Faster R-CNN on AWS

AWS Setup

1. Login to https://aws.amazon.com with your credentials and you will be directed to the AWS Management Console page.
2. On the upper right-hand corner set your location as *Oregon* on the AWS Management Console page.
3. Go to Services, which can be found on the top menu bar, and click on EC2 from the Compute category in the drop-down menu.
4. Choose Instances from the left-side menu to start the process of launching an EC2 instance.
    a. Click on the **Launch Instance** blue button
    b. Select **Deep Learning Base AMI (Ubuntu 16.04)** as your AMI. ***Note:*** *You can select any machine of your choice that satisfies the requirements necessary to run Faster R-CNN.*
    c. Next, select **p2.xlarge GPU instance** as your instance type. ***Note:*** *You can select any GPU instance of your choice. We chose this GPU instance type due to the low cost.*
    d. No other configurations are necessary so proceed to the final page by clicking on the **Review and Launch** blue button on the bottom, right-hand corner.
    e. Click on **Launch** and a prompt will appear directing you to either create a new key pair or choose an existing key pair to access your EC2 instance from your local system.
    f. Follow the instructions on the next prompt to access your instance.

Faster R-CNN Setup

The following instructions were written by referencing the original installation guide (https://github.com/facebookresearch/detectron2/blob/master/INSTALL.md). The original installation guide shows a demo of running inference on an image using the Mask R-CNN model. For our project, we used the Faster R-CNN that was implemented with Residual Network 50 (ResNet50) as the backbone and Feature Pyramid Network (FPN) that uses 3x as its learning rate. This model can be found in Detectron2 Model Zoo (https://github.com/facebookresearch/detectron2/blob/master/MODEL_ZOO.md). If any errors result in the following the set of instructions, please refer to the original installation guide or contact us.

1. In order to install the required packages to run Faster R-CNN, we installed Anaconda to make installation of these packages easier.
2. From https://anaconda.com/distribution/, download the Anaconda version for Linux with Python 3.7 version.
3. Using the following commands, install the required packages (found in).

a. **conda install pytorch torchvision cudatoolkit=9.2 -c pytorch**
b. **sudo apt-get install python-opencv**

4. The Faster R-CNN model we will be using is from Detectron2, which is PyTorch-based modular object detection library. Execute the following set of commands in the given order to install Detectron2. ***Note:*** *If you are directly copying and pasting the commands below, you will have to delete the inverted single quotations and type it again.*
    a. **pip install 'git+https://github.com/facebookresearch/fvcore'**
    b. **pip install cython**
    c. **pip install 'git+https://github.com/cocodataset/cocoapi.git#subdirectory=PythonAPI'**
    d. **git clone https://github.com/facebookresearch/detectron2 detectron2_repo**
    e. **pip install -e detectron2_repo**
5. Now that you have installed Detectron2, you can run inference on an image using the Faster R-CNN model. Execute the following set of commands to see how Faster R-CNN performs on an image.
    a. **wget http://images.cocodataset.org/val2017/000000439715.jpg -O input.jpg**
    b. **python ~/detectron2_repo/demo.py –config-file ~/detectron2_repo/configs/COCO-Detection/faster_rcnn_R_50_FPN_3x.yaml –input input.jpg –output output.jpg –opts MODEL.WEIGHTS detectron2://COCO-Detection/faster_rcnn_R_50_FPN_3x/137849458/model_final_280758.pkl**
6. In order to view the output image with the detected objects, you can either install a GUI application of the Ubuntu machine or simply use the scp (Secure Copy) command to transfer the output image file to your local machine by executing the following command. ***Note:*** *You will have to replace the text within <>.*
    a. **scp -i ~/.ssh/<*.pem file name*> ubuntu@<*ip-address of your EC2 Instance*>:~/output.jpg ~/<*path-to-directory-you-want-to-store-file*>**
7. Once you open output.jpg on your machine, you should see the following image with detected objects.