

HW7

Yen Wen Lu

UIN: 668611021

NetId: ywlu2

I implemented 196 features and trained for 100 epochs, when training the discriminator without generator. While training a discriminator with generator, I implemented 196 features and trained for 200 epochs.

In the “HW7\_code” folder, “perturb\_real\_images.py” is for perturb real images. “syn\_max\_classification.py” is for Synthetic Images Maximizing Classification Output. “syn\_max\_varlayer.py” and “syn\_max\_varlayer\_8.py” are for Synthetic Features Maximizing Features at Various Layers.

Test accuracy for the two discriminators:

1. Test accuracy (Discriminator without Generator): 85.41337025316456

```
| test_accu: 85.41337025316456
```

2. Test accuracy (Discriminator with Generator): 84.15743670886076

```
| epoch: 199   batch_idx: 0   loss1 0.05 loss2 -3.57 loss3 -3.13 loss4 0.43 loss5 0.12 acc1 82.03
| epoch: 199   batch_idx: 50   loss1 0.06 loss2 -2.74 loss3 -2.27 loss4 0.30 loss5 0.07 acc1 89.23
| epoch: 199   batch_idx: 100   loss1 0.06 loss2 -2.58 loss3 -2.13 loss4 0.30 loss5 0.07 acc1 89.42
| epoch: 199   batch_idx: 150   loss1 0.06 loss2 -2.59 loss3 -2.13 loss4 0.31 loss5 0.07 acc1 88.97
| epoch: 199   batch_idx: 200   loss1 0.06 loss2 -2.57 loss3 -2.12 loss4 0.31 loss5 0.07 acc1 88.98
| epoch: 199   batch_idx: 250   loss1 0.07 loss2 -2.55 loss3 -2.09 loss4 0.31 loss5 0.07 acc1 88.98
| epoch: 199   batch_idx: 300   loss1 0.07 loss2 -2.54 loss3 -2.08 loss4 0.31 loss5 0.07 acc1 88.97
| epoch: 199   batch_idx: 350   loss1 0.07 loss2 -2.54 loss3 -2.09 loss4 0.31 loss5 0.07 acc1 89.00
| Testing 84.15743670886076 69991.78903269768
```

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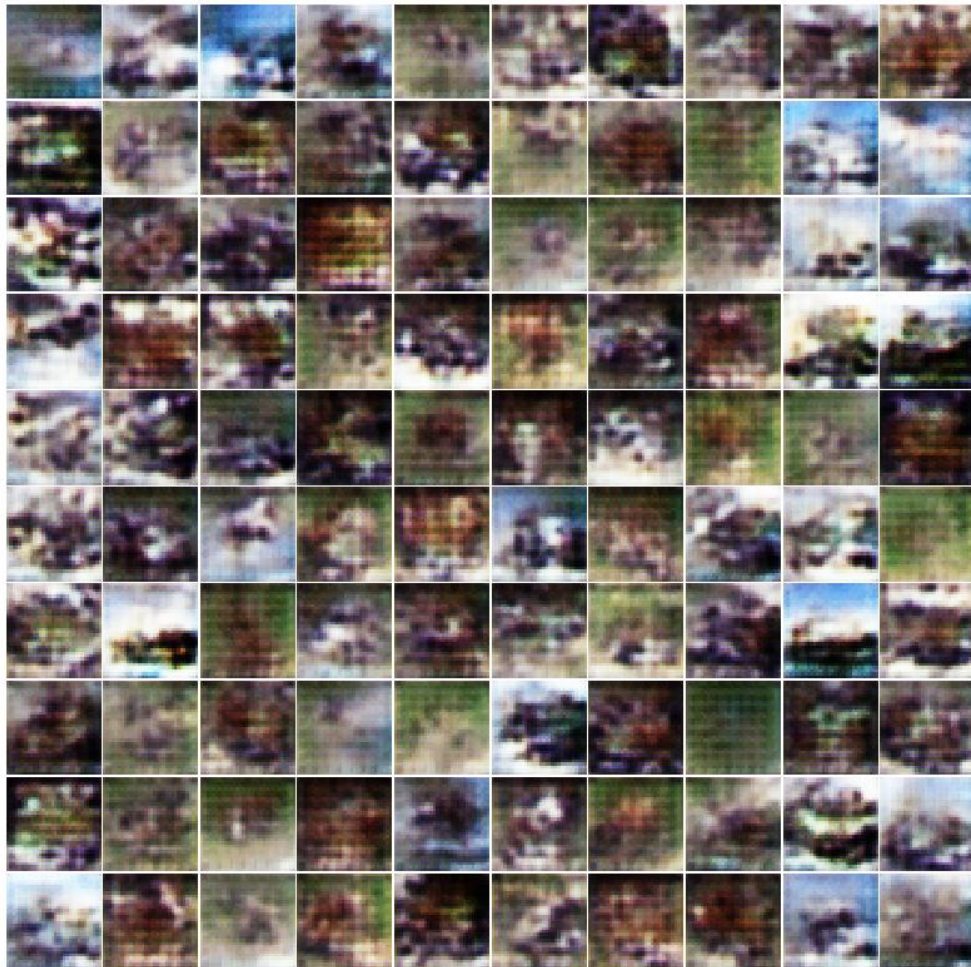
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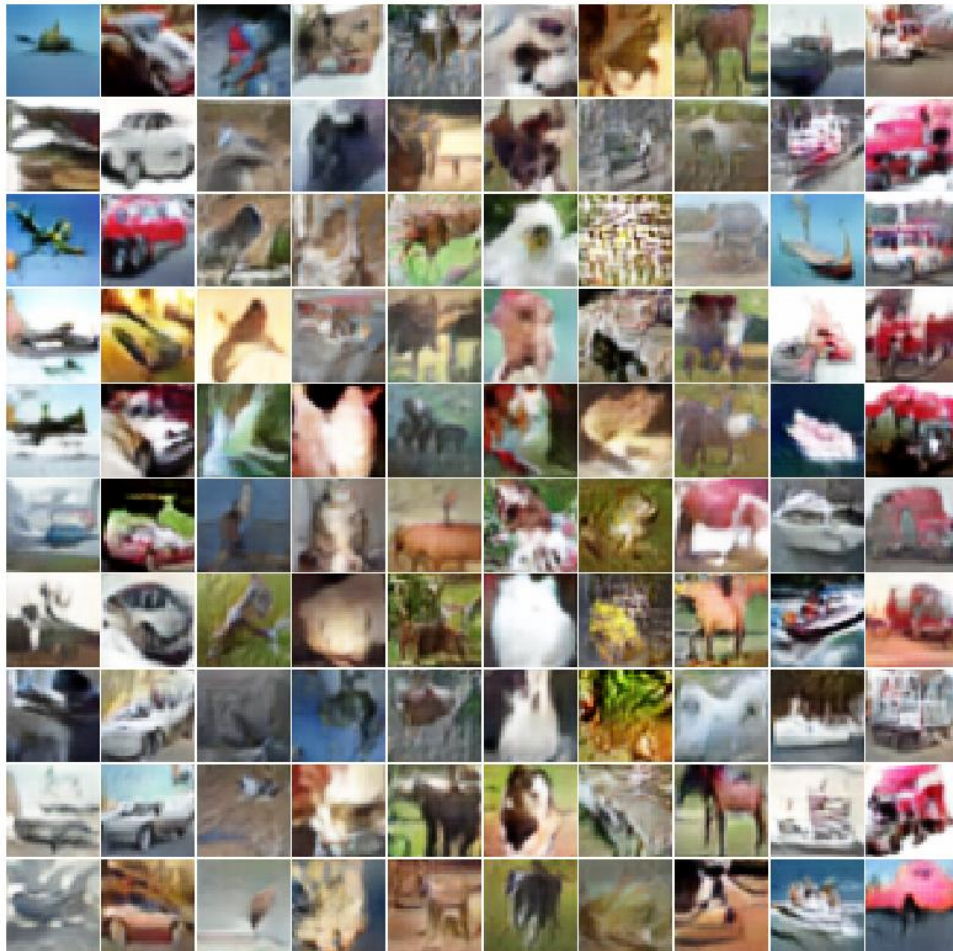
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3. Choose 5-6 pictures of generated images to show how training progresses

Epoch 0



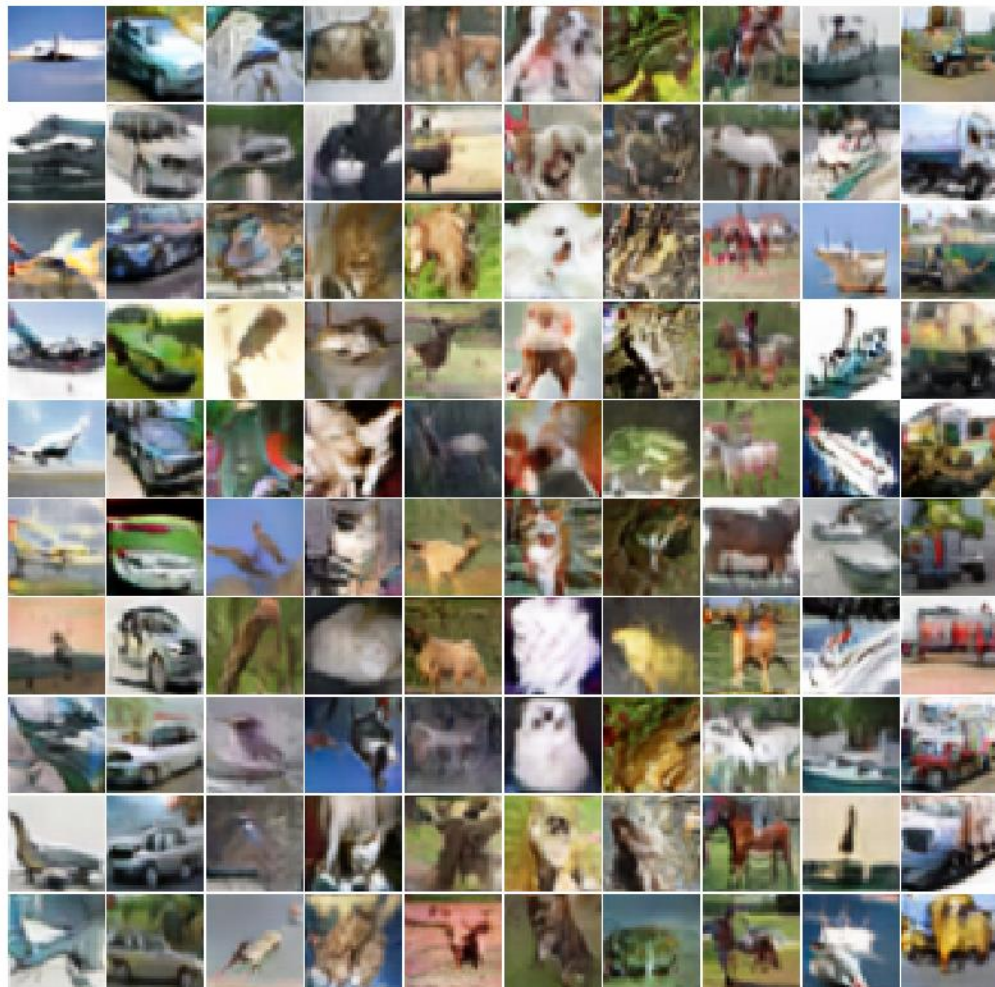
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Epoch 40



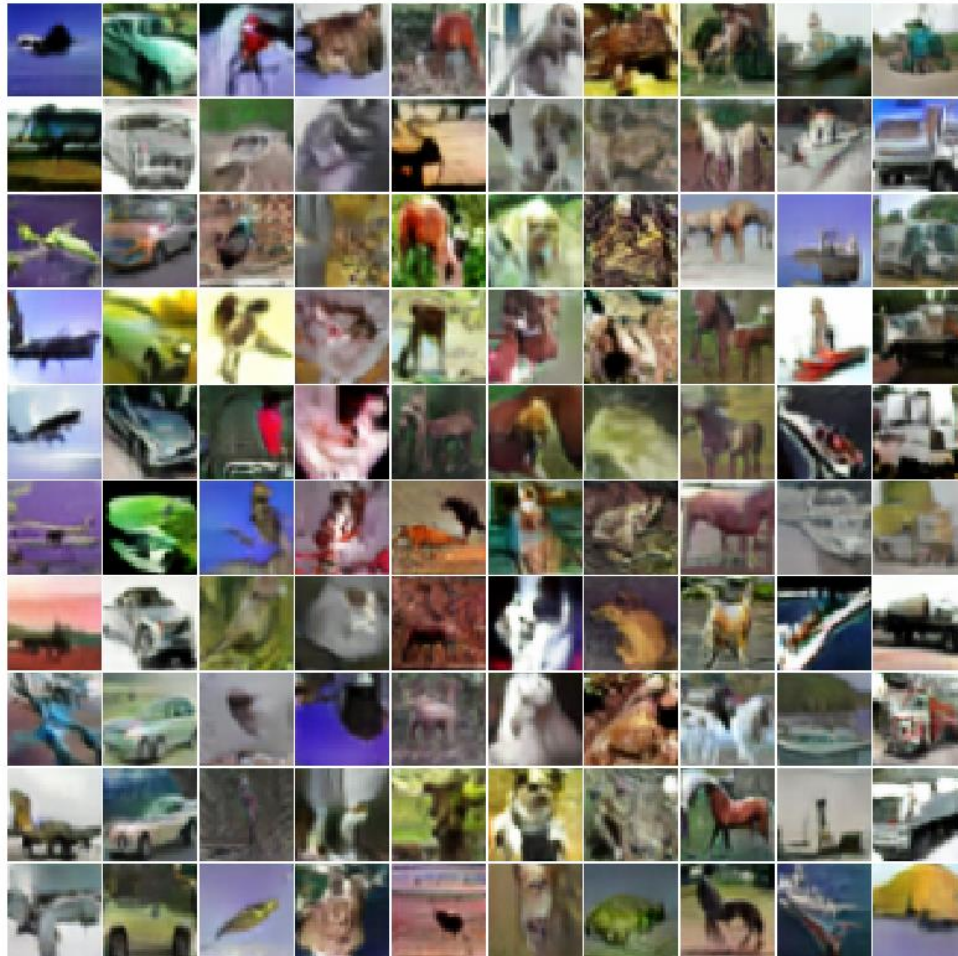


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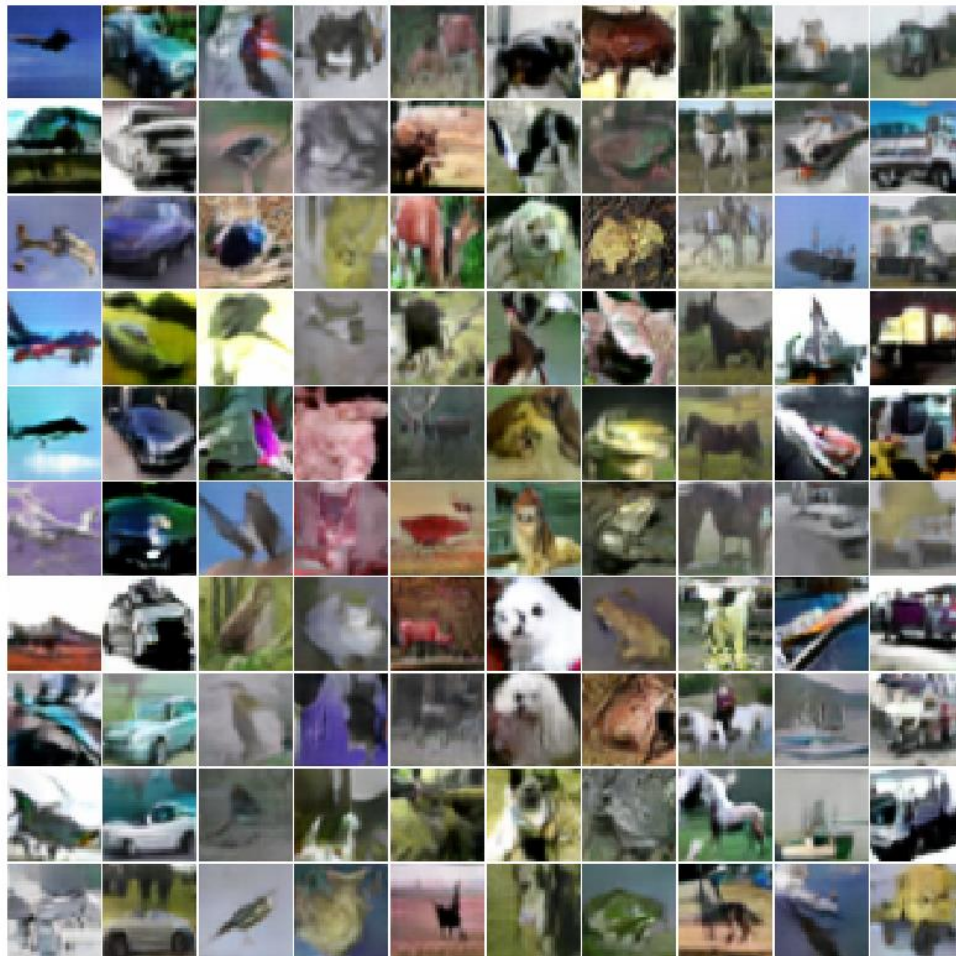
Epoch 80



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Epoch 120

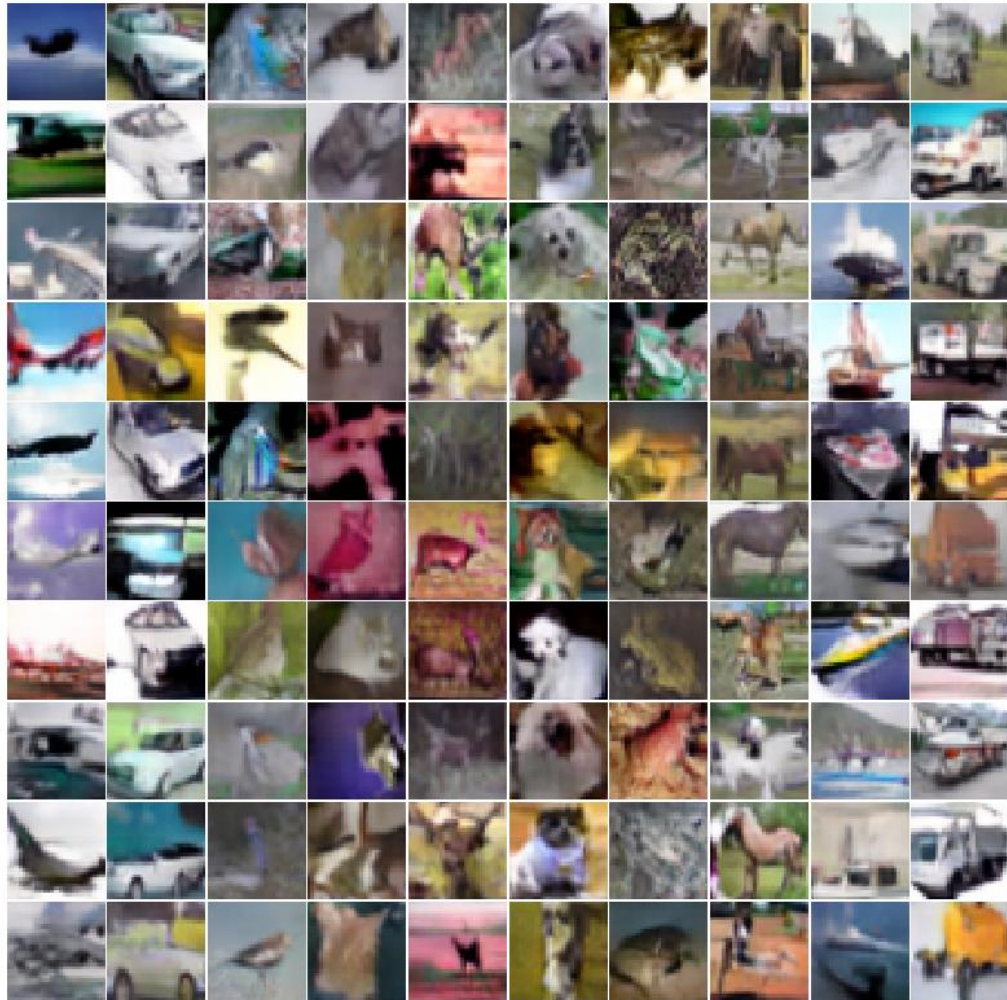


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Epoch 160





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Epoch 199



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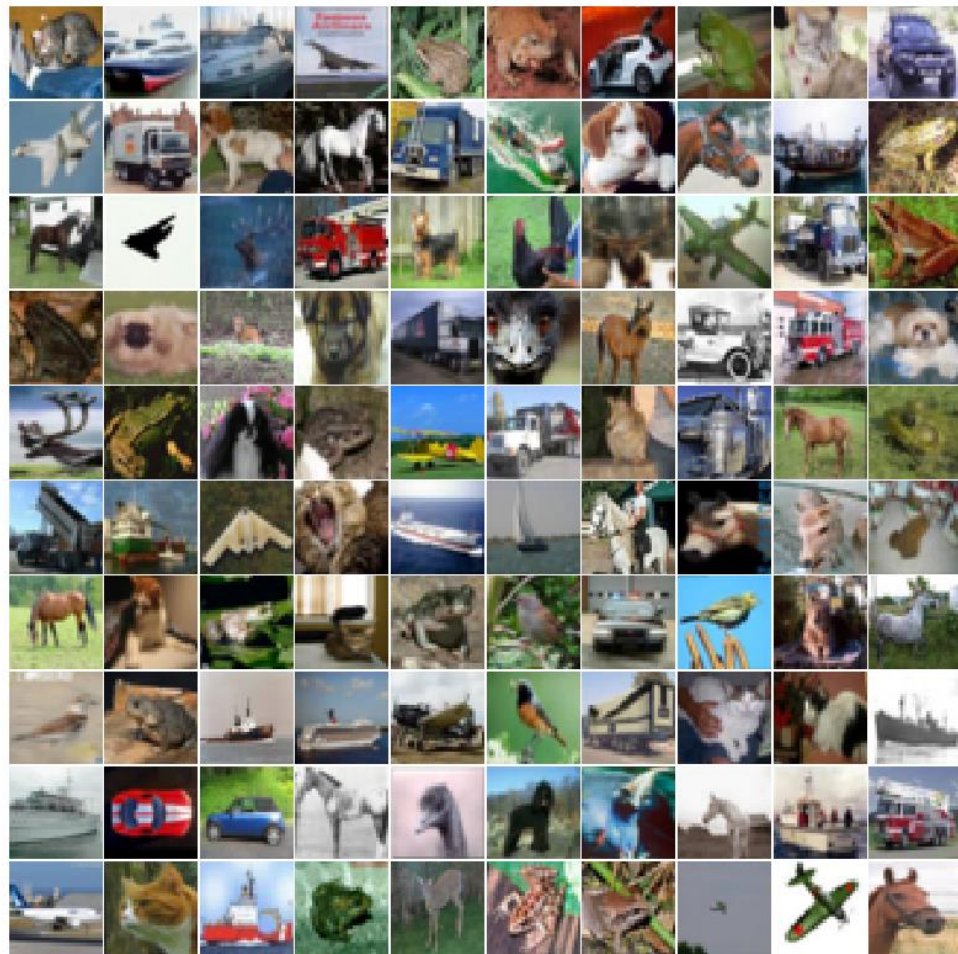
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#### 4. Visualization

- a. From Perturb Real Images part, a batch of real images, a batch of the gradients from an alternate class for these images, and the modified images the discriminator incorrectly classifies.

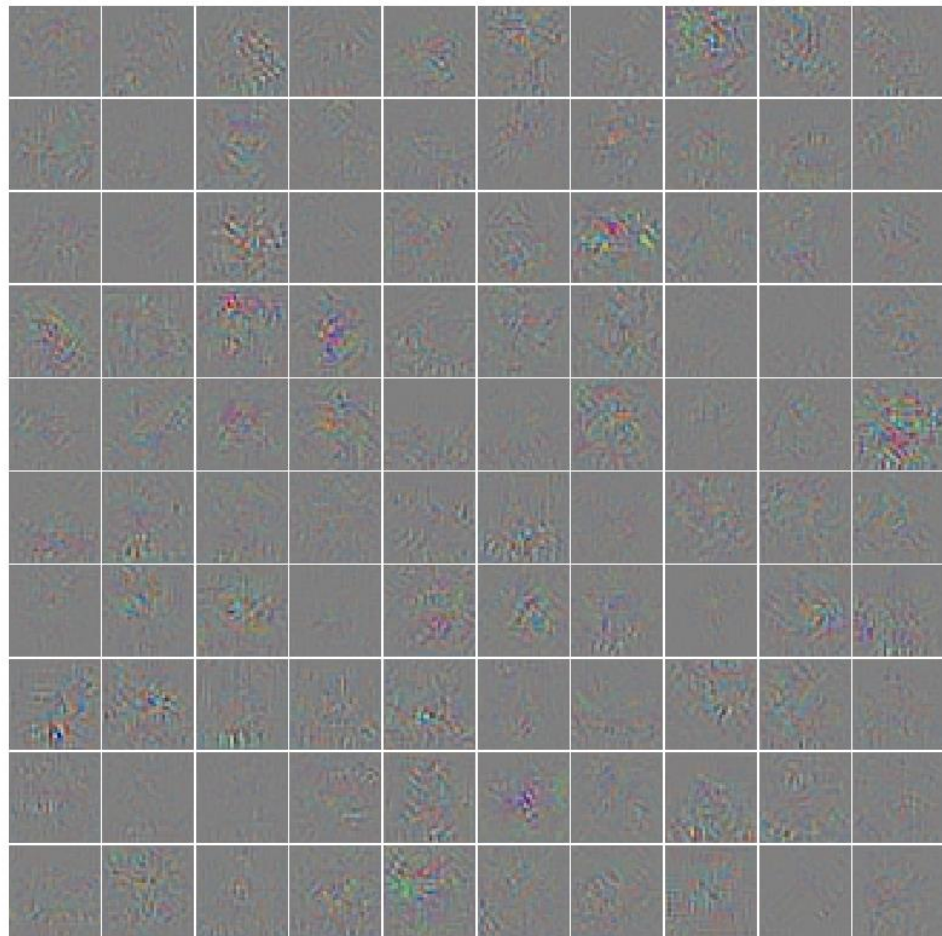
- real images





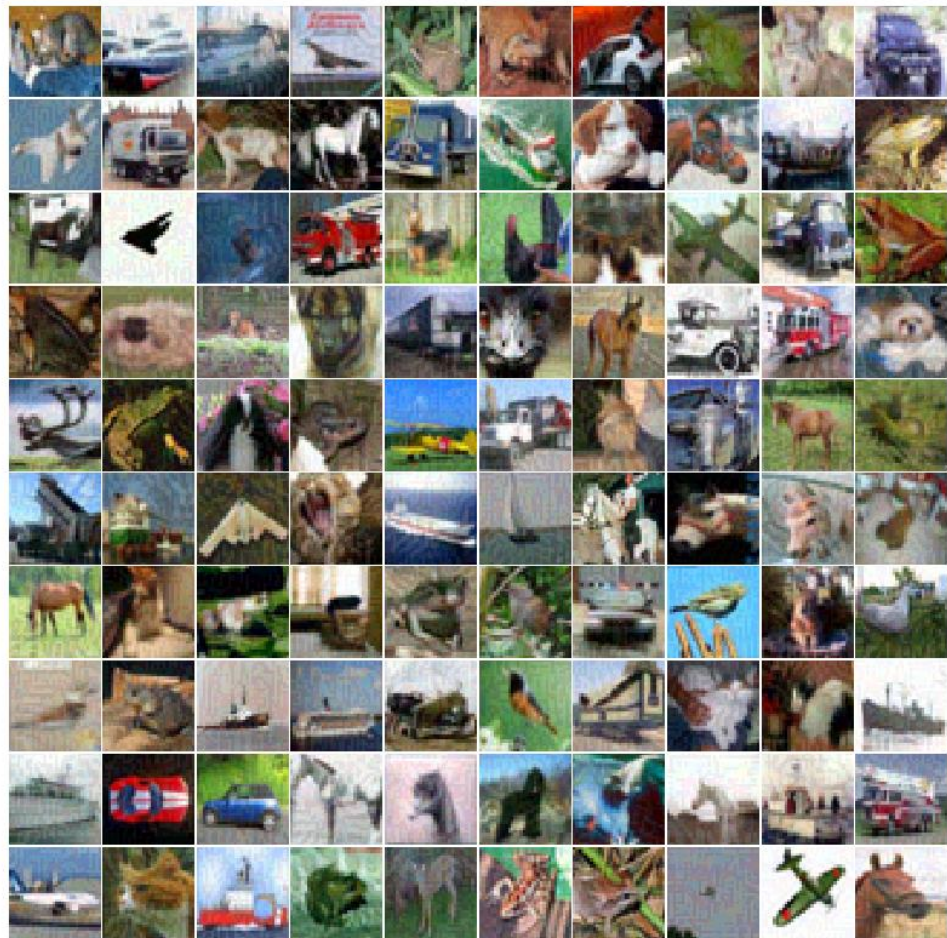
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● *gradients*



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- *altered images*



- b. From Synthetic Images Maximizing Classification Output Synthetic images maximizing the class output. One for the discriminator trained without the generator and one for the discriminator trained with the generator.

- *Synthetic images maximizing class output for discriminator trained without the generator*



- *Synthetic images maximizing class output for discriminator trained with the generator*





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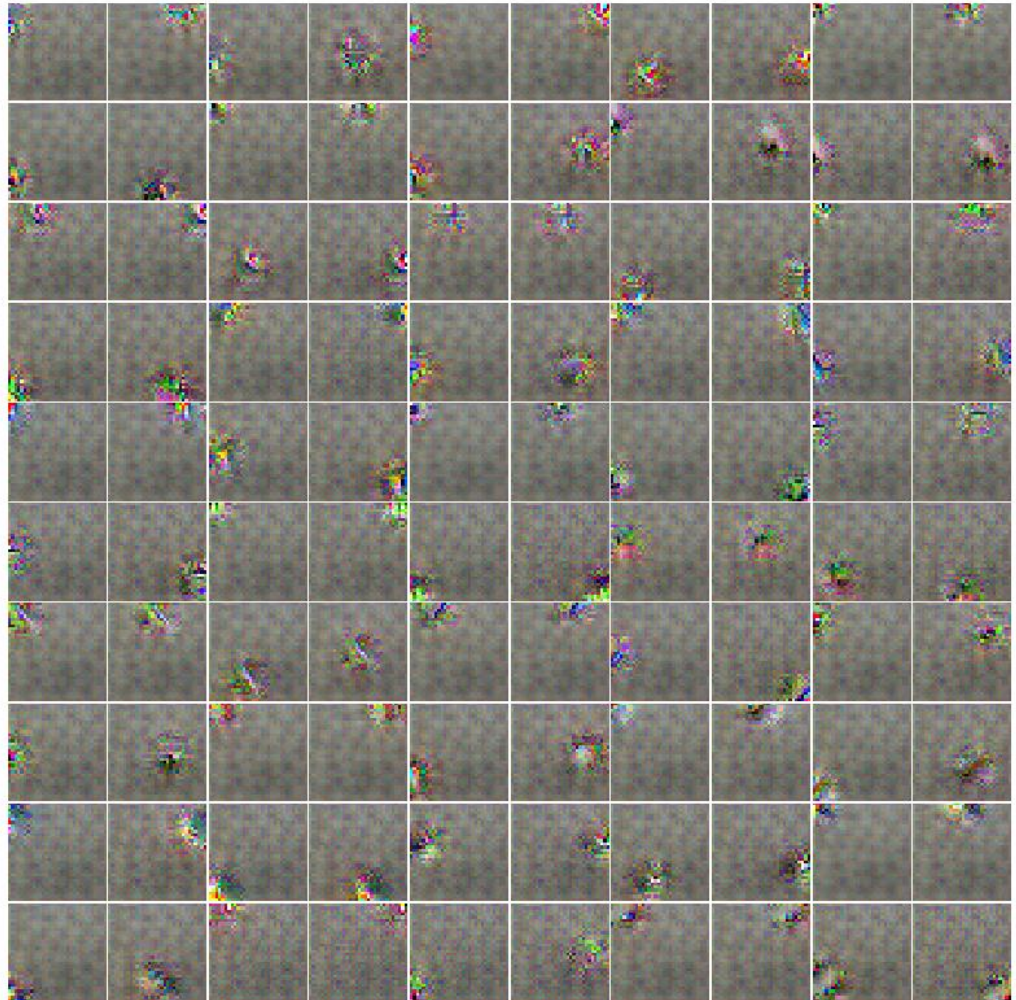
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C. From Synthetic Features Maximizing Features at Various Layers, Synthetic images maximizing a particular layer of features. Do this for at least two different layers (for example - layer 4 and layer 8.)

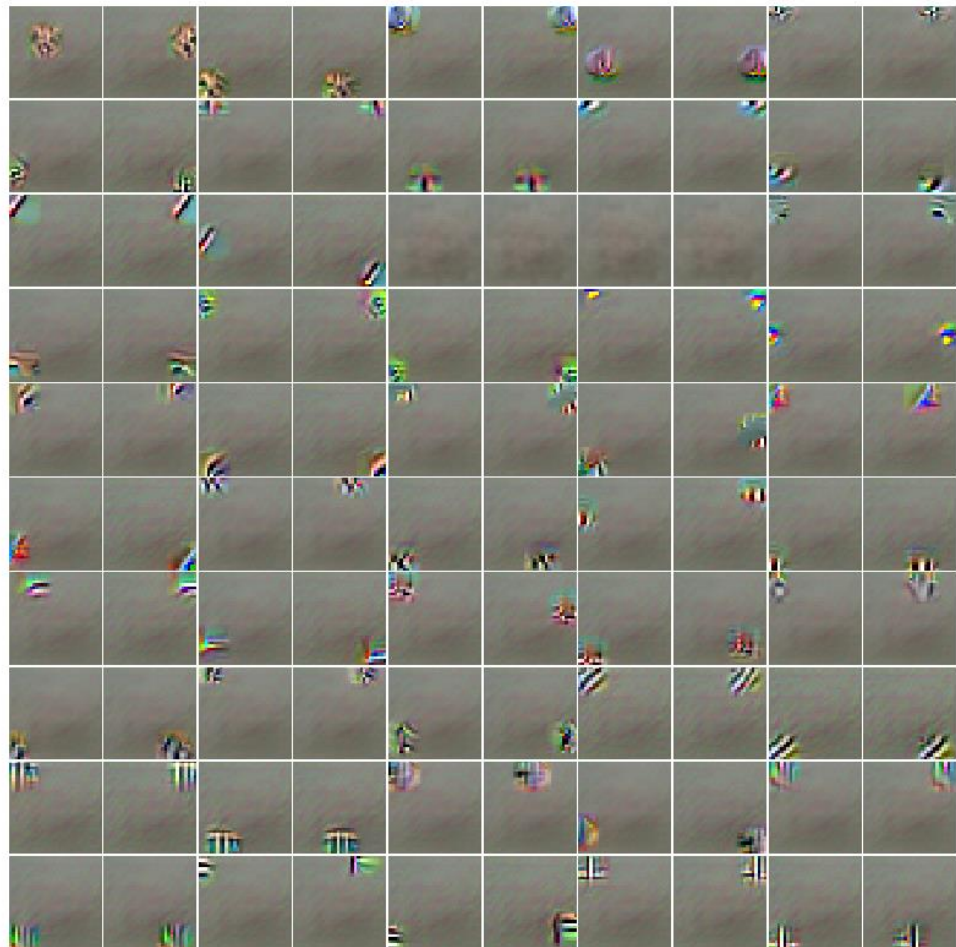
- *discriminator trained without the generator (layer 4)*





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- *discriminator trained with the generator (layer 4)*



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- *discriminator trained without the generator (layer 8)*



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- *discriminator trained with the generator (layer 8)*

