Writeup

Project Overview

In our project, we write a function to apply a kernel to an image, and then In this project, i generated a dataset by pasting images on to various background with different textures. I then trained a CNN to classify the images based on the shapes that were pasts onto the image.

Implementation Detail

0.1 Pre-Processing

The images for the dataset come from the Cal Tech 101 Silhouettes data set. From this dataset, I selected four shapes to use for our model. We used the anchor, the ceiling fan, the crab, and the scorpion. I chose these shapes because they all had a similar structure and would still be a tough task. There were other possible subsets of shapes that looked nothing like each other that would have been too easy for the model. Once I got all the shapes I wanted to use, I created a data set of the images by pasting the shapes in a random location on one of the background textures I generated. The background textures are randomly chosen to be one of the eight I made. These include gradients, stripe patters with horizontal and vertical lines, chess board pattern, a triangle tiling pattern, along with random noise and a white background. The same thing is done with the validation and test data sets.

Figure 1: A scorpion on top of the checkered triangle background

Figure 2: An anchor shape on top of a gradient background

Figure 3: A ceiling fan shape on top of a striped background

Figure 4: A crab shape on top of the random noise background

0.2 Neural Network

I made a CNN for the classifier network. The CNN has 3 layers of convolution and relu, max pooling, and batch normalization, followed by a fully connected classifier layer.

Result

After testing the model, it usually ends up with around an $85 - 80\%$ accuracy.