

Image Rotation Detection

When viewing old family photos there are periodically images rotated at a 90, 180 or 270 degrees depending on the angle the camera was held. This causes issues while viewing or editing images. This project aims to fix that issue for the common user.

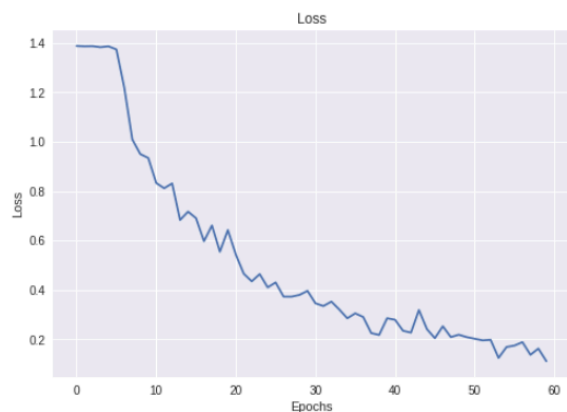
Using a classifier with 4 classes [0,1,2,3] indicating 0, 90, 180 or 270 degrees respectively, an alexnet was trained on the mnist dataset to identify the rotation of the images. After automatically rotating the images to a random angle as described above, the images are fed into the network, the network then spits out a 4 dimensional array for classifying the rotation class. Cross entropy is then used to calculate the difference of the output and the class it should be. Using the limited resources of Colab, the model was able to be trained on the mnist dataset with good accuracy. Given success of the alexnet on the mnsit dataset, training with the ImageNet dataset provided the network with the ability to detect scenes with objects and people generalizing the network. Training the network on the images with more variety gave the network more of a challenge to identify the images based on rotation, but given the large set of images the network was able to be optimized to a loss of nearly 0 with the ImageNet. Given the empirical results in the below images there is some concern for over fitting as all of the 5 images images given to the network were returned with the incorrect angle.

With more time and repeated training of the model, given the success of the mnist dataset we can predict an accurate model on generalized images with high confidence. The Samsung R&D Institute in Bangalore, India produced the paper “DETECTING CANONICAL ORIENTATION OF IMAGES USING CONVOLUTIONAL NEURAL NETWORKS” outlining this structure of attacking the image rotation detection problem. They experienced state of the art

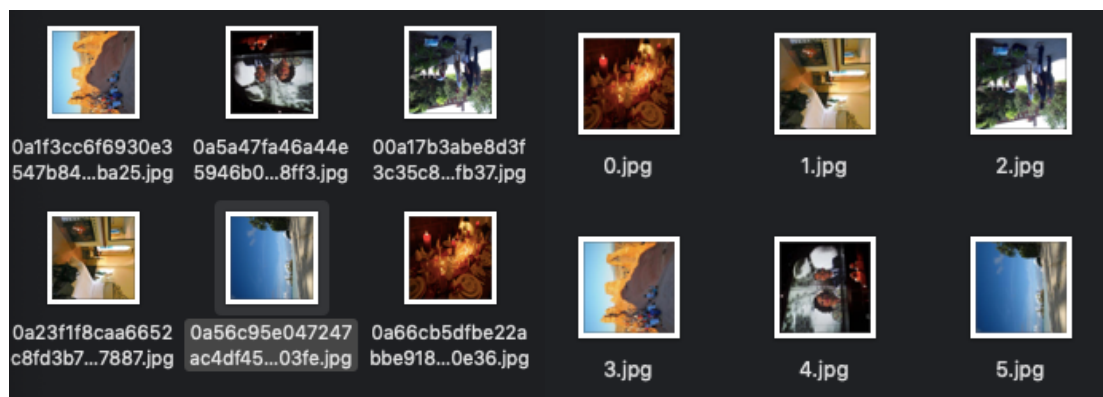
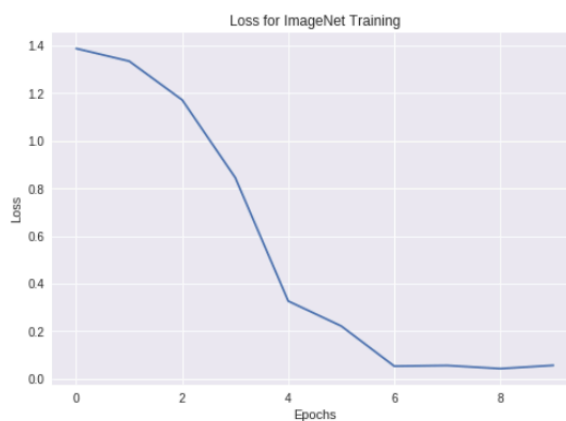
Cody Kesler
CS 501R

results training this network design on the MIT Places dataset. This, for the time being, shows the effectiveness and the superiority of Deep Learning vs other machine learning models.

Loss for the Nmist Dataset Training



Loss for ImageNet Training



Original images rotated manually

Images rotated by the angle outputted by the network

As made evident by the images the network incorrectly labels the rotated image as it didn't rotate them at all.