

# Object Detection Using Computer Vision

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## INTRODUCTION

Object Detection is used in an abundance of areas such as surveillance, modeling, or even video game design. In this project, methods of object detection were researched. These methods would later be applied to gesture creation. One of the most important tools for object detection is the OpenCV library. This is an open-source computer vision library with real-time functions and algorithms designed for real-time applications. The research for this project includes learning about the applications of OpenCV and how to integrate it into applications for object detection.

## OBJECTIVES

- Learn code written to construct a custom gesture
- Learn how to detect a single object in an image
- Learn how to detect multiple objects in an image

## METHODS

- Recreate Gesture functions with Unity and Visual Studio
- Develop Haar Cascades
  - Use built in OpenCV functions
  - Use third party software
- Use an API for image classification and Object Detection
- Use Python and C# for communication with the API and for testing Haar Cascade files

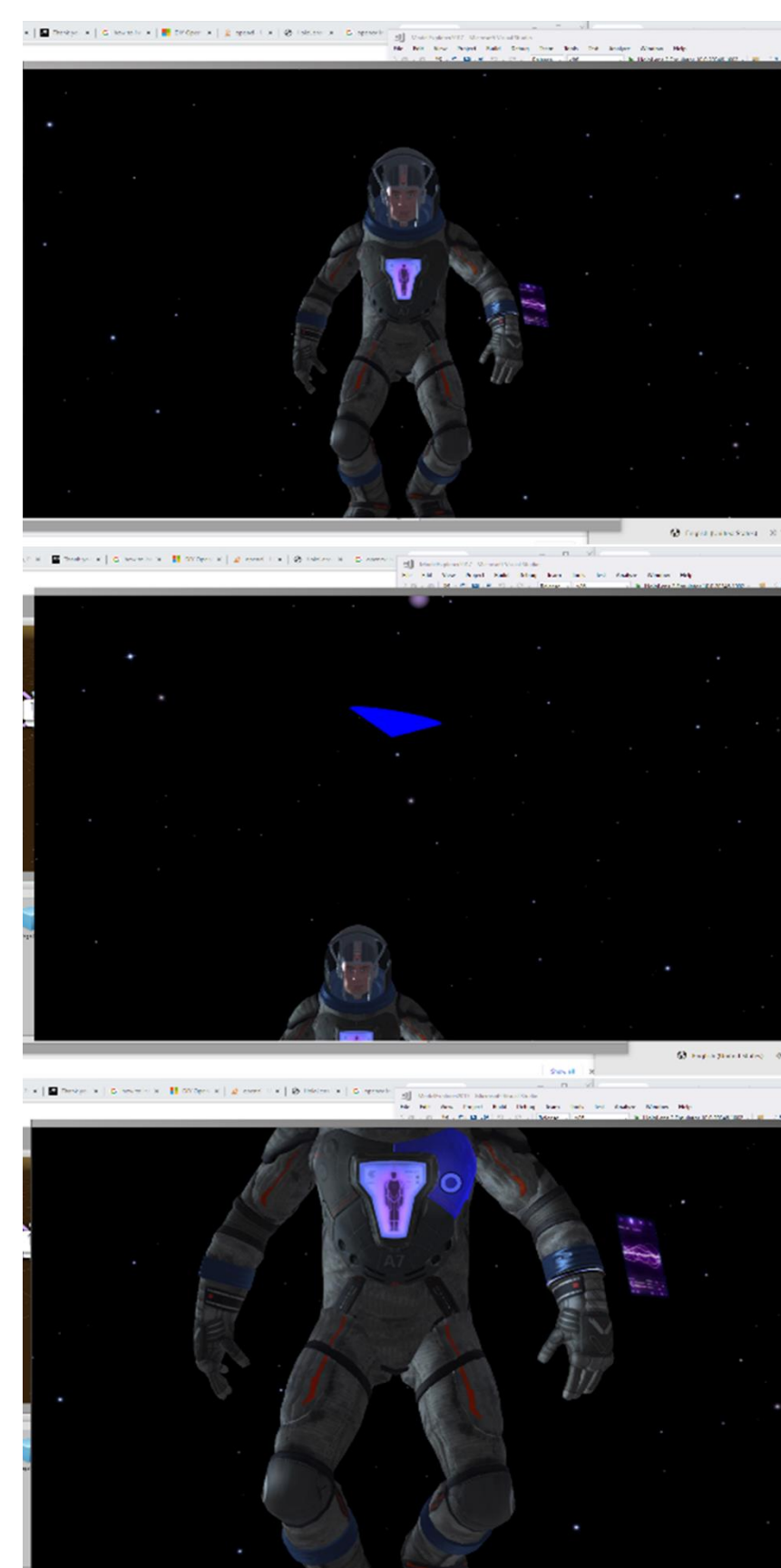


Figure 1. Cursor displaying where Astronaut is in Space

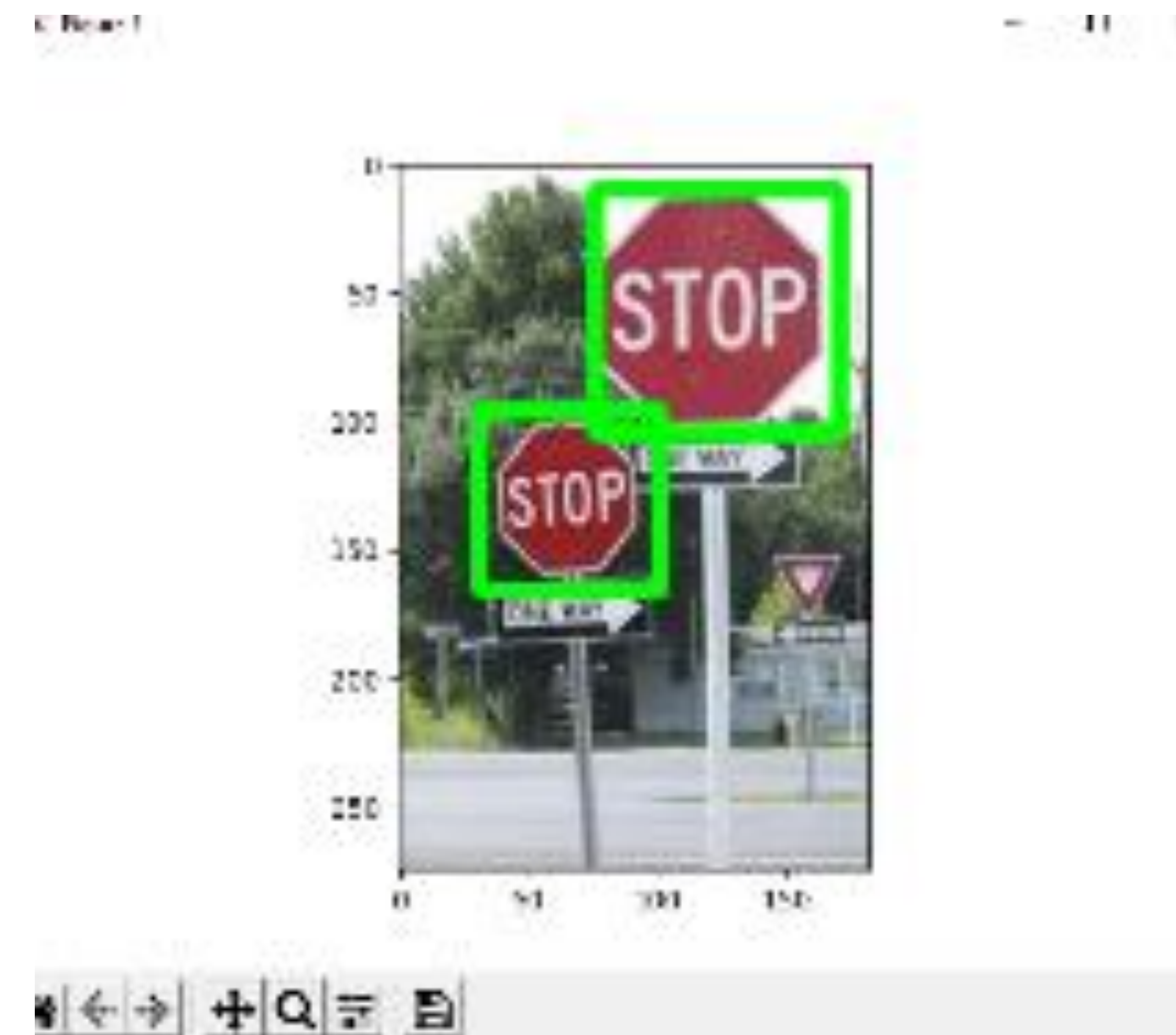


Figure 2. Detection of Stop Signs

## RESULTS

- Figure 2 is an example of using an existing Haar Cascade Classifier for Stop Signs. Haar Cascade Classifiers can detect multiple of the same object within an image
- A custom Haar Cascade Classifier was created for the detection of coffee mugs. The accuracy of the Classifier is shown in Figure 3 when this classifier is used to detect a single and multiple coffee mug object within an image
- The API gave high accuracy for detecting multiple objects in an image but there was a lot of noise. This can be seen in Figure 4. The API was able to detect the apple, banana and orange in the image with accuracy above 95% .

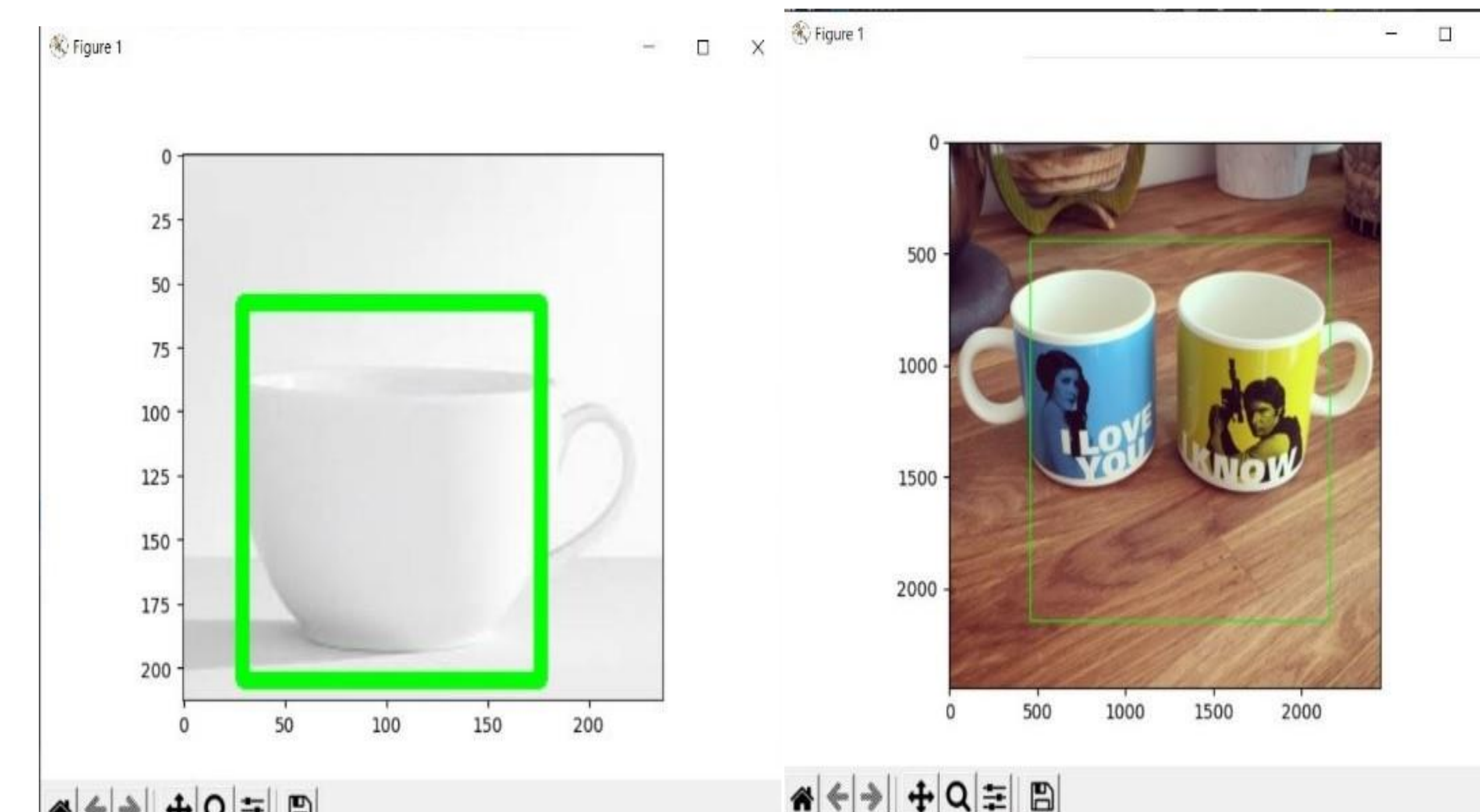


Figure 3. Detection of Coffee Mugs

## CONCLUSIONS

In conclusion, multiple methods of object detection have been explored. Haar Cascades Classifiers are good for detection of multiple of the same object but not useful for multi object detection. Researching on how to detect multiple different objects, and API was selected as the main method. This is accurate but leaves little room to change how training is done for better customization of the network.

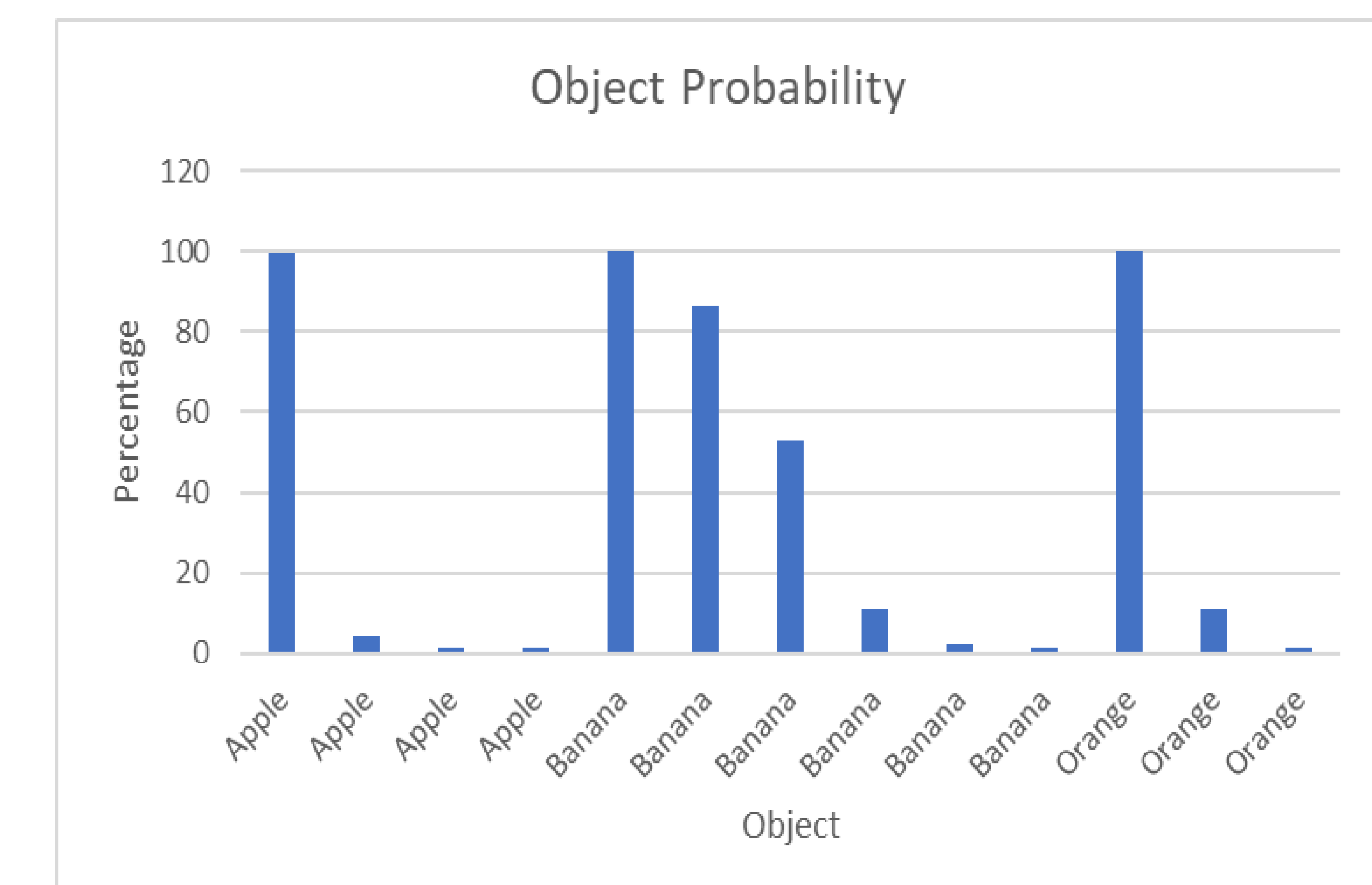


Figure 4. Multiple Object Detection, Results from API

## FUTURE WORK

Future work includes creating Computer Generated Images/Objects also known as CGI. These computer-generated objects will be placed in the same space as a real object. The goal will be to detect the real object while having the fake object in the space.

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## Acknowledgments

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