolov4 gives better results any other object detection models.

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