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Object detection

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| Updates | |
| Object detection | 4/2/2018 |
| Collision Warning | 10/2/2018 |

# Object detection

Object detection is a computer technology related to computer vision and image processing that deals with detecting instances of semantic objects of a certain class (such as humans, buildings, or cars) in digital images and videos.

# Object detection Platforms

## TensorFlow

TensorFlow is an open source software library for numerical computation using data flow graphs. Nodes in the graph represent mathematical operations while the graph edges represent the multidimensional data arrays (tensors) communicated between them.

1. TensorFlow Object Detection API

Creating accurate machine learning models capable of localizing and identifying multiple objects in a single image remains a core challenge in computer vision. The TensorFlow Object Detection API is an open source framework built on top of TensorFlow that makes it easy to construct, train and deploy object detection models.

1. SSD: Single Shot MultiBox Detector in TensorFlow

SSD is an unified framework for object detection with a single network.

## YOLO: You Only Look Once

Prior detection systems repurpose classifiers or localizers to perform detection. They apply the model to an image at multiple locations and scales. High scoring regions of the image are considered detections.

YOLO uses totally different approach. It applies a single network to the full image. This network divides the image into regions and predicts bounding boxes and probabilities for each region. These bounding boxes are weighted by the predicted probabilities.

# Microcontrollers For Object Detection Approach

## NVidia Jetson TX1

* 64-bit quad-core ARM Cortex-A57
* 256-core Maxwell GPU

## NVidia Jetson TK1

* 192-core Kepler GK20a GPU

## Raspberry Pi3

* 1.2 GHz quad-core ARM Cortex A53
* 1 GB RAM
* It has also provided TensorFlow support for it.
* An active growing community and recent interest by Google makes this a real viable choice for computer vision.

## Intel Edison

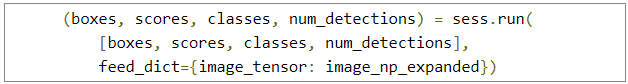
* Atom 2-core at 500 MHz
* 1 GB RAM memory
* 4 GB storage

# Raspberry Pi 3 VS Intel Edison

1. [Raspberry Pi VS Edison 1](https://www.raspberrypi.org/forums/viewtopic.php?t=146877)
2. [Raspberry Pi VS Edison 2](https://www.sparkfun.com/news/1603)

# Collision Warning

The code that actually recognizes objects and returns the information for the locations and confidence is:



So, here, we can iterate through the boxes for further analysis. Boxes are an array, inside of an array, so, to iterate through them, we need to do:



Now, for the "too close" tracking, we're interested in some specific classes. One could argue that \*any\* object that is too close is something we might want to avoid. The deal is, however, that, to determine distance, you need to know the object's size before-hand.

References

1. TensorFlow

<https://www.tensorflow.org/>

1. TensorFlow object detection API

<https://github.com/tensorflow/models/tree/master/research/object_detection>

1. SSD: Single Shot MultiBox Detector in TensorFlow

<https://arxiv.org/abs/1512.02325>

<https://github.com/balancap/SSD-Tensorflow>

1. YOLO: You Only Look Once

<https://pjreddie.com/darknet/yolo/>

1. Microcontrollers For Object Detection Approach

<https://www.learnopencv.com/embedded-computer-vision-which-device-should-you-choose/>

1. Collision Warning

<https://pythonprogramming.net/detecting-distances-self-driving-car/>