

The very first step towards autonomous cars is giving cars the ability to see and identify the objects on the basis of which it can decide the steering controls and other functioning. This report discusses on the hardware aspect of the project.

Real Time Object Detection

Detection refers to identification of an object or a person by training a model by itself. Detection of images or moving objects have been highly worked upon, and has been integrated and used in commercial, residential and industrial environments. But, most of the strategies and techniques have heavy limitations in the form of computational resources, lack of proper data analysis of the measured trained data, dependence of the motion of the motion of the objects, and also there is a concern over speed of the movement and illuminances. Hence, there is a need to draft, apply and recognize new techniques of detection that tackle the existing limitations.

Objective 1: Hardware setup

Tools used: Raspberry Pi Model 3B, Pi cam, Arduino Uno, Jumper Wires

Firstly, the raspberry pi needs to be configured for communicating via Wi-Fi. Then the pi camera board attached to the Raspberry Pi via a 15-way ribbon cable. Although the connectors on the PCB and the Pi are different, they work in similar way.

Objective 2: Real time object detection

Library used: Open CV, Tensorflow

After the hardware setup, the raspberry pi should be able to detect objects in real time. This is achieved by first identifying the images and then labelling it with Open CV, on the basis of this identification Tensorflow uses its Deep Learning algorithm to measure the accuracy the object detected and the makes decision based on this accuracy.

Knowledge:

Raspberry Pi:

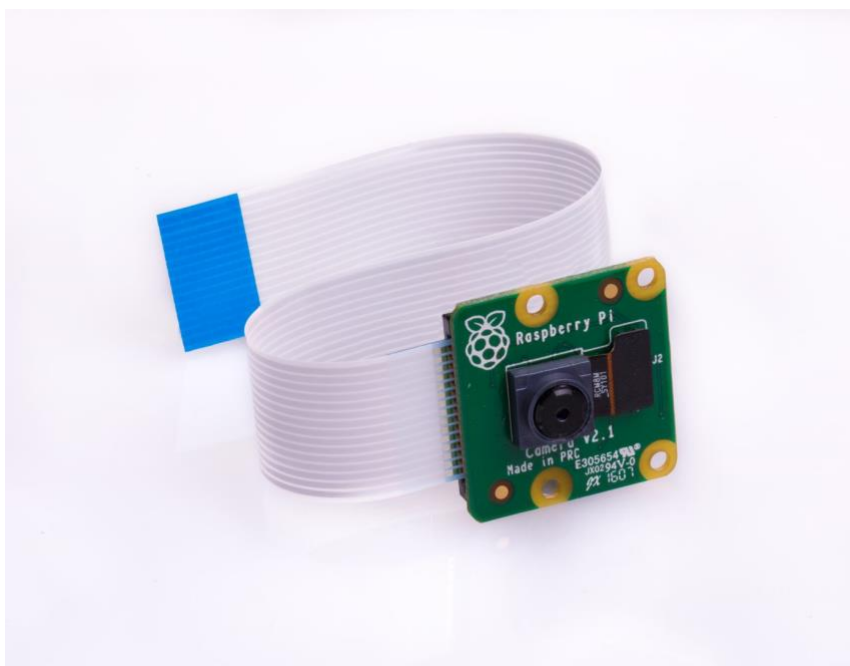
The **Raspberry Pi** is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.



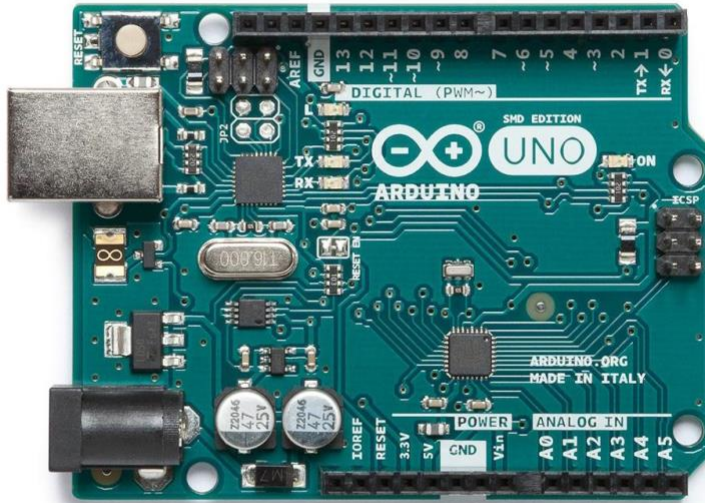
Pi Cam:

The Raspberry Pi Camera Module v2 replaced the original Camera Module in April 2016. The v2 Camera Module has a Sony IMX219 8-megapixel sensor (compared to the 5-megapixel Omni Vision OV5647 sensor of the original camera).

The Camera Module can be used to take high-definition video, as well as stills photographs. It's easy to use for beginners, but has plenty to offer advanced users if you're looking to expand your knowledge. There are lots of examples online of people using it for time-lapse, slow-motion, and other video cleverness. You can also use the libraries we bundle with the camera to create effects.



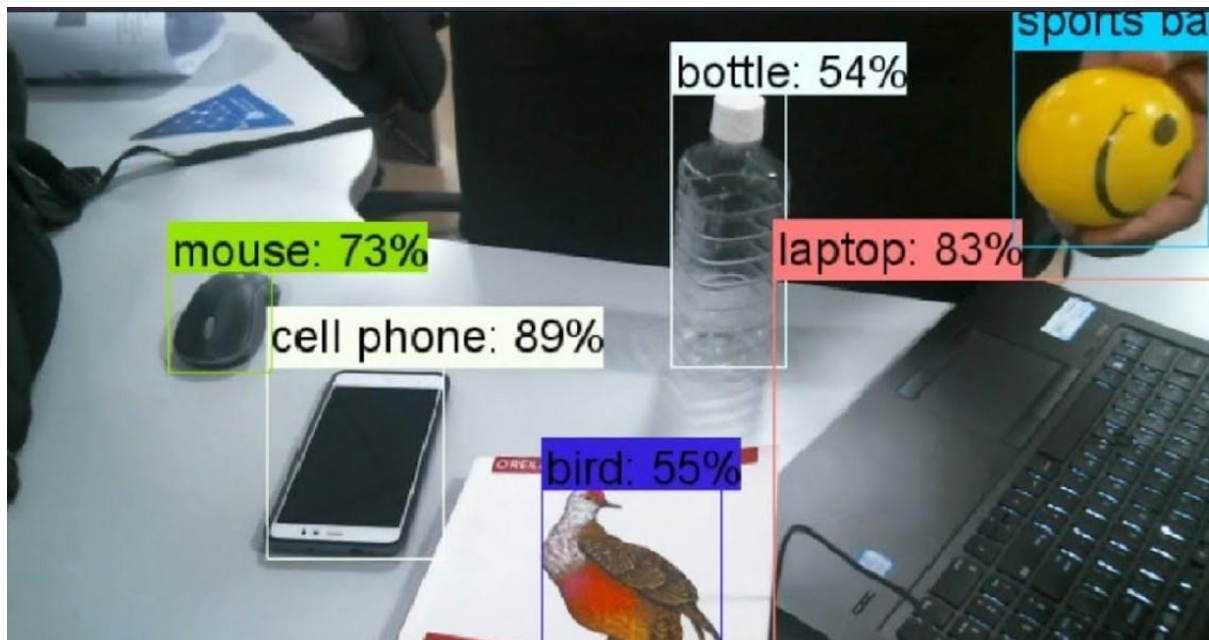
Arduino Uno:



The **Arduino UNO** is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by **Arduino.cc**. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.

Real Time Object Detection using Raspberry Pi and Pi camera:

After the complete hardware is setup and configured for wireless communications, we use the open source library provided for tensorflow object detection API.



The workflow for Deep Learning has 3 Primary Steps

1. Gathering Training Data
2. Training the model
3. Predictions on New Images

We are currently training the raw data and also working on further hardware integration of Raspberry Pi with the RC car and also controlling the motors of the RC car using the Arduino Uno.