Real-time Object Detection with Tensorflow on Amazon Cloud

Jacek Korbel

February 5, 2018

Abstract

The goal of this paper is to run Object Detection API on AWS EC2.

1 Introduction

One of the applications of Machine Learning and Deep Learning is the detection and recognition of various objects, for example cars, traffic lights in autonomous cars or cancer. These applications can also apply to the detection and recognition of, for example, wild, endangered animals. Cameras placed in forests can transmit the image to the server and applications in real time process it and recognize animal species and inform about the occurrence of a rare species to better protect it.

The purpose of the work was to create a deep learning application for detecting aurochs, which is a protected species in Poland, from videos. It was decided to use it for this purpose Object Detection API, which is a module of the Tensorflow Package. This application, whose operation is based on convolutional neural networks, allows detection of any object after the preparation and training of the model.

The computing cloud AWS was chosen as the server on which the application will run. On the server has been installed Ubuntu 16.04. The EC2 Instance has only 1CPU 2.5GHz and 1GB memory, but that was enough to run Object Detection API and to get videos from network. To train the model to detect aurochs, a better instance was needed, which allow to use GPU in computations, for example Deep Learning AMIs, which have preinstalled CUDA and Tensorflow-GPU etc.

2 Model preparation

All steps for preparation application to detect aurochs were based on the tutorial [1].

2.1 Installation Object Detection API

At the beginning was created a free charge instance. Later, the SSH connection between user's computer and instance was configured. The easiest way to install and check if the Tensorflow and Object Detection API works was installation the Anaconda package.

2.2 Jupyter Notebook Configuration

After installation a Jupyter Notebook connection was configured that allowed for simple changes in example file and displaying the results directly in the browser, which was much easier than editing files in nano editor or download the files.

2.3 Testing Object Detection API on videos

In this step, the program code has been modified to be able to detect objects straight from the video. OpenCV2 library has been used for cutting videos to images and than for converting images to video after use Object Detection API. Additionally Pafy was used to get videos from Youtube.

2.4 Data Preparation

In this step, data were prepared, which were used to train model to detect aurochs. At the beginning it was necessary to collect about 200 photos of aurochs using google images. It was very boring job because it was necessary to save every picture manually. Then it was necessary to download labelimg program to user's computer and label every downloaded picture. The label program automatically has created an XML file that describes the objects in the pictures. Then this data were splitted between train and test samples. After that files were upload to instance and TF Records from these splits were generated.

2.5 Training Custom Object Detector

In this step the configuration files of the previously trained model were modified because a semi-trained model was used to reduce the training time for the new object. The benefit of transfer learning is that training can be much quicker, and the required data that you might need is much less. After that these files and test and training files have been copied to tensorflow ->model-> object detection folder. Then it tried to start the model training, but it ended with errors. There was a problem with the Anaconda Package, so it was set to not use it at this point. Unfortunately, the problem still occurred and the model could not be trained.

It has not been able to create a aurochs detection program and has not tested AMI with the GPUs, but much has been learned about EC2 and Tensorflow.

References

[1] Object detection api tutorial. https://pythonprogramming.net/training-custom-objects-tensorflow-object-detection-api-tutorial. Accessed: 2018-02-05.