Mini Project 2: Machine Learning

Introduction

Machine Learning become more and more popular and in some aspect, it helps to achieves auto control and production in the industry. So, what is the Machine Learning? Machine Learning is a scientific study of algorithms and statistical models that computer systems use to perform a specific task without explicit instructions, relying on patterns and inference instead(Wikipedia). Generally speaking, it's like training your computer to tell a cat or dog according numbers of pictures. Here, TensorFlow, an open source library, designed by Google, can achieve many machine learning missions. The core of the TensorFlow is that it builds a connection between the codes (by users) and the computation graphs. Relying on its API, users don't have to construct their framework, which is painful and unfriendly to the beginners. TensorFlow also provides a lot of pre-trained models in the TensorFlow Detection Model Zoo (Tensorflow, 2017). According to the situation of the problems, for example, problems of computer vision, users can apply these models and have no need to build their deep neutral network from the start, which save time and make sure the accuracy and speed as well.
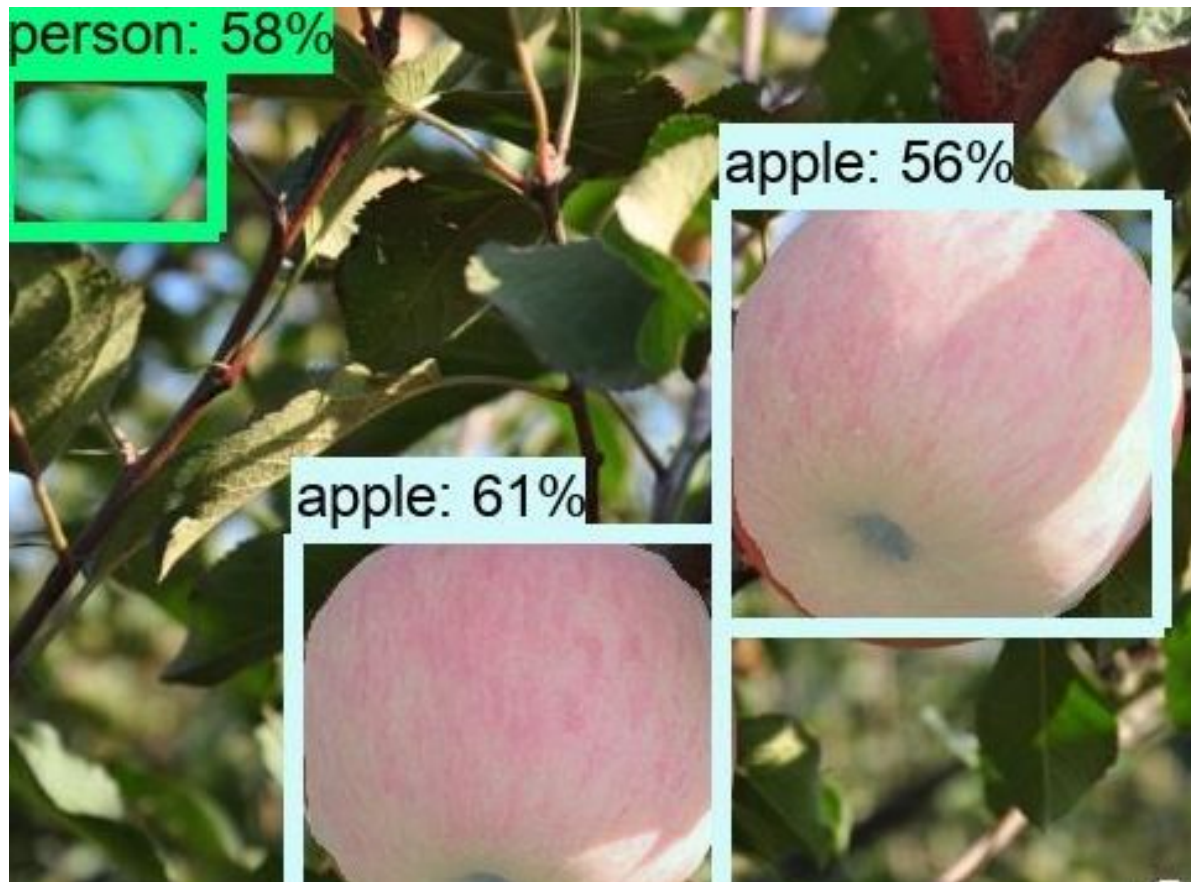
Analysis

From the Tensorflow github, instructions posted to users about setup and installation.

Here optimize the TensorFlow object detection API and "Mask R-CNN" pre-trained

model, which also generate bounding box and mask.
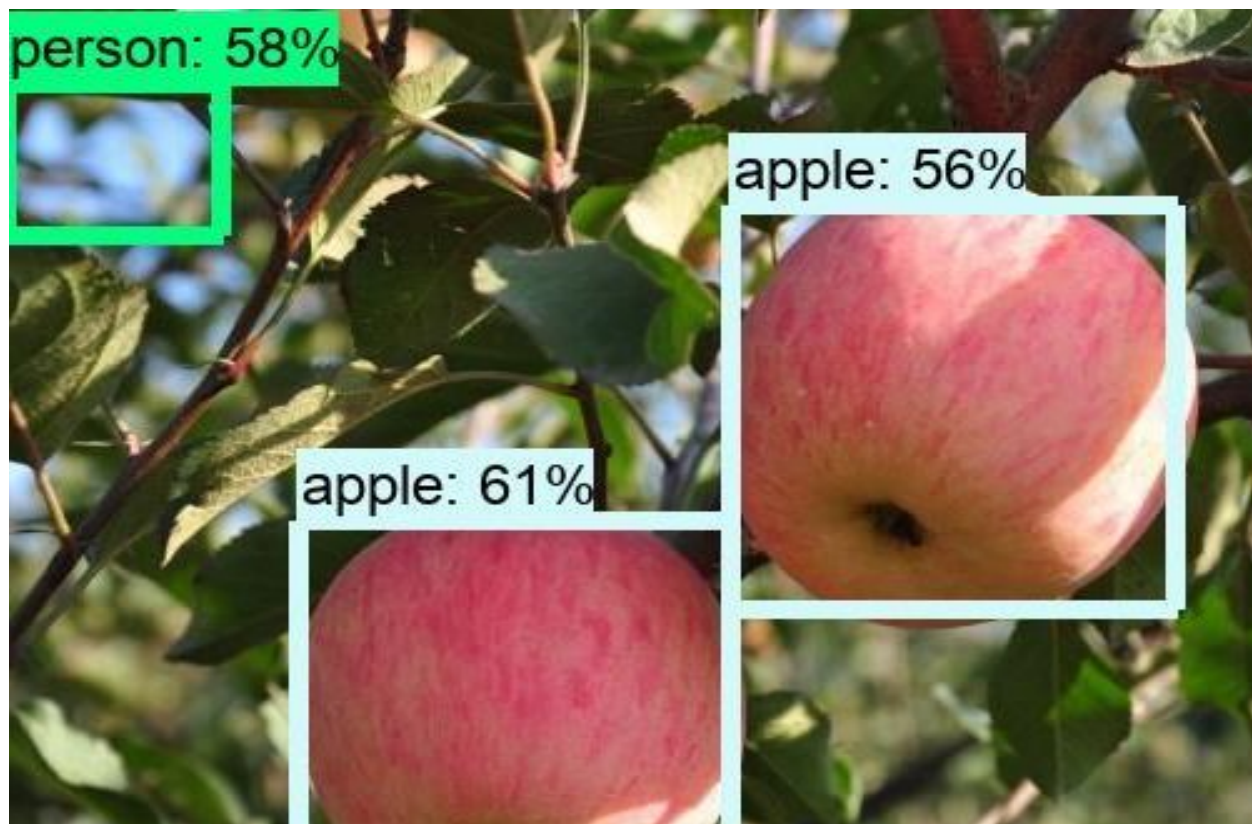
generate with bounding boxes

generate with mask

Before the Mask-RCNN, Faster-RCNN model was used to object detection. But Faster-RCNN exists the problem about feature image and the original are mis-alignment. That might affect the accuracy. So, the Mask-RCNN use the ROIAlign to replace the ROI Polling. ROI pooling is an operation widely used in object detection task using convolutional neutral network, for example, to detect multiple cars and pedestrians in a single image. Its purpose is to perform max pooling on inputs of non-uniform sizes to obtain fixed-size feature maps (e.g. 7×7) (Grel, 2017).

Pros and Cons

Pros:

1. Graphs. TensorFlow has better computational graph visualizations, which are indigenous when compare to others like Theano and Torch.

2. Library. Backed by Google, TensorFlow as an open source library, has a huge collection of dataset. Also, quick update and new release with new features.

3. Scalability. TensorFlow can be used on various hardware machines, which cover from cell devices and computers.

Cons:

1. TensorFlow support computation across GPUs and CPUs. But the TensorFlow doesn't provide GPU support on MacOS.

Recommendation

TensorFlow is a friendly tool to start Machine Learning for the beginners. Before start it, it's better have a good review about some basic concepts and definition. Have some Python basic knowledge. TensorFlow fully support Python. It's easy to run on python environment. To achieve the object detection via TensorFlow, here are some important steps need to be followed to install.

1. Install the TensorFlow. Install the TensorFlow CPU (simplest install, but also in most cases the slowest cases in the performance) or TensorFlow GPU (requirement for hardware).

2. Install the TensorFlow Models. Here to achieve the object detection, the object_detection also need to be installed manually.

3. Install dependencies (matplotlib, pillow, lxml, jupyter, opencv and cython).

4. Protobuf Installation/Compilation and add necessary environment variables.

5. Test installation.

Conclusion

It's friendly for beginners to use TensorFlow when they start to learn machine learning. Providing with a number of pre-trained models and dataset, TensorFlow can help solve some common problems about the computer vision, such as object detection. Based on the problems and choose suitable models in the TensorFlow library, it helps a lot for developers doing research or solving real-life problems.

Reference

Grel, T. (2019, June 28). Region of interest pooling explained. Retrieved from
     https://deepsense.ai/region-of-interest-pooling-explained/

Tensorflow. (2019, October 17). tensorflow/models. Retrieved from
     https://github.com/tensorflow/models/tree/master/research/object_detection.