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Robotics Nanodegree Deep Learning Project- Follow Me

Project Description

The project focuses on using a fully convolutional network (FCN) to perform semantic segmentation. The project uses data from the quadcopter simulation where humans and a hero are spawned. The quadcopter patrols on a path and captures various images. The network then uses these images to segment each image into one of three categories: person, hero, or background. The quadcopter can use this data to follow to hero in real time in the simulation.

The Fully Convolutional Network

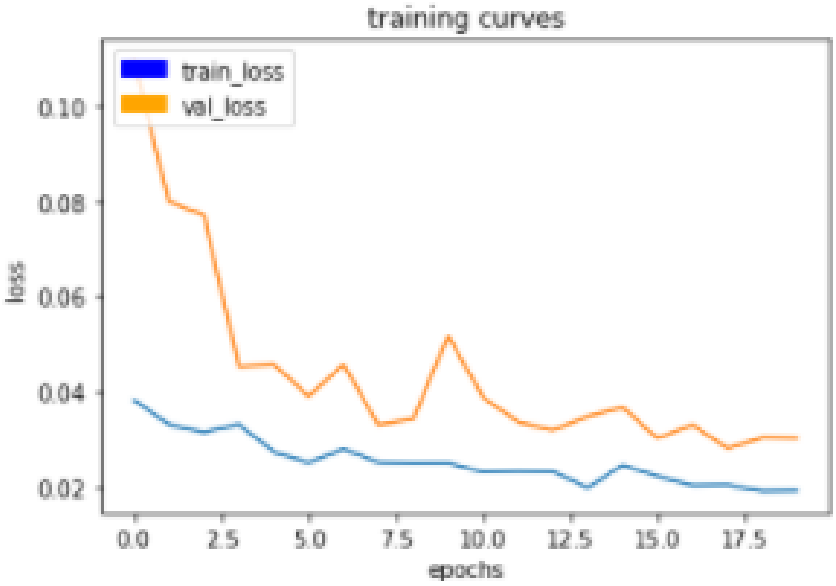
The FCN uses separable convolution layers to improve model performance and decrease processing time. The input layer uses ReLU to accelerate the convergence of stochastic gradient descent inexpensively. The network uses three encoder blocks of size 32, 32, and 64 with strides = 2. The 1x1 convolution layer is of size 64 with strides = 1. The decoder blocks are sized 64, 64, and 32. Training the model is computationally intensive, so the AWS cloud computing service was used with the px2.large.

Hyperparameters

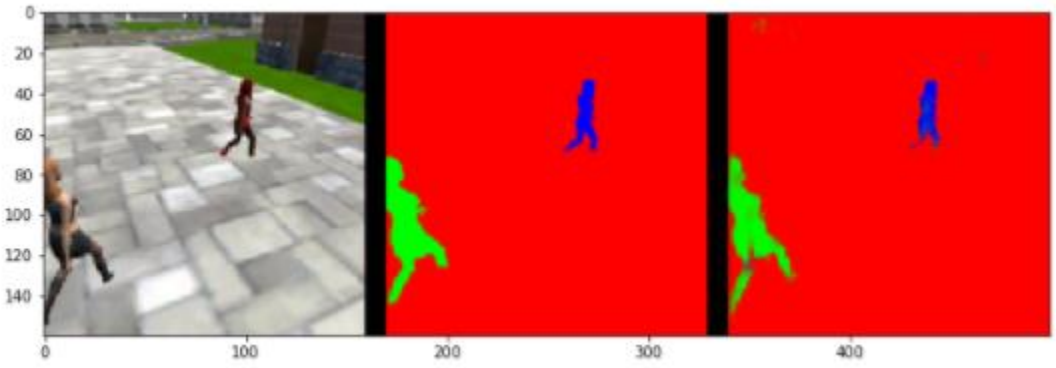
The hyperparameters used for this model are:

```
learning_rate = 0.005
batch_size = 64
num_epochs = 20
steps_per_epoch = 50
validation_steps = 50
workers = 2
```

The network training curves are used to minimize training and validation loss. Increasing the steps per epoch or the number of epochs was shown to improve the performance of the model. The final training curve resulted in a training loss of 0.0191 and a validation loss of 0.0301.



The model then performed semantic segmentation on images to predict objects in the simulation. The performance of the predications was based on the Intersection over Union (IoU) method. The IoU score was 0.557 for this model. The final score includes the weights based on false positive and negatives and true positives and negatives. The final score of the model is 0.414.



References

http://cs231n.github.io/neural-networks-1/

https://www.pyimagesearch.com/2016/11/07/intersection-over-union-iou-for-object-detection/