Experiment :

1. **Activation function experiment**

try different activation functions, replace ReLU with LeakyReLU, and try different slope

Figure 2 shows the pictures generated by the model with ReLU and the model with LeakyReLU, Figure 3 shows the loss of the two models. From these two figures we can see that the model with LeakyReLU performs better.

Figure 3 shows that for the model with LeakyReLU, the loss of discriminator and generator are closer, which can help the training of the discriminator and generator.

We also tried different slope for LeakyReLU, Figure 4 shows the loss of both Generator and Discriminator with different slope values.

Figure2, Figure3, Figure4 是overleaf中对应图片，之后同理

1. **ablation study**

**2.1 ablation study for batchnorm**

Figure 5 shows the pictures generated by the two models, figure 6 shows the loss of the two models. From these two figures we can see that the performance of the model with batchnorm is better and its loss is smaller.

Reason : Batch Normalization can reduce the dependence of gradients on the scale of the parameters or their initial values, regularize the model and reduce the need for dropout, photometric distortions, local response normalization and other regularization techniques.

**2.2 ablation study for dropout**

Figure 7 and Figure 8 show the result of the ablation study of dropout.The result shows that the model without dropout performs better.

Reason : Dropout is generally less effective when regularizing convolutional layers, the reason is that convolutional layers have few parameters, so they initially require fewer regularization operations. Besides, due to the spatial relationship of feature maps, activation values can become highly correlated, which makes Dropout ineffective.

We also tested different dropout values and found that the DCGAN model can achieve better performance with smaller dropout value. Figure 9 shows the pictures generated by the model with different dropout values and Figure 10 shows the loss of the models with different dropout values.