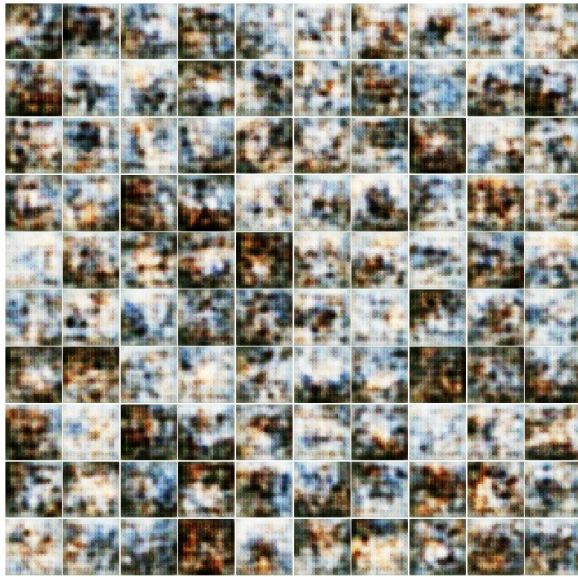# HW6 - Understanding CNNs and Generative Adversarial Networks
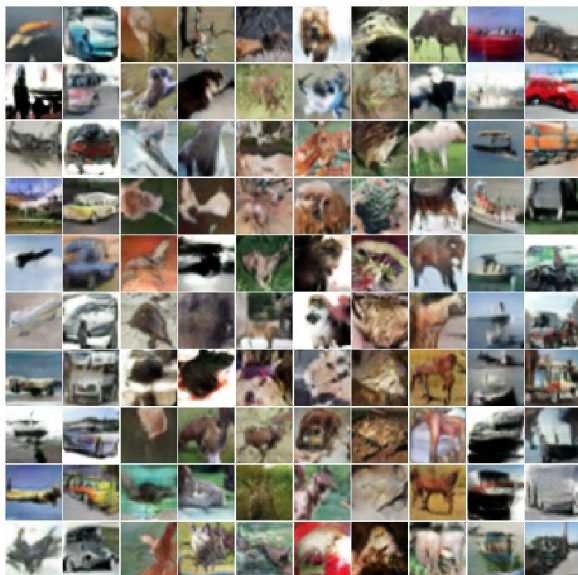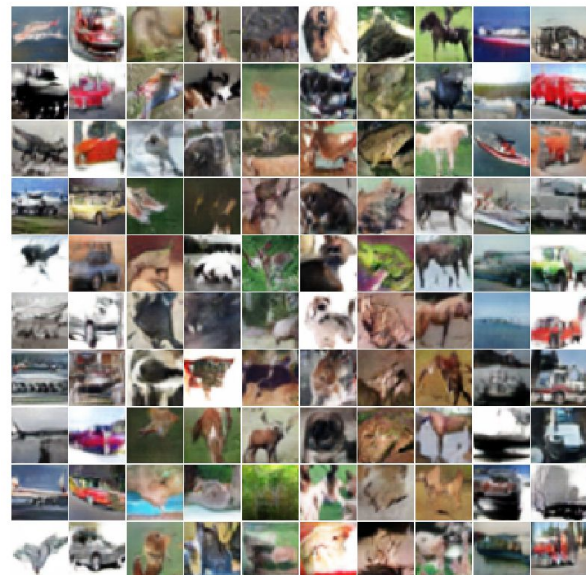
Zhenye Na (zna2)

Generated Images

Epoch 0

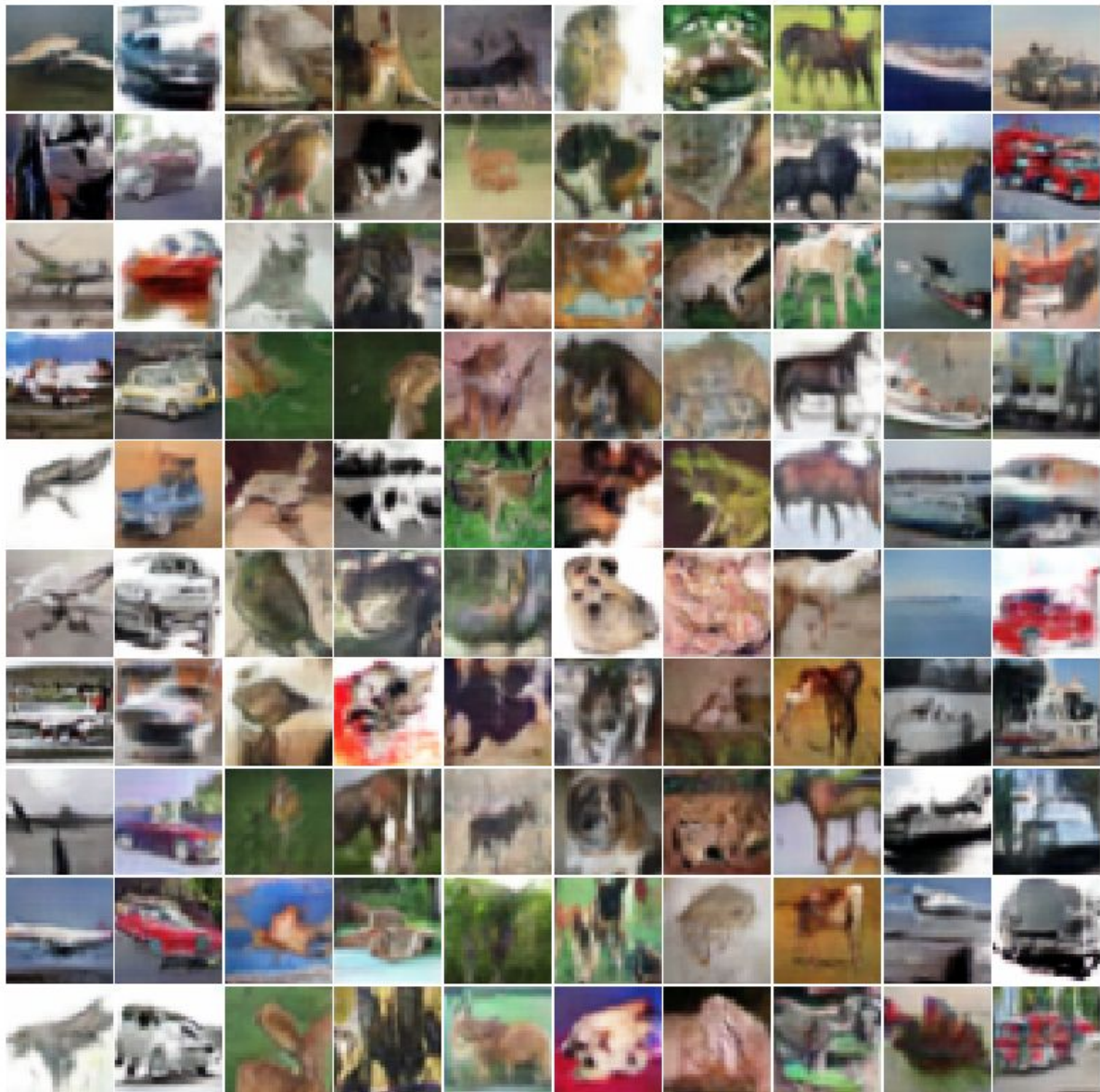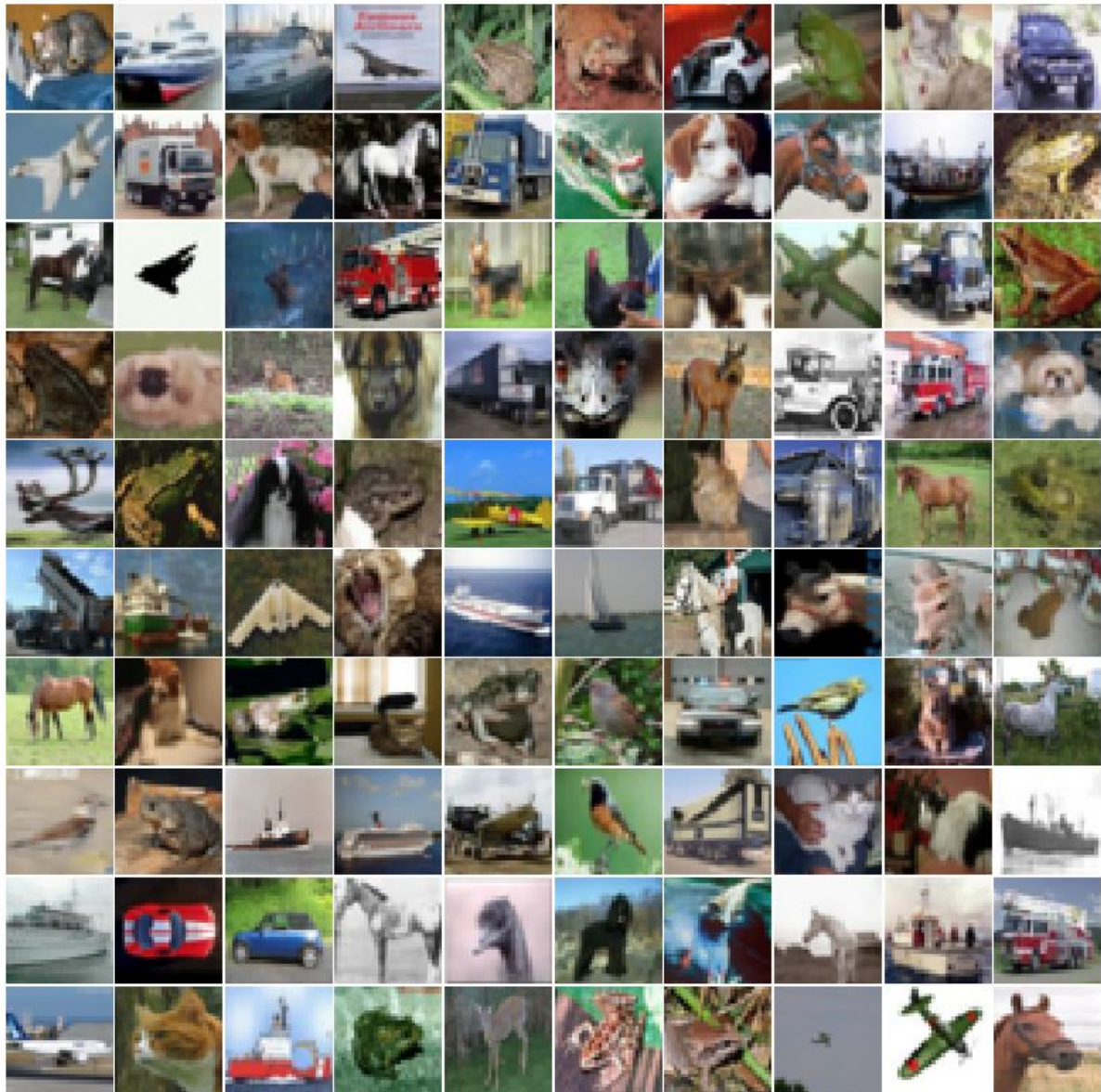*Epoch 50*

Epoch 100

Epoch 150

Final image

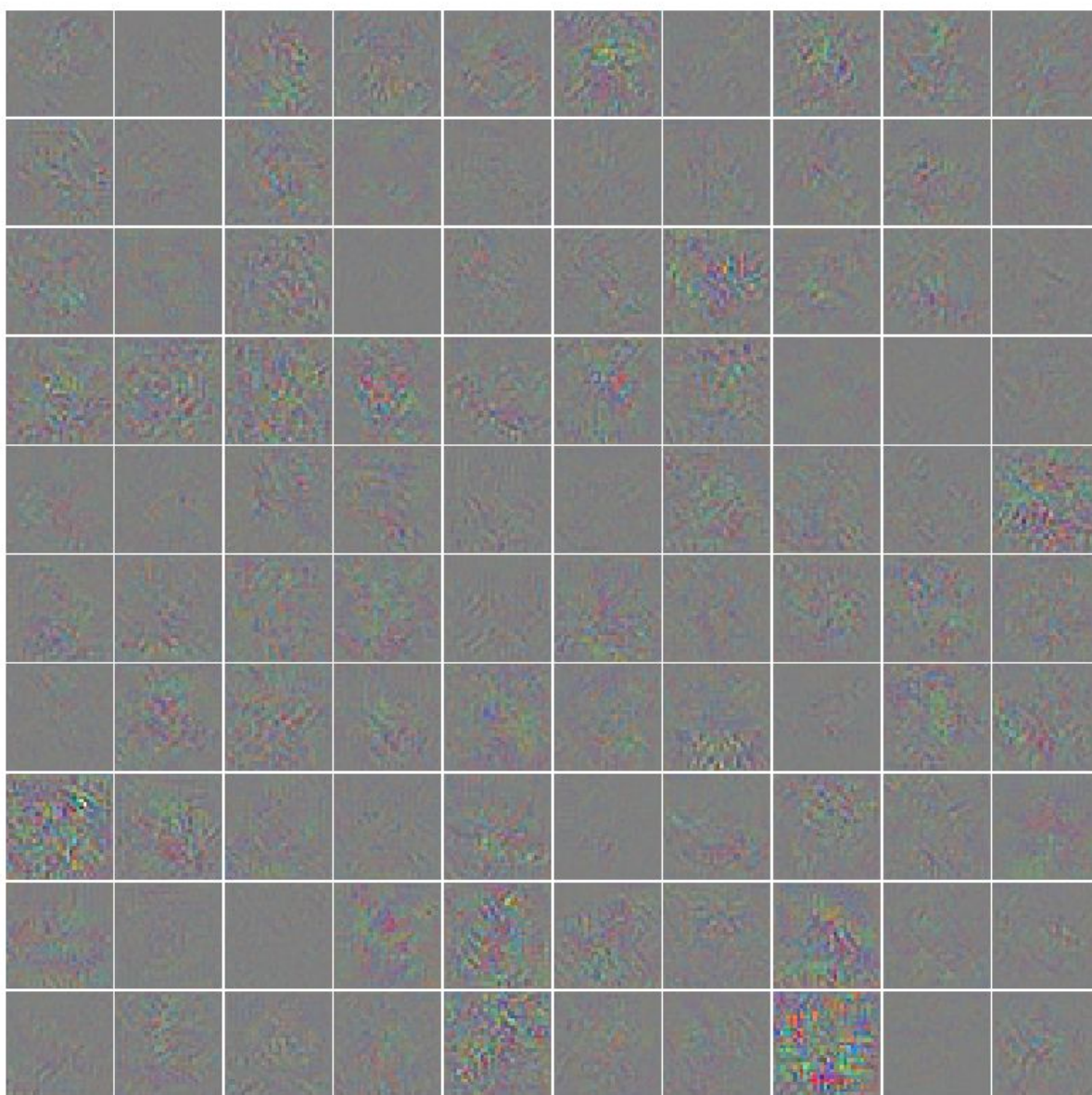# Real images, Gradients images, and the jittered images

Original Image | Accuracy: 86.71875%
Jittered Image | Accuracy: 14.0625%

Real images

Gradient images
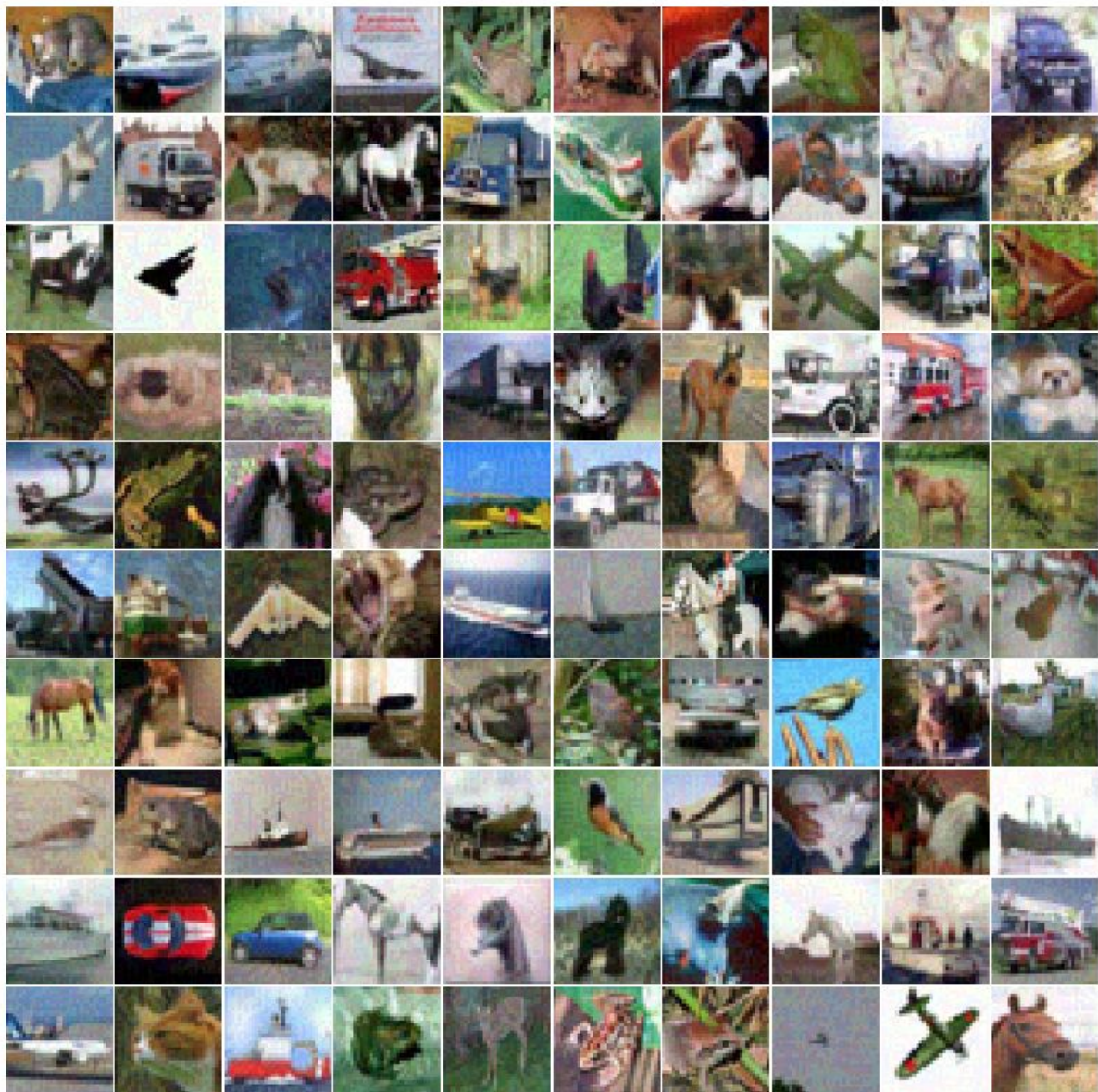
Jittered images

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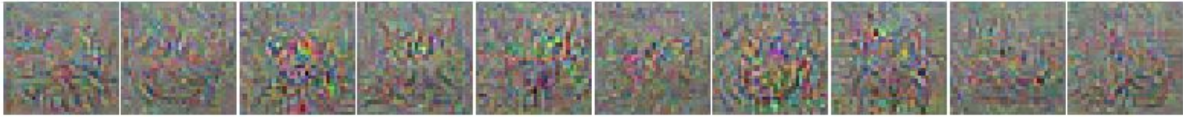
*Synthetic images maximizing class output for discriminator trained **without** the generator*

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

Synthetic images maximizing a particular layer of features

*Synthetic images maximizing layer 5 features for discriminator trained **without** the generator*

*Synthetic images maximizing layer 5 features for discriminator trained **with** the generator*

*Synthetic images maximizing layer 4 features for discriminator trained **without** the generator*

*Synthetic images maximizing layer 4 features for discriminator trained **with** the generator*

Test accuracy
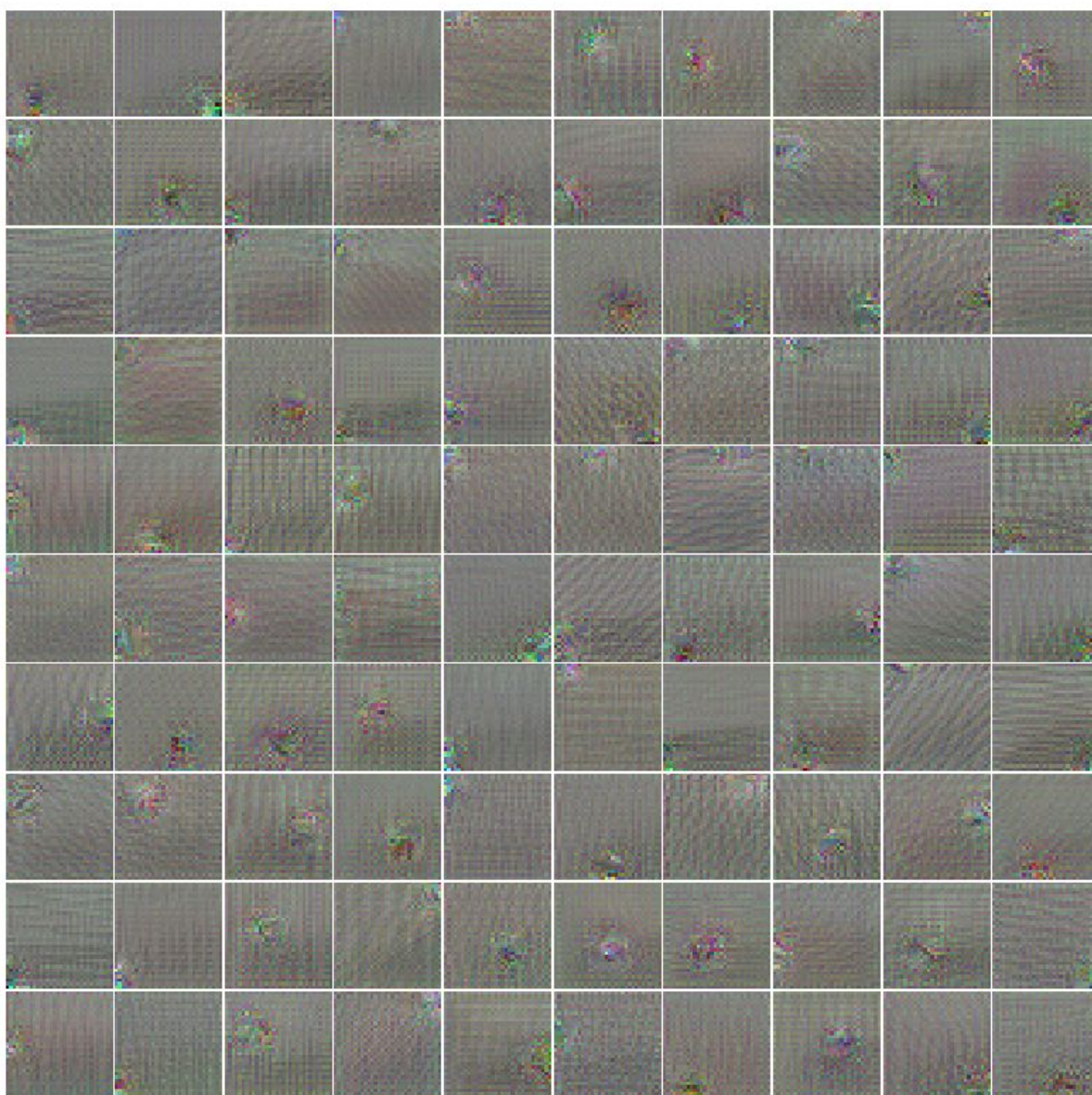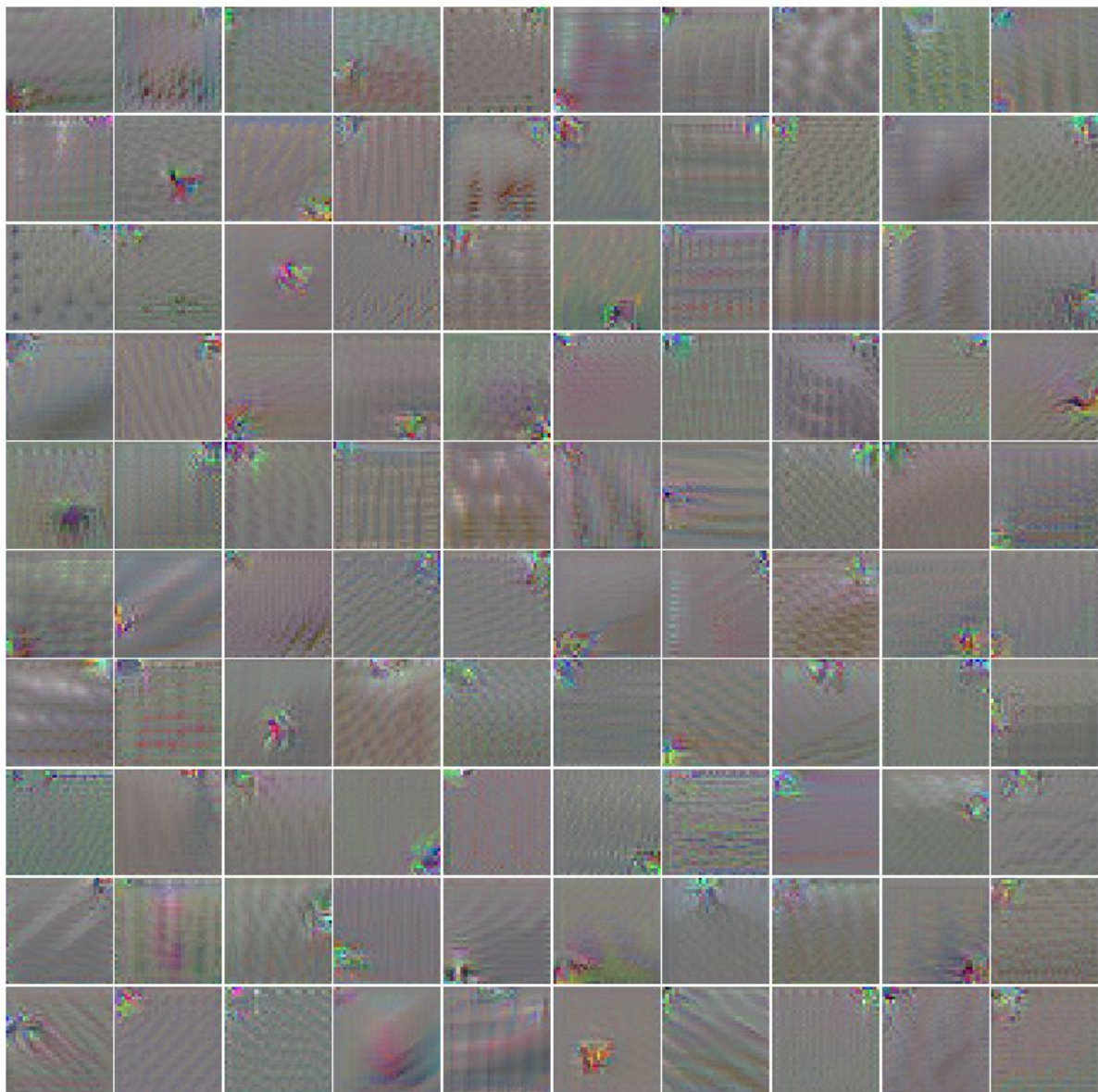
Train Discriminator **without** Generator accuracy after 120 epochs: **88%**

Iteration: 115 | Loss: 0.030395884066820145 | Training accuracy: 99% | Test accuracy: 88%
Iteration: 116 | Loss: 0.02933293953537941 | Training accuracy: 99% | Test accuracy: 88%
Iteration: 117 | Loss: 0.029903272166848183 | Training accuracy: 99% | Test accuracy: 88%
Iteration: 118 | Loss: 0.02967444434762001 | Training accuracy: 99% | Test accuracy: 88%
Iteration: 119 | Loss: 0.030497124418616295 | Training accuracy: 99% | Test accuracy: 88%
Iteration: 120 | Loss: 0.030752010643482208 | Training accuracy: 99% | Test accuracy: 88%

Train Discriminator **with** Generator accuracy after 200 epochs: **81.94%**

Training epoch: 199 | Accuracy: 82.14597479738697 | Batch: 0 | Gradient penalty: 0.3670464047845522 | Discriminator fake source: -4.054707726991934 | Discriminator real source: -2.9508168206716583 | Discriminator real class: 0.5077918931113026 | Discriminator fake class: 0.13898714073355134
Training epoch: 199 | Accuracy: 82.15331496825948 | Batch: 50 | Gradient penalty: 0.3669609120159409 | Discriminator fake source: -4.054706128939048 | Discriminator real source: -2.9509789307637884 | Discriminator real class: 0.5075832895990321 | Discriminator fake class: 0.13891244435793004
Training epoch: 199 | Accuracy: 82.16071606658002 | Batch: 100 | Gradient penalty: 0.3668769711629251 | Discriminator fake source: -4.054776266852982 | Discriminator real source: -2.9512107749418703 | Discriminator real class: 0.5073755615350102 | Discriminator fake class: 0.13883501456195257
Training epoch: 199 | Accuracy: 82.1680574130991 | Batch: 150 | Gradient penalty: 0.36679992543876244 | Discriminator fake source: -4.054786784893186 | Discriminator real source: -2.9513998201151987 | Discriminator real class: 0.5071698740674482 | Discriminator fake class: 0.13875783280303133
Training epoch: 199 | Accuracy: 82.1745860964388 | Batch: 200 | Gradient penalty: 0.36671082761442547 | Discriminator fake source: -4.054832523702343 | Discriminator real source: -2.9516330290853214 | Discriminator real class: 0.5069790831621419 | Discriminator fake class: 0.13868211486914628
Training epoch: 199 | Accuracy: 82.18197934460127 | Batch: 250 | Gradient penalty: 0.366637880505804 | Discriminator fake source: -4.054770334706012 | Discriminator real source: -2.9517422786140477 | Discriminator real class: 0.5067701756376604 | Discriminator fake class: 0.13860680357824
Training epoch: 199 | Accuracy: 82.18922271887153 | Batch: 300 | Gradient penalty: 0.36655876104186097 | Discriminator fake source: -4.054666036103269 | Discriminator real source: -2.95181124808543 | Discriminator real class: 0.5065703021537641 | Discriminator fake class: 0.13852867251804168
Training epoch: 199 | Accuracy: 82.19599583445569 | Batch: 350 | Gradient penalty: 0.36647625181188587 | Discriminator fake source: -4.0546269948439795 | Discriminator real source: -2.951950162129539 | Discriminator real class: 0.5063744209891898 | Discriminator fake class: 0.13845128746521282
Testing accuracy: 81.94224683544304 | Elapsed time: 92295.69546079636