Progress Report

IEORE 4742 Deep Learning for OR and FE

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Problem Statement

To train a Generative Adversarial Network with regularization parameter between layers so that the model learns to generate images with connected components.

Work done

We have come up with various training paradigms to add regularization parameters at different levels in the generator architecture. We experimented with regularization at every layer, regularization at alternate layers and regularization at just the final layer. The function that we used as the regularization parameter is as follows.

```
layer_n = tf.nn.sigmoid(layer_n-1)
layer_n = tf.clip_by_value(layer_n, clip_value_min = 0.5,
   clip_value_max=1)
layer_n = 1 - layer_n
```

The architecture consists of five convolution layers in both the generator and the discriminator. When we were regularization at every layer the model was not able to learn anything and generated garbage images. This was because we were being to aggressive in our regularization strategy. The image generated from the network with regularization at every layer are shown below.

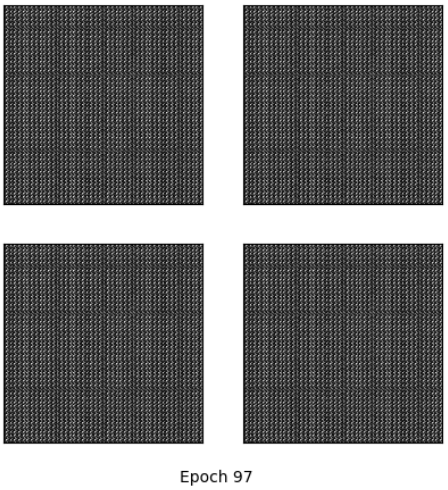

Figure 1: Regularization at every layer

We then tried adding the regularization parameter at every other layer. The images generated by the network after training are shown below.

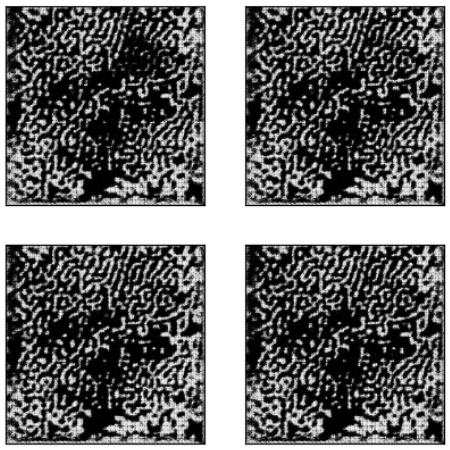

Figure 2: Regularization at every other layer

The images that have been generated are able to capture some structure in the sense that they contain a few connected components. But there are still a few black dots in the connected components. We also tried to add regularization parameter at only the last layer. The images generated by the trained network are shown below.

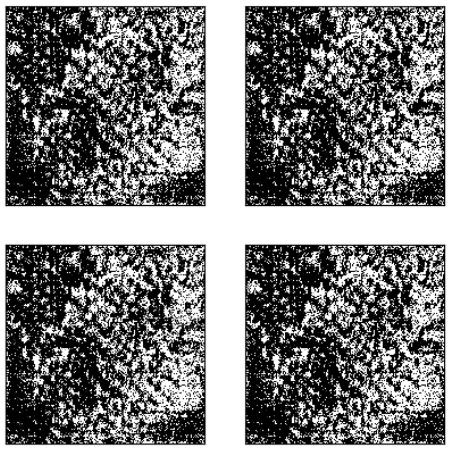

Figure 3: Regularization at only the last layer

The images generated by the network with regularization at only the last layer are worse than the images generated by the network with regularization at every other layer.

We are now working on designing new regularization function that will be able to better capture the complexity of the images.