神经网络 期末作业三 实验报告

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声明

作业中使用了李宏毅ML20的baseline，并参照了wgan-pytorch的实现。

任务一

网络结构

Generator

```
----------------------------------------------------------------
        Layer (type)               Output Shape         Param #
================================================================
            Linear-1                 [-1, 8192]         819,200
       BatchNorm1d-2                 [-1, 8192]          16,384
              ReLU-3                 [-1, 8192]               0
   ConvTranspose2d-4             [-1, 256, 8, 8]      3,276,800
       BatchNorm2d-5             [-1, 256, 8, 8]            512
              ReLU-6             [-1, 256, 8, 8]              0
   ConvTranspose2d-7           [-1, 128, 16, 16]        819,200
       BatchNorm2d-8           [-1, 128, 16, 16]            256
              ReLU-9           [-1, 128, 16, 16]              0
  ConvTranspose2d-10            [-1, 64, 32, 32]        204,800
      BatchNorm2d-11            [-1, 64, 32, 32]            128
             ReLU-12            [-1, 64, 32, 32]              0
  ConvTranspose2d-13             [-1, 3, 64, 64]          4,803
             Tanh-14             [-1, 3, 64, 64]              0
================================================================
Total params: 5,142,083
Trainable params: 5,142,083
Non-trainable params: 0
----------------------------------------------------------------
Input size (MB): 0.00
Forward/backward pass size (MB): 3.00
```

```
Params size (MB): 19.62
Estimated Total Size (MB): 22.62
----------------------------------------------------------------
```

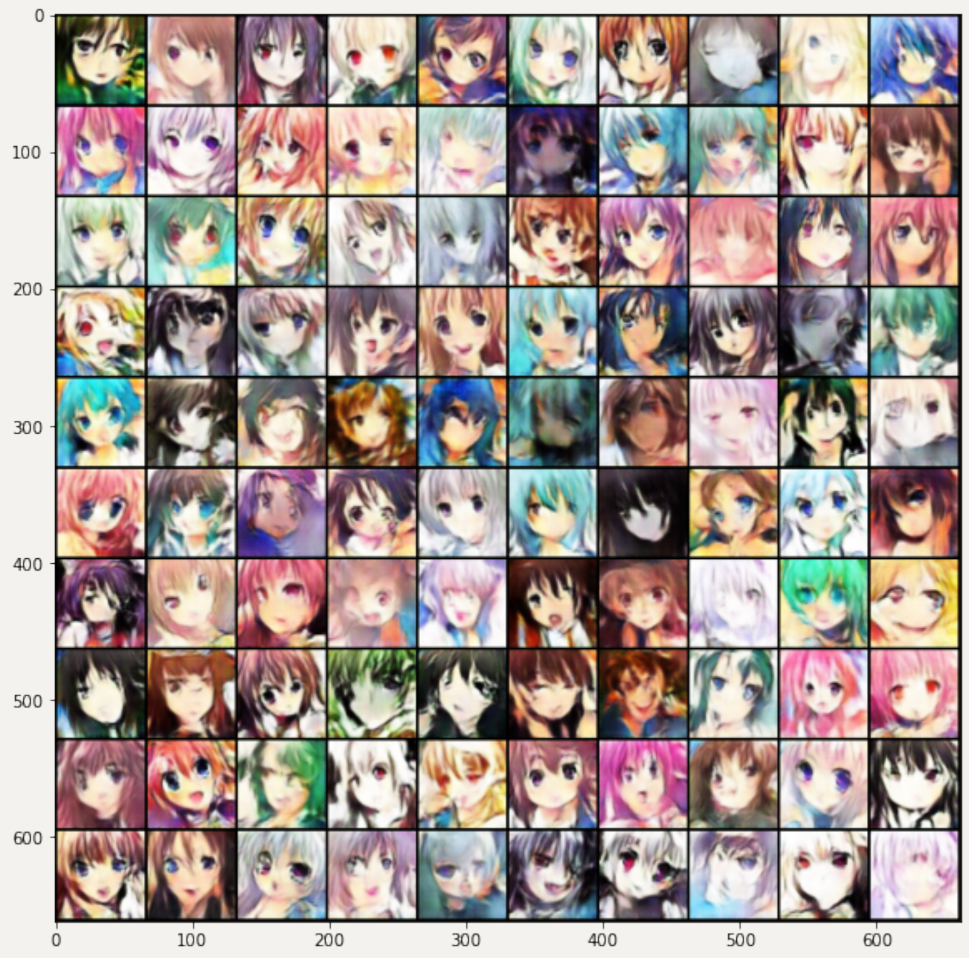
Discriminator

```
----------------------------------------------------------------
        Layer (type)               Output Shape         Param #
================================================================
            Conv2d-1           [-1, 64, 32, 32]           4,864
         LeakyReLU-2           [-1, 64, 32, 32]               0
            Conv2d-3          [-1, 128, 16, 16]         204,928
       BatchNorm2d-4          [-1, 128, 16, 16]             256
         LeakyReLU-5          [-1, 128, 16, 16]               0
            Conv2d-6            [-1, 256, 8, 8]         819,456
       BatchNorm2d-7            [-1, 256, 8, 8]             512
         LeakyReLU-8            [-1, 256, 8, 8]               0
            Conv2d-9            [-1, 512, 4, 4]       3,277,312
      BatchNorm2d-10            [-1, 512, 4, 4]           1,024
        LeakyReLU-11            [-1, 512, 4, 4]               0
           Conv2d-12              [-1, 1, 1, 1]           8,193
          Sigmoid-13              [-1, 1, 1, 1]               0
================================================================
Total params: 4,316,545
Trainable params: 4,316,545
Non-trainable params: 0
----------------------------------------------------------------
Input size (MB): 0.05
Forward/backward pass size (MB): 2.31
Params size (MB): 16.47
Estimated Total Size (MB): 18.83
----------------------------------------------------------------
```

超参数

batch size = 64, epoch = 51, optimizer = Adam(lr=1e-4, betas=(0.5,0.999))

结果



任务二

网络结构

Generator

```
--------------------------------------------------------------
        Layer (type)               Output Shape         Param #
==============================================================
            Linear-1                 [-1, 6400]         646,400
       BatchNorm2d-2            [-1, 256, 5, 5]             512
              ReLU-3            [-1, 256, 5, 5]               0
   ConvTranspose2d-4            [-1, 256, 9, 9]         590,080
       BatchNorm2d-5            [-1, 256, 9, 9]             512
              ReLU-6            [-1, 256, 9, 9]               0
   ConvTranspose2d-7            [-1, 256, 9, 9]         590,080
       BatchNorm2d-8            [-1, 256, 9, 9]             512
```

```
           ReLU-9     [-1, 256, 9, 9]             0
ConvTranspose2d-10   [-1, 256, 17, 17]      590,080
    BatchNorm2d-11   [-1, 256, 17, 17]          512
           ReLU-12   [-1, 256, 17, 17]            0
ConvTranspose2d-13   [-1, 256, 17, 17]      590,080
    BatchNorm2d-14   [-1, 256, 17, 17]          512
           ReLU-15   [-1, 256, 17, 17]            0
ConvTranspose2d-16   [-1, 128, 33, 33]      295,040
    BatchNorm2d-17   [-1, 128, 33, 33]          256
           ReLU-18   [-1, 128, 33, 33]            0
ConvTranspose2d-19    [-1, 64, 64, 64]       73,792
    BatchNorm2d-20    [-1, 64, 64, 64]          128
           ReLU-21    [-1, 64, 64, 64]            0
ConvTranspose2d-22     [-1, 3, 64, 64]        1,731
           Tanh-23     [-1, 3, 64, 64]            0
====================================================
Total params: 3,380,227
Trainable params: 3,380,227
Non-trainable params: 0
----------------------------------------------------
Input size (MB): 0.00
Forward/backward pass size (MB): 13.86
Params size (MB): 12.89
Estimated Total Size (MB): 26.76
----------------------------------------------------
```

Discriminator

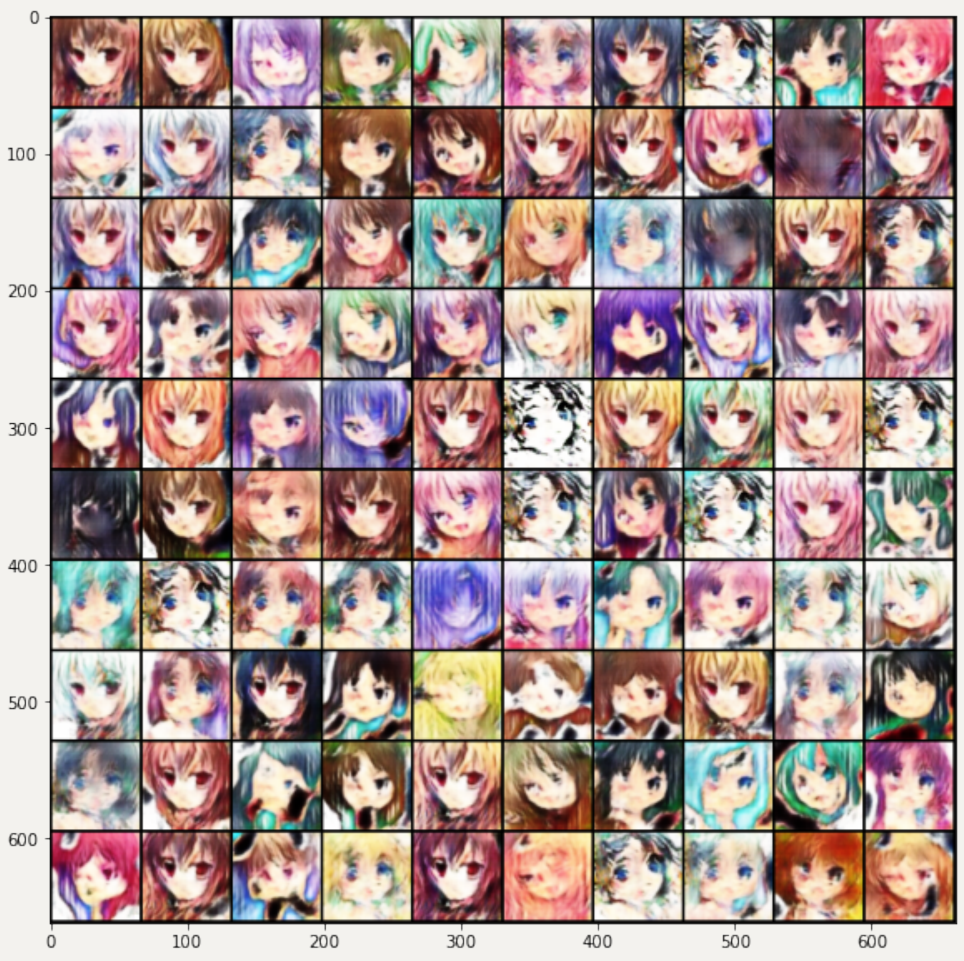
```
----------------------------------------------------
    Layer (type)         Output Shape       Param #
====================================================
        Conv2d-1     [-1, 64, 32, 32]         4,864
     LeakyReLU-2     [-1, 64, 32, 32]             0
        Conv2d-3    [-1, 128, 16, 16]       204,928
   BatchNorm2d-4    [-1, 128, 16, 16]           256
     LeakyReLU-5    [-1, 128, 16, 16]             0
     Dropout2d-6    [-1, 128, 16, 16]             0
        Conv2d-7      [-1, 256, 8, 8]       819,456
   BatchNorm2d-8      [-1, 256, 8, 8]           512
     LeakyReLU-9      [-1, 256, 8, 8]             0
    Dropout2d-10      [-1, 256, 8, 8]             0
       Conv2d-11      [-1, 512, 4, 4]     3,277,312
  BatchNorm2d-12      [-1, 512, 4, 4]         1,024
```

```
    LeakyReLU-13      [-1, 512, 4, 4]             0
    Dropout2d-14      [-1, 512, 4, 4]             0
       Linear-15              [-1, 1]         8,193
================================================================
Total params: 4,316,545
Trainable params: 4,316,545
Non-trainable params: 0
----------------------------------------------------------------
Input size (MB): 0.05
Forward/backward pass size (MB): 2.75
Params size (MB): 16.47
Estimated Total Size (MB): 19.26
----------------------------------------------------------------
```

超参数

batch size = 32, epoch = 51, optimizer = SGD(lr=1e-4)

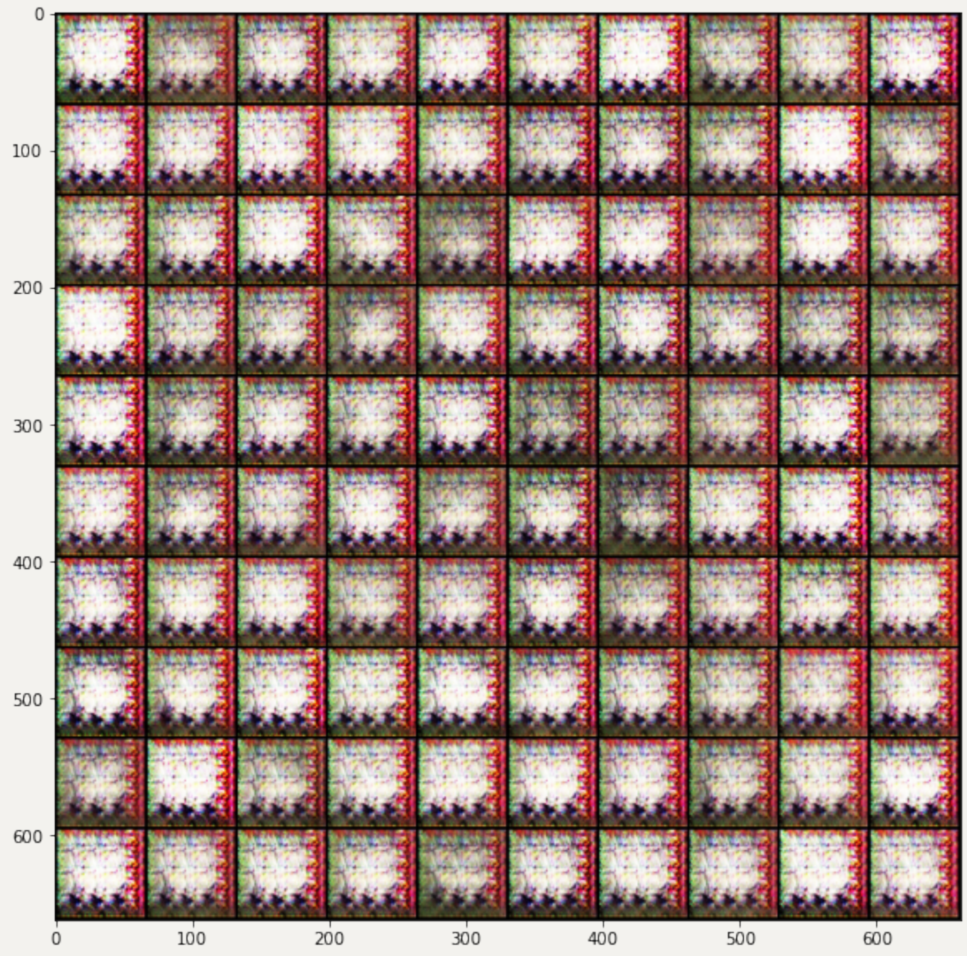
结果



总结

由图可见，DCGAN并未取得较baseline(WGAN)更好的结果，但是baseline训练极为不稳定，甚至出现如下图所示的状况，此为任务一中所展示图的下一个epoch的结果。

由于计算负载较高，所以WGAN将batch折半为32，相比baseline，WGAN一切设定从简，例如去掉了所有sigmoid，将Adam换回SGD，但结果上的确增加了稳定性。鄙人认为DCGAN在51epoch后还能有较大提升。


0
100
200
300
400
500
600
0
100
200
300
400
500
600