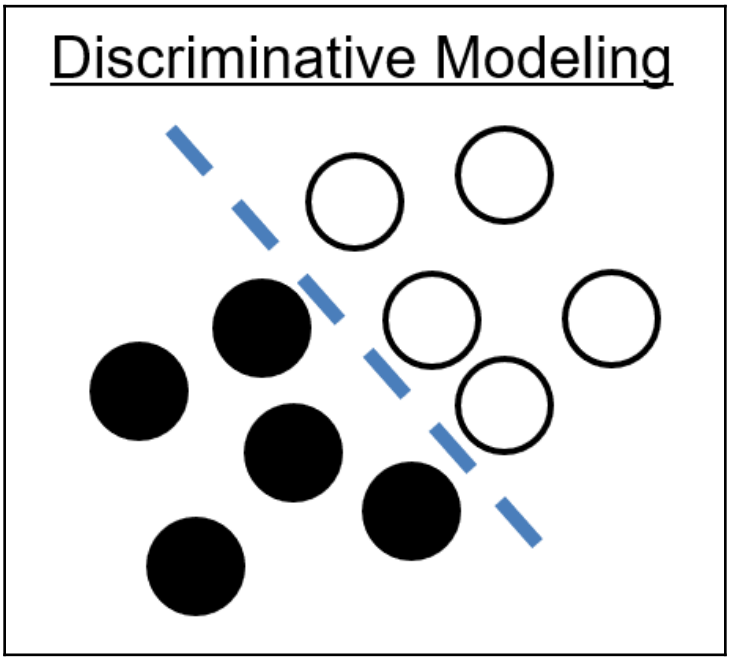
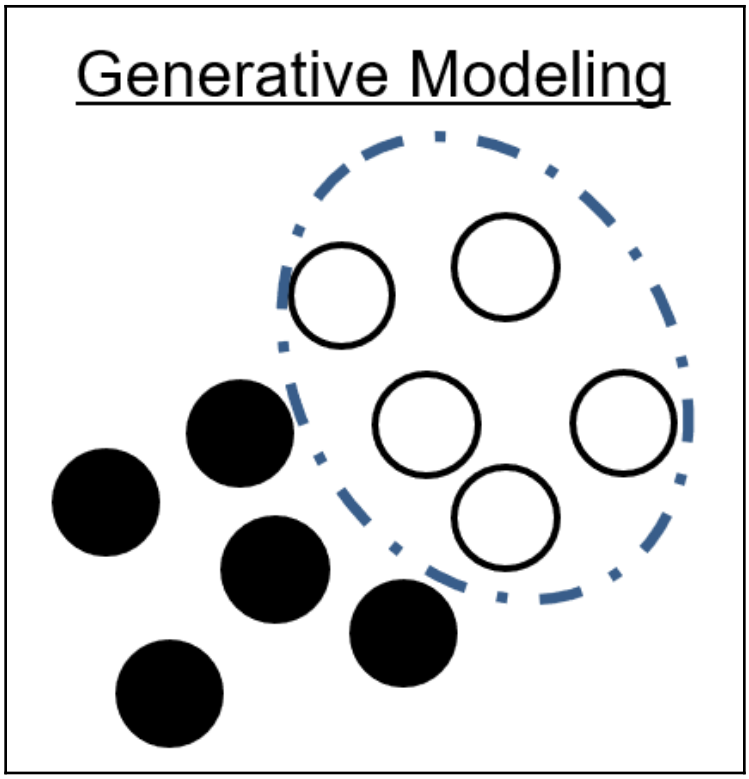
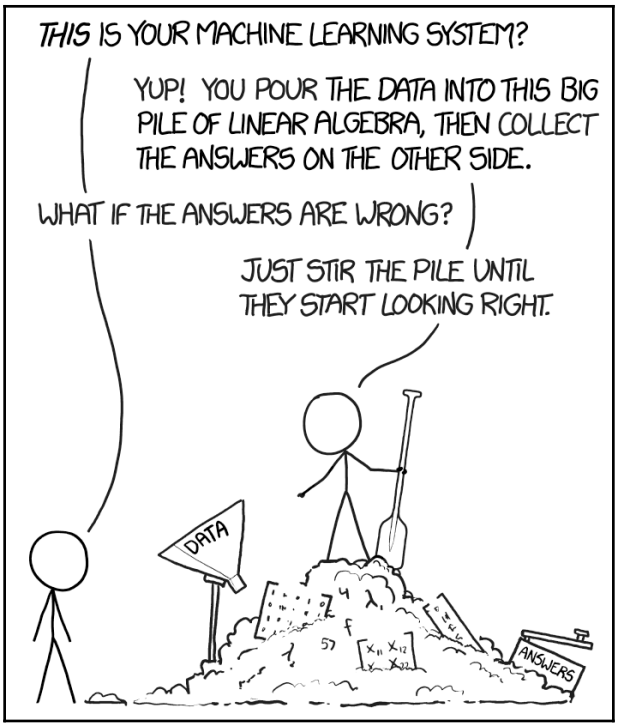
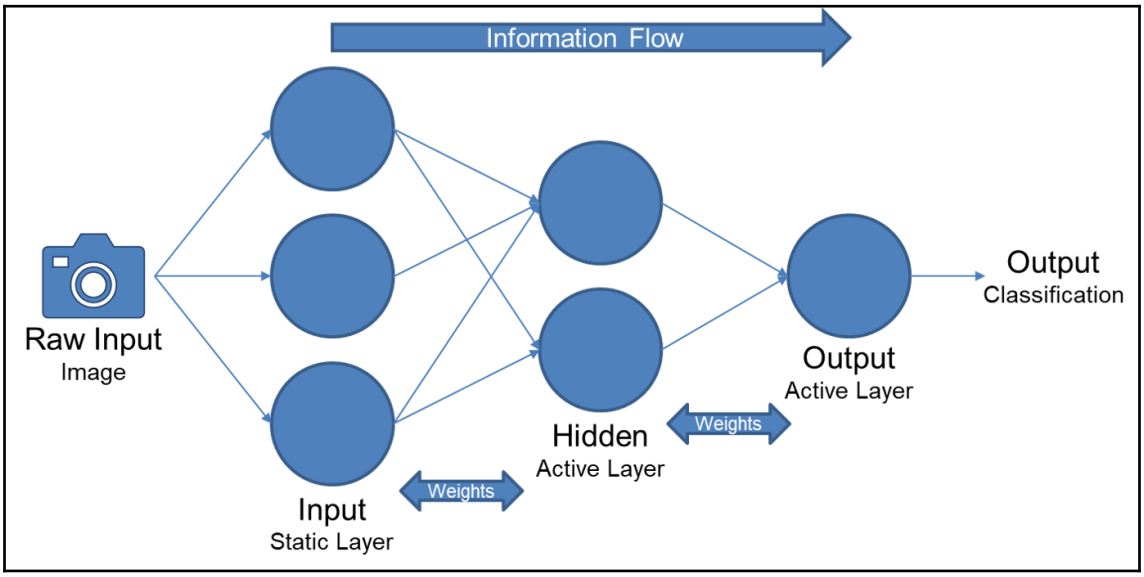
1
Graphics

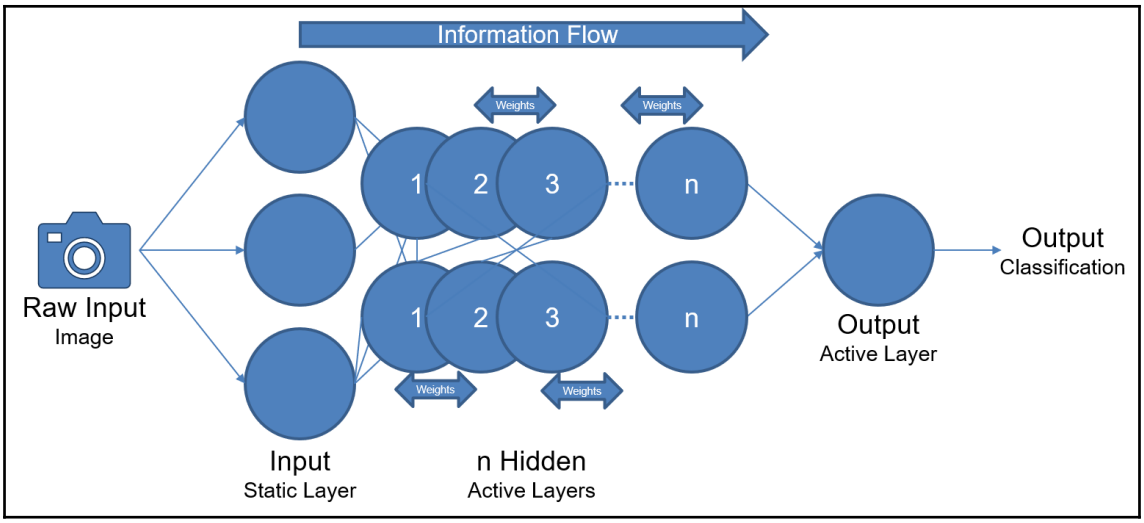
Chapter 1: What Is a Generative Adversarial Network?

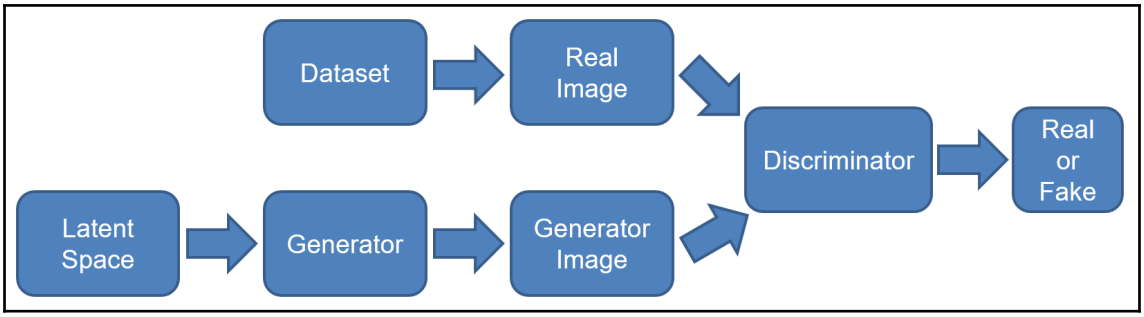


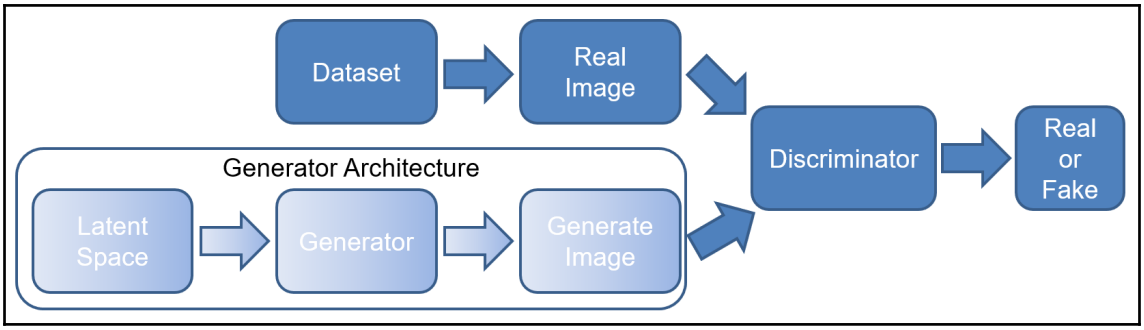

Generative Modeling


THIS IS YOUR MACHINE LEARNING SYSTEM?
YUP! YOU POUR THE DATA INTO THIS BIG PILE OF LINEAR ALGEBRA, THEN COLLECT THE ANSWERS ON THE OTHER SIDE.
WHAT IF THE ANSWERS ARE WRONG?
JUST STIR THE PILE UNTIL THEY START LOOKING RIGHT.
DATA
ANSWERS

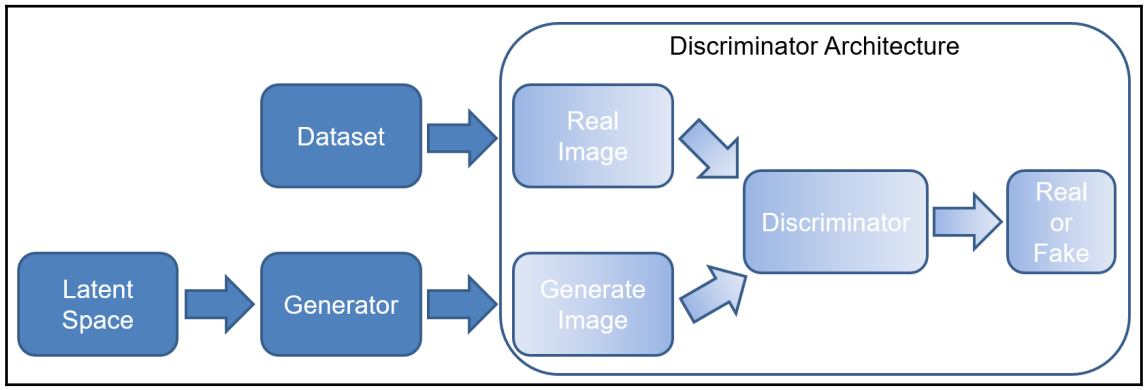

Information Flow
Raw Input
Image
Input
Static Layer
Weights
Hidden
Active Layer
Weights
Output
Active Layer
Output
Classification


Information Flow
Weights
Weights
1
2
3
n
1
2
3
n
Weights
Weights
Raw Input
Image
Input
Static Layer
n Hidden
Active Layers
Output
Active Layer
Output
Classification


Dataset
Real
Image
Discriminator
Real
or
Fake
Latent
Space
Generator
Generator
Image

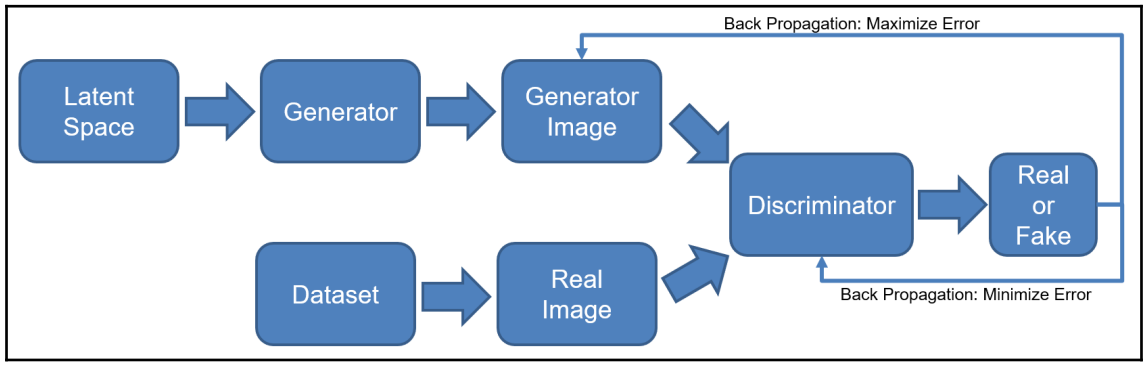

Dataset
Real
Image
Discriminator
Real
or
Fake
Generator Architecture
Latent
Space
Generator
Generate
Image

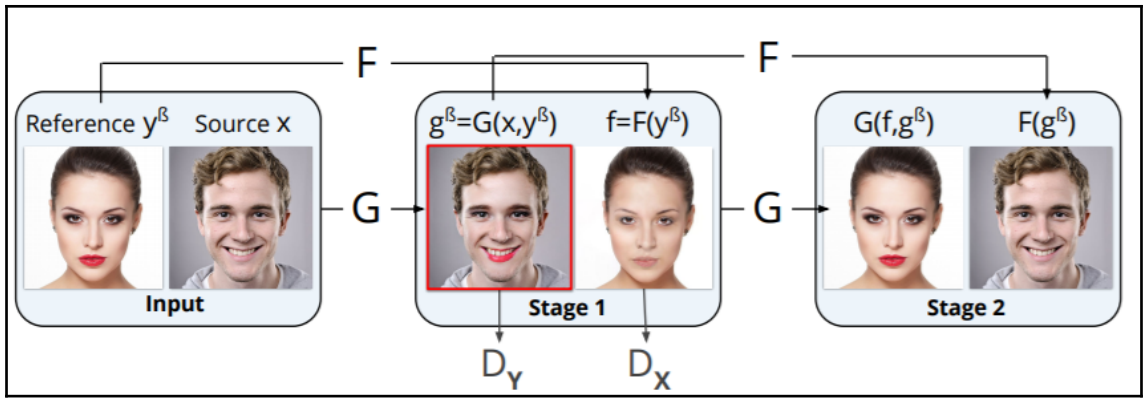
```
1   class Generator:
2
3       def __init__(self):
4           self.initVariable = 1
5
6       def lossFunction(self):
7
8           return
9
10      def buildModel(self):
11
12          return
13
14      def trainModel(self,inputX,inputY):
15
16          return
```

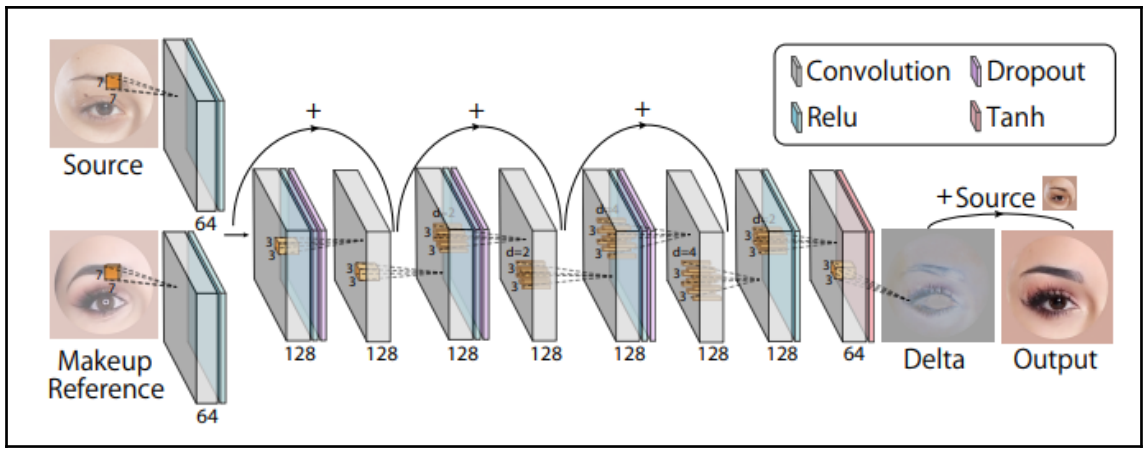


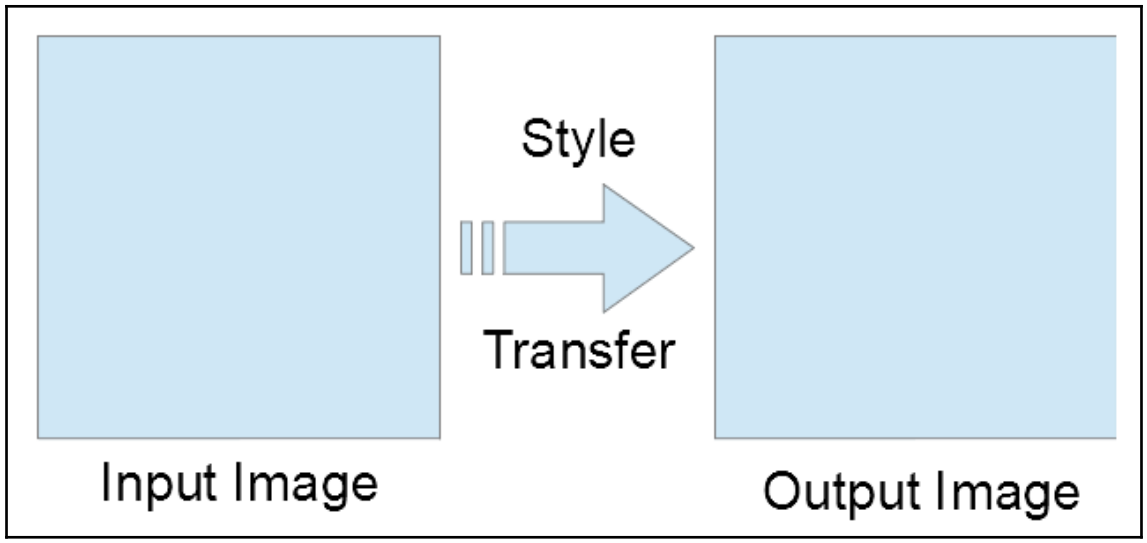
```
class Discriminator:

    def __init__(self):
        self.initVariable = 1

    def lossFunction(self):

        return

    def buildModel(self):

        return

    def trainModel(self,inputX,inputY):

        return
```

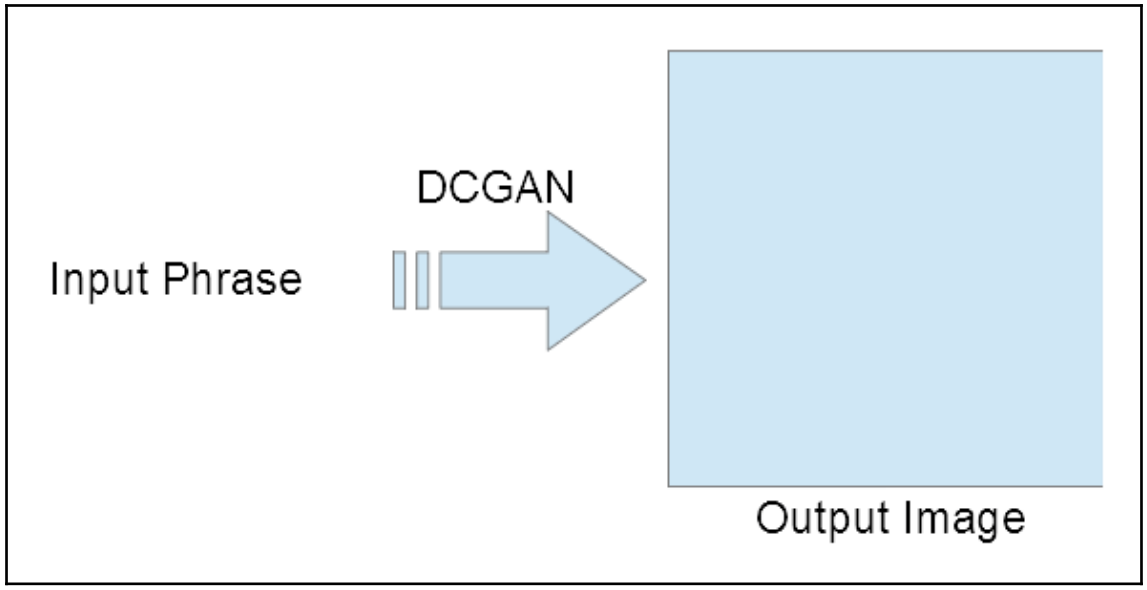
```
1   class Loss:
2
3       def __init__(self):
4           self.initVariable = 1
5
6       def lossBaseFunction1(self):
7
8           return
9
10      def lossBaseFunction2(self):
11
12          return
13
14      def lossBaseFunction3(self):
15
16          return
```

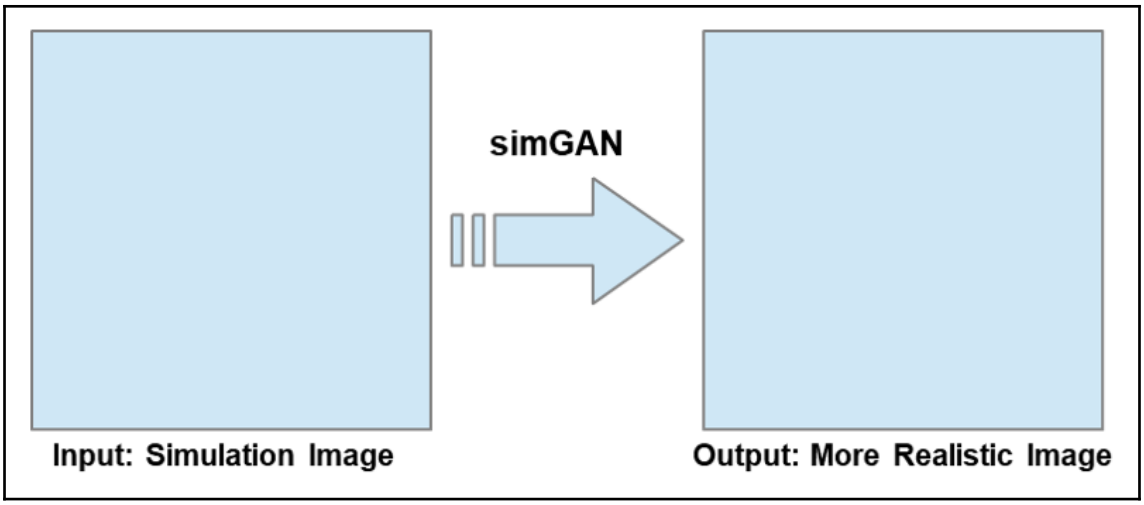



F
F
Reference y^ß
Source x
G
g^ß=G(x,y^ß)
f=F(y^ß)
G
G(f,g^ß)
F(g^ß)
Input
Stage 1
Stage 2
D_Y
D_X

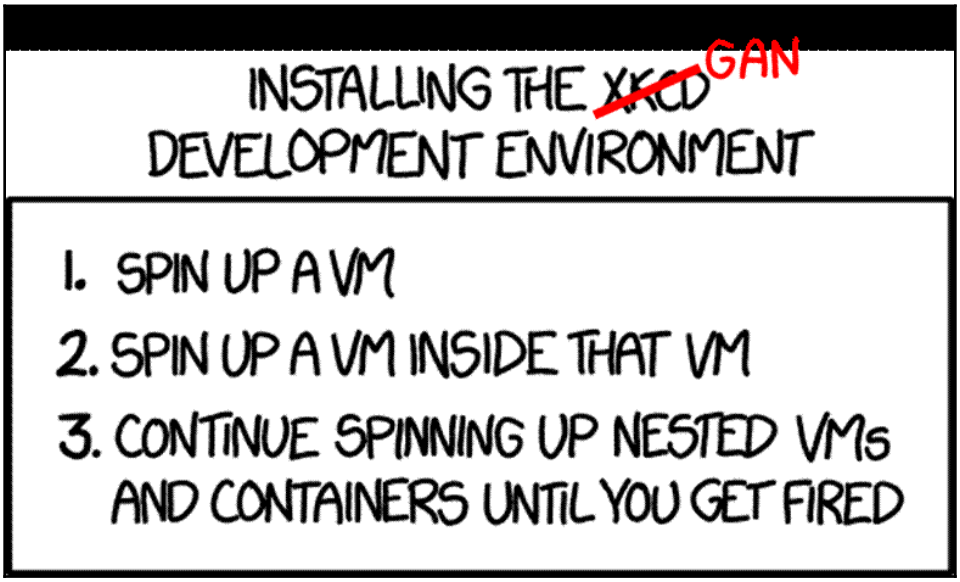

Convolution
Dropout
Relu
Tanh
Source
Makeup Reference
64
64
+
+
+
128
128
128
128
128
128
128
64
+Source
Delta
Output


Style
Transfer
Input Image
Output Image

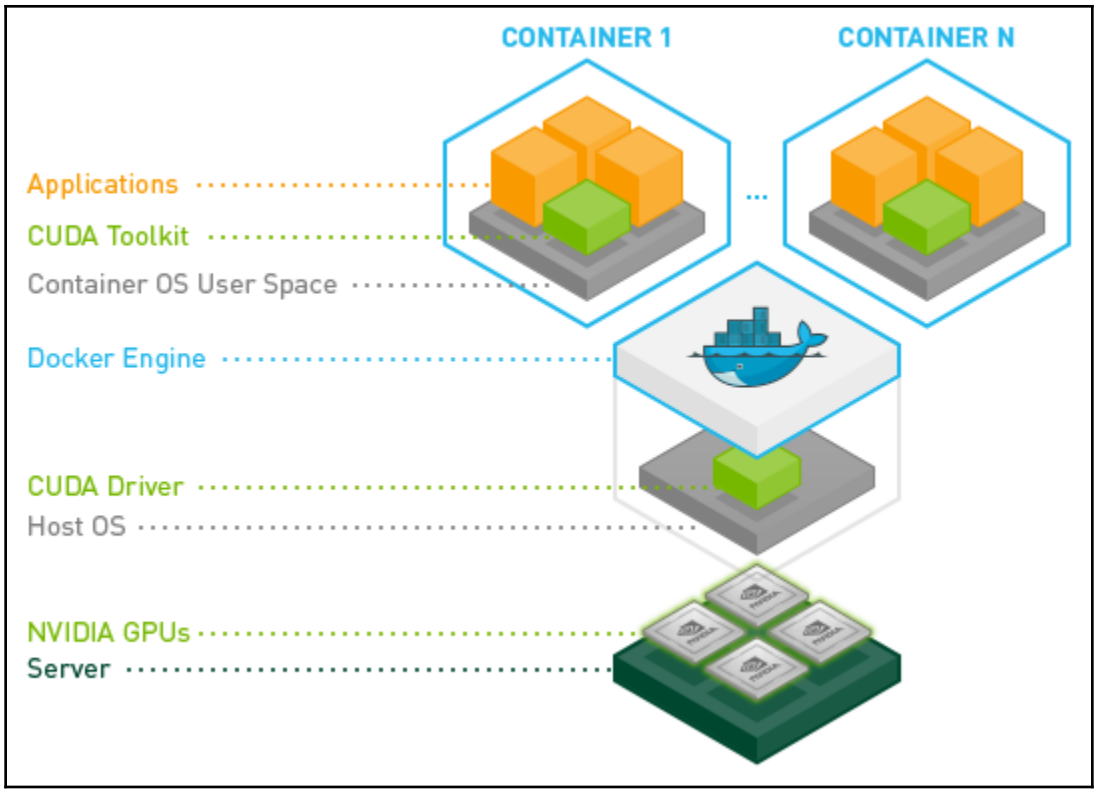

DCGAN
Input Phrase
Output Image


simGAN
Input: Simulation Image
Output: More Realistic Image

Chapter 2: Data First, Easy Environment, and Data Prep




```
NVIDIA-SMI 384.90                 Driver Version: 384.90                    |
-------------------------------+----------------------+----------------------+
GPU  Name        Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
Fan  Temp  Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
===============================+======================+======================|
  0  Tesla K80           Off  | 00000000:00:04.0 Off |                    0 |
N/A   34C    P0    70W / 149W |  11439MiB / 11439MiB |      0%      Default |
-------------------------------+----------------------+----------------------+

-----------------------------------------------------------------------------+
Processes:                                                       GPU Memory |
 GPU       PID   Type   Process name                             Usage      |
=============================================================================|
   0      5880      C   python3                                    10860MiB |
   0      5916      C   python3                                      341MiB |
   0      6154      C   python3                                      225MiB |
-----------------------------------------------------------------------------+
```


CONTAINER 1
CONTAINER N
Applications
CUDA Toolkit
Container OS User Space
Docker Engine
CUDA Driver
Host OS
NVIDIA GPUs
Server

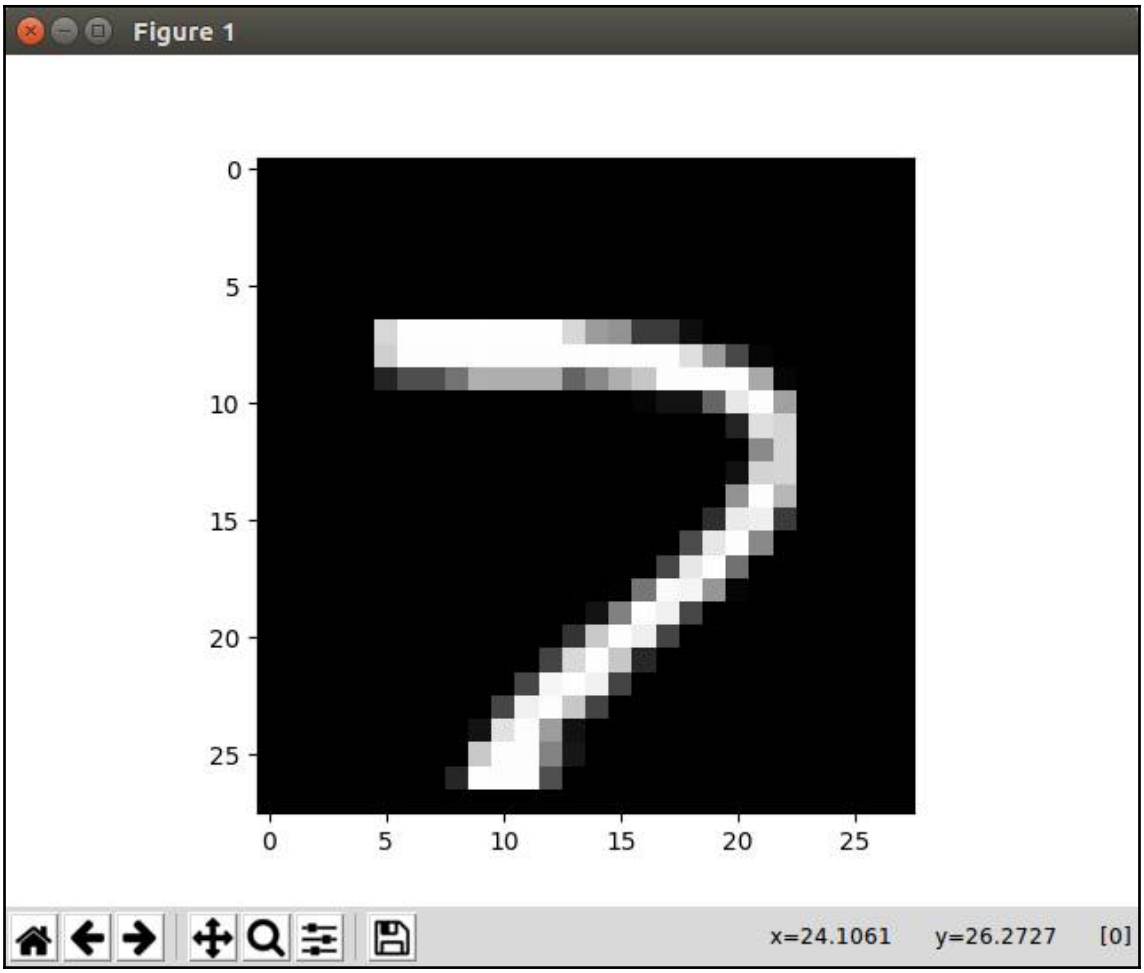
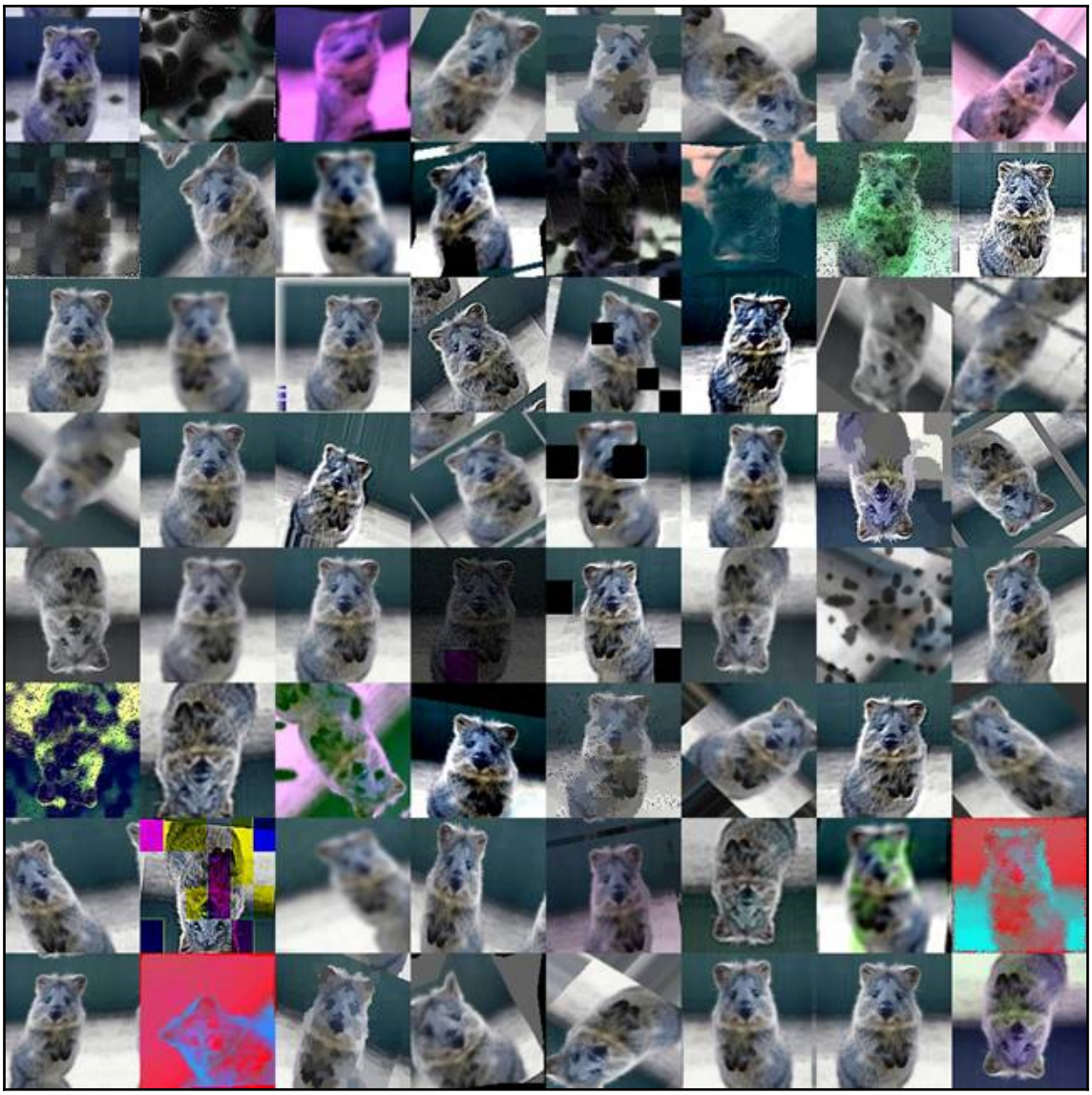
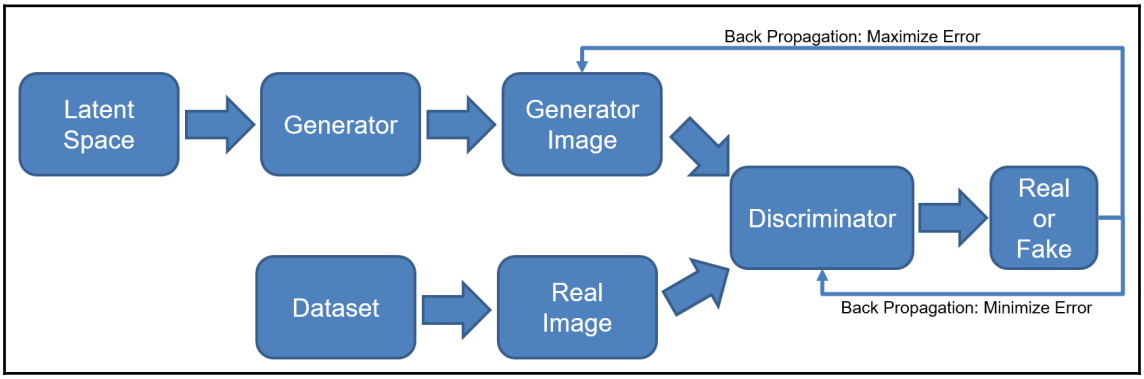
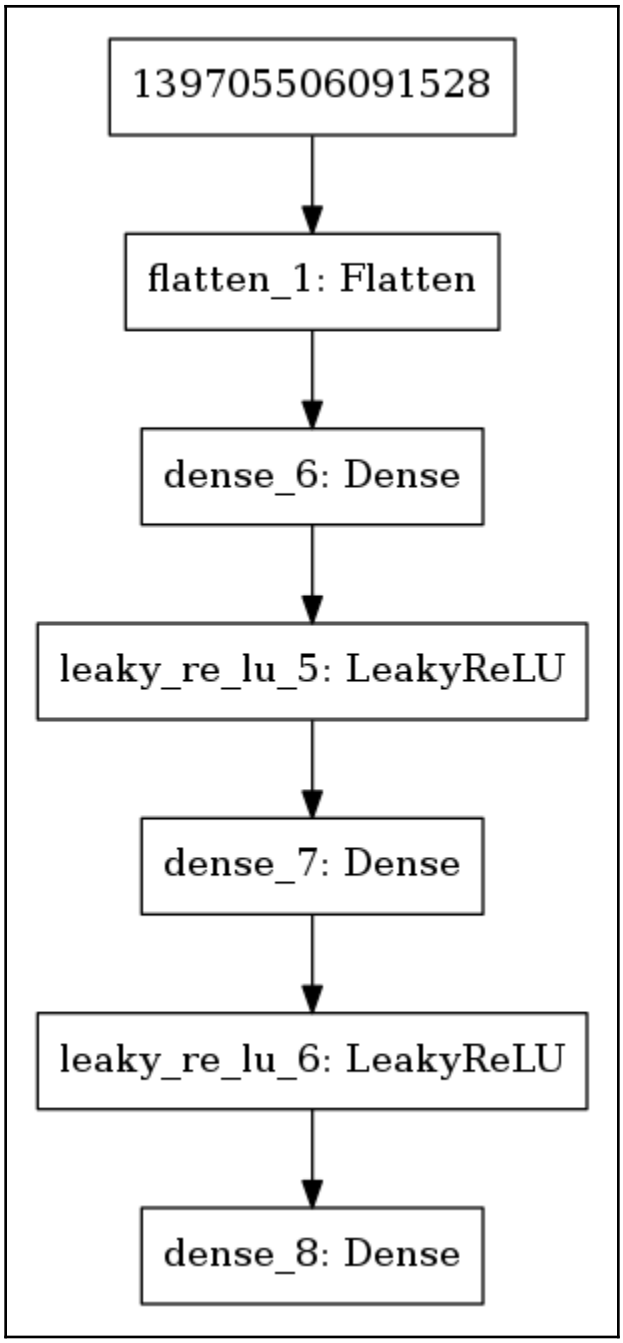


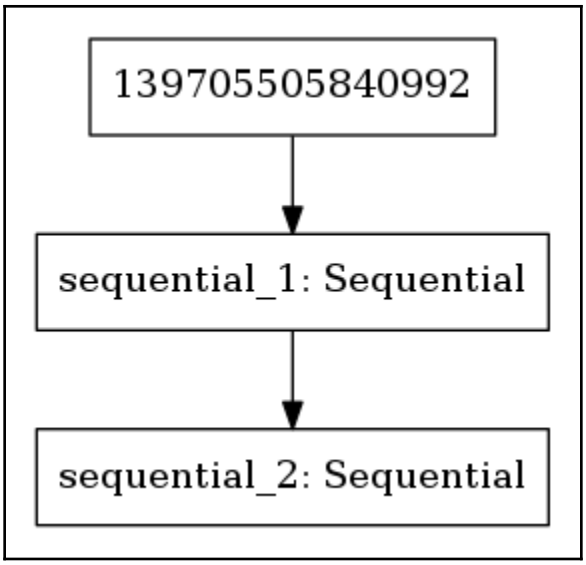
Figure 1
0
5
10
15
20
25
0
5
10
15
20
25
x=24.1061
y=26.2727
[0]

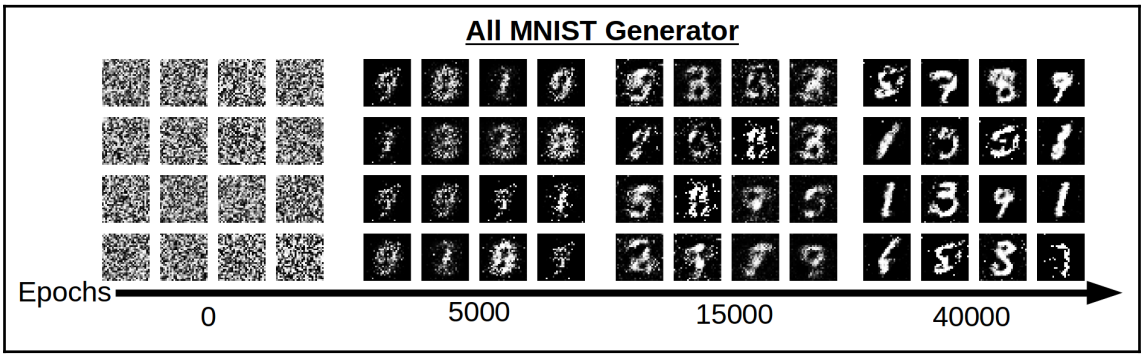


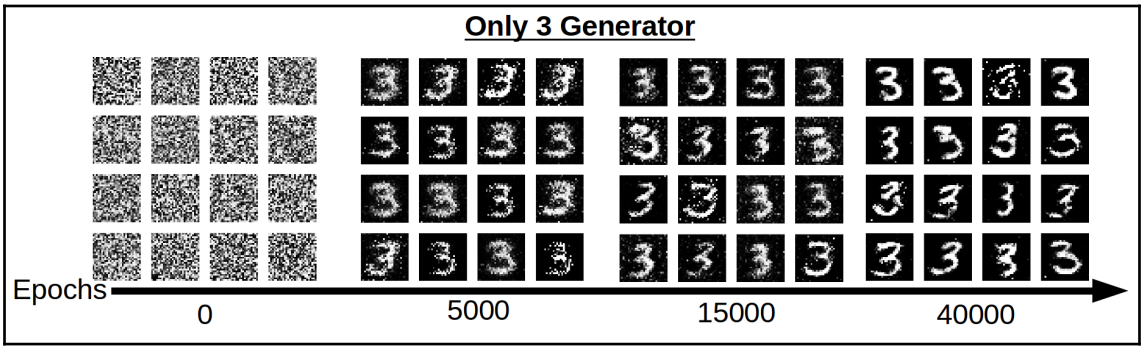
Chapter 3: My First GAN in Under 100 Lines



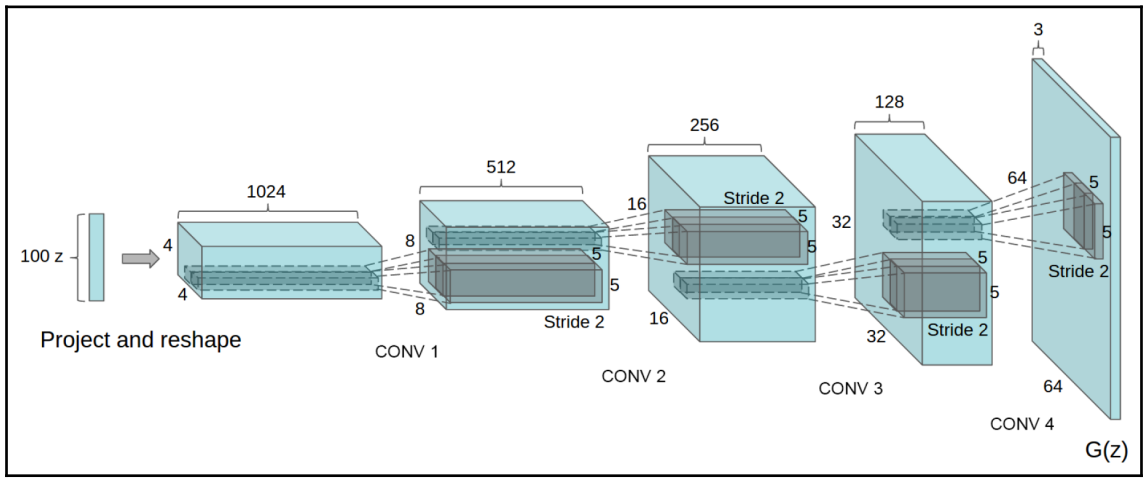

139705506091528
flatten_1: Flatten
dense_6: Dense
leaky_re_lu_5: LeakyReLU
dense_7: Dense
leaky_re_lu_6: LeakyReLU
dense_8: Dense

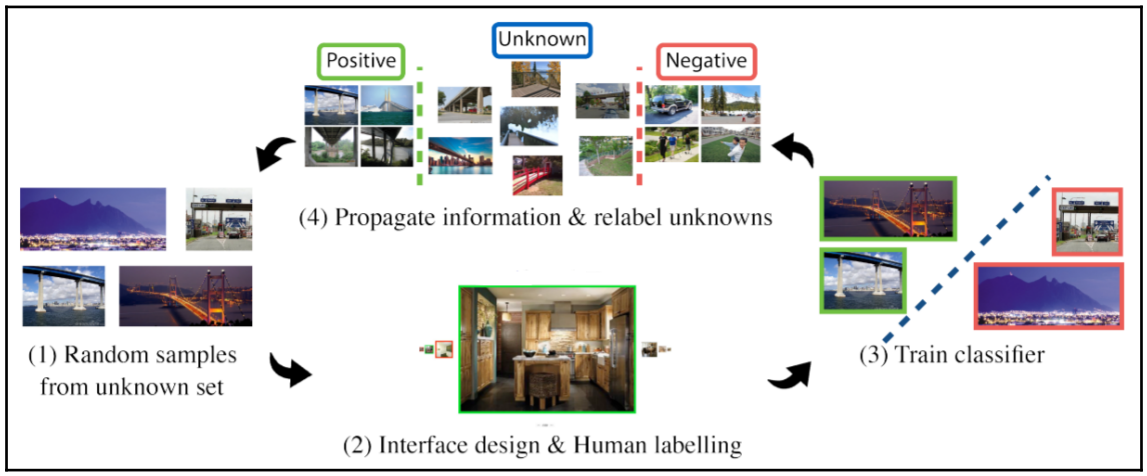

139705505840992
sequential_1: Sequential
sequential_2: Sequential

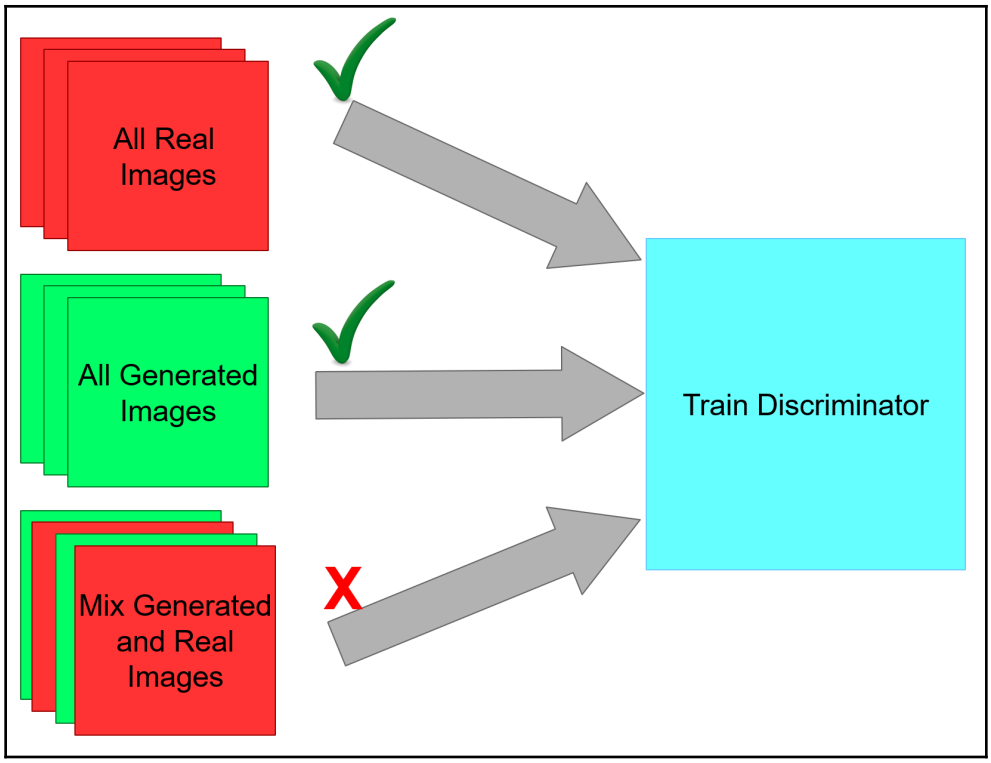

All MNIST Generator
Epochs
0
5000
15000
40000

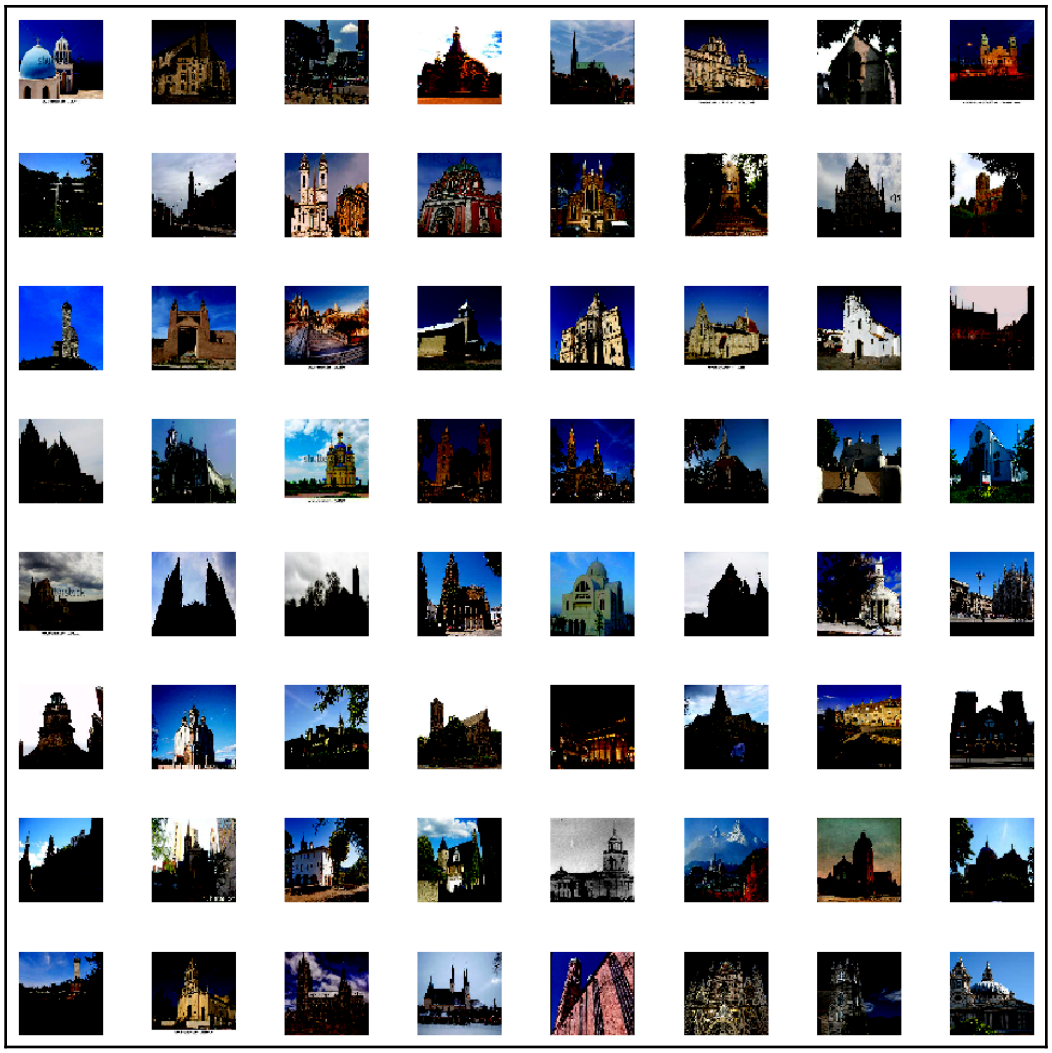

Only 3 Generator
Epochs
0
5000
15000
40000

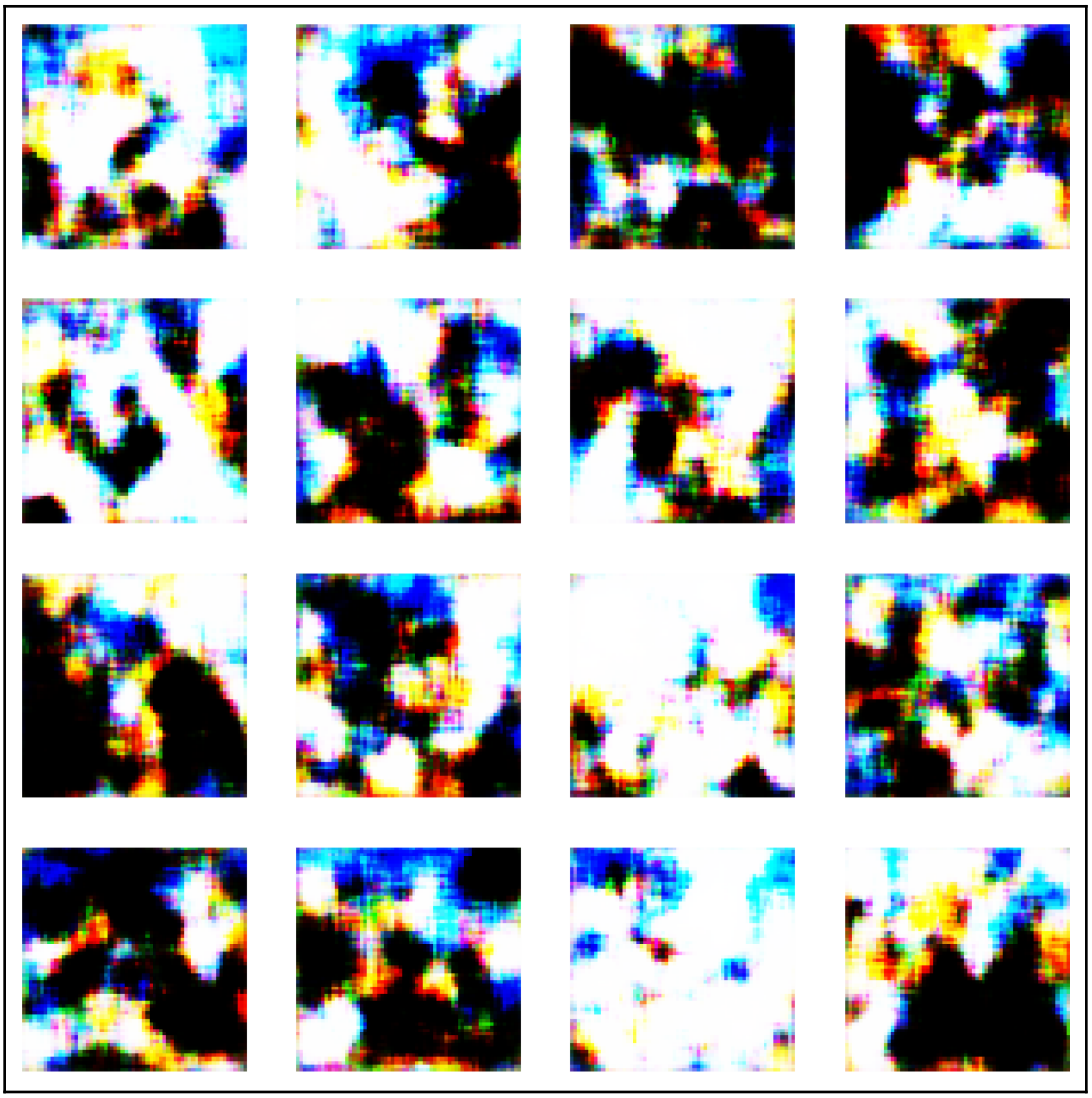
Chapter 4: Dreaming of New Outdoor Structures Using DCGAN

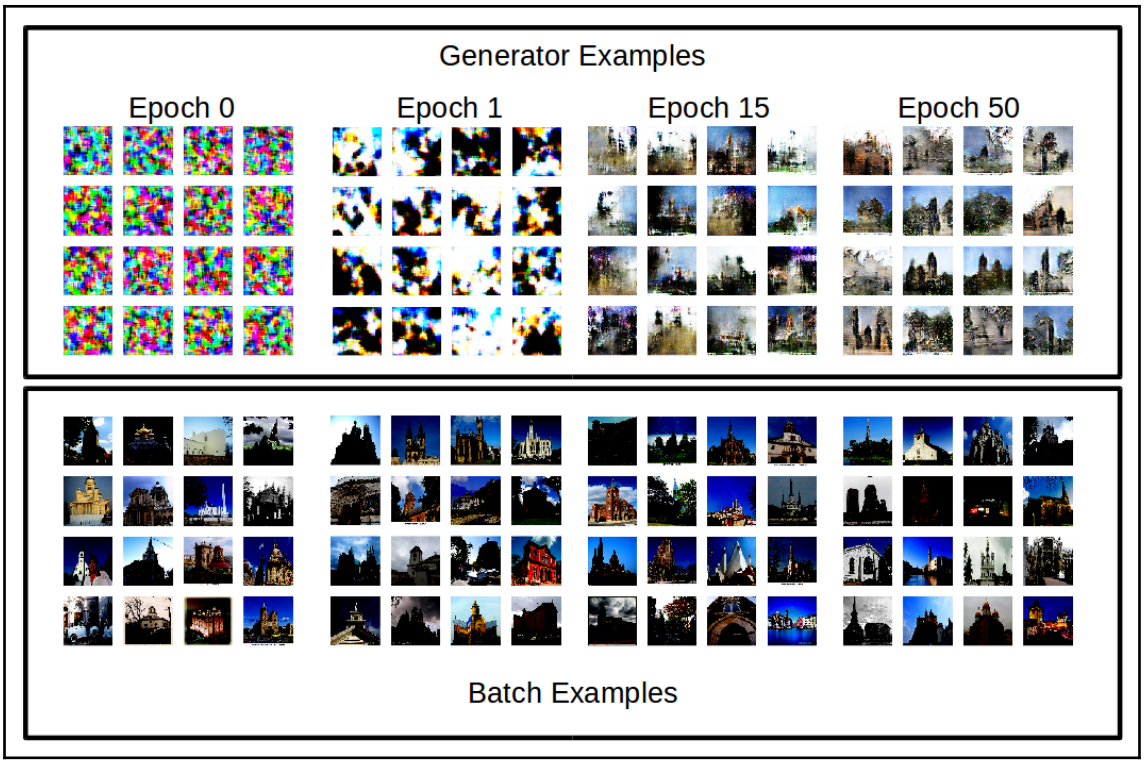




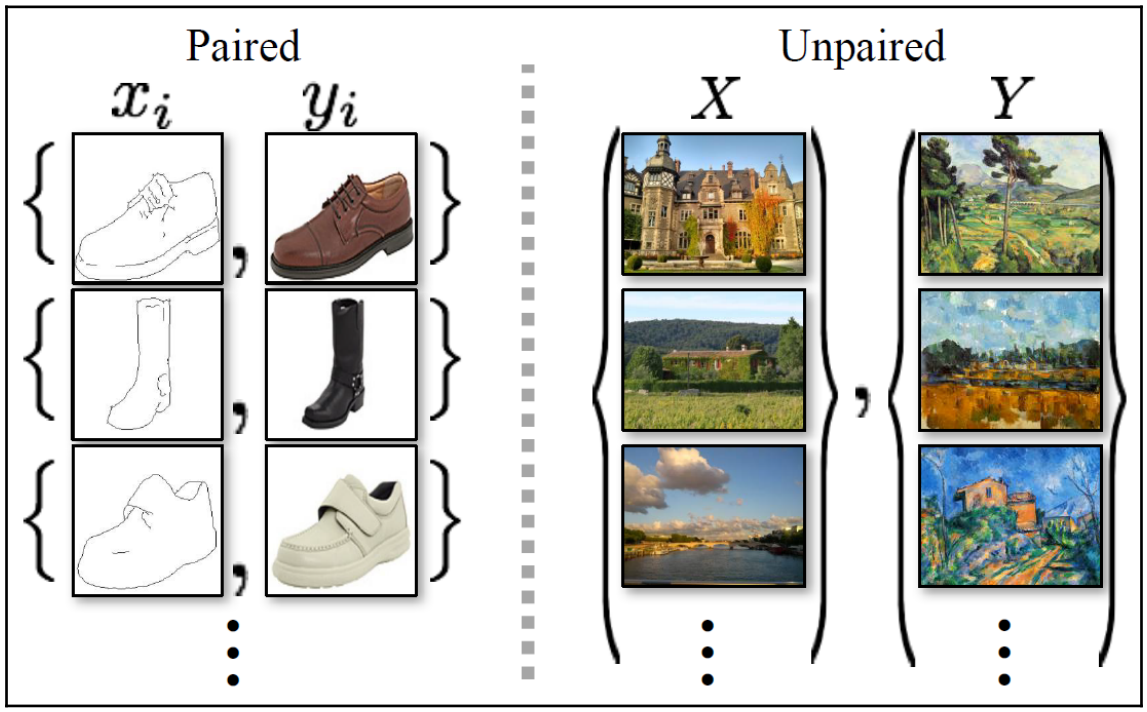

All Real Images
All Generated Images
Mix Generated and Real Images
X
Train Discriminator

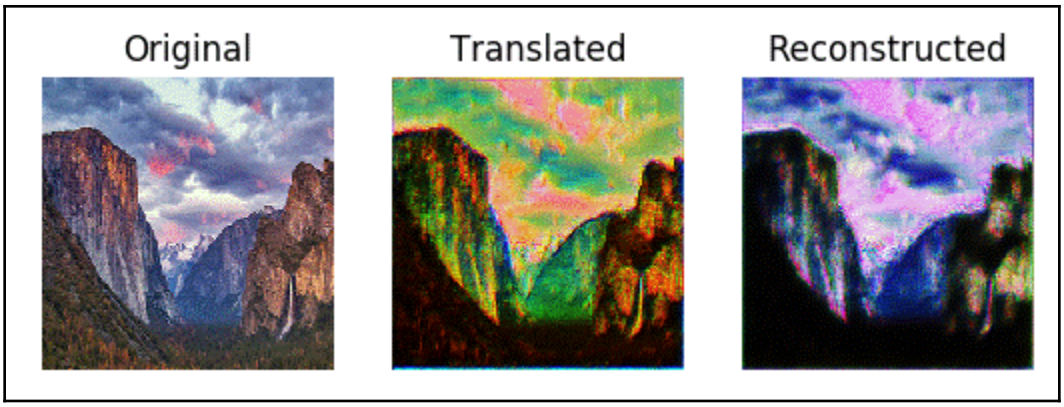




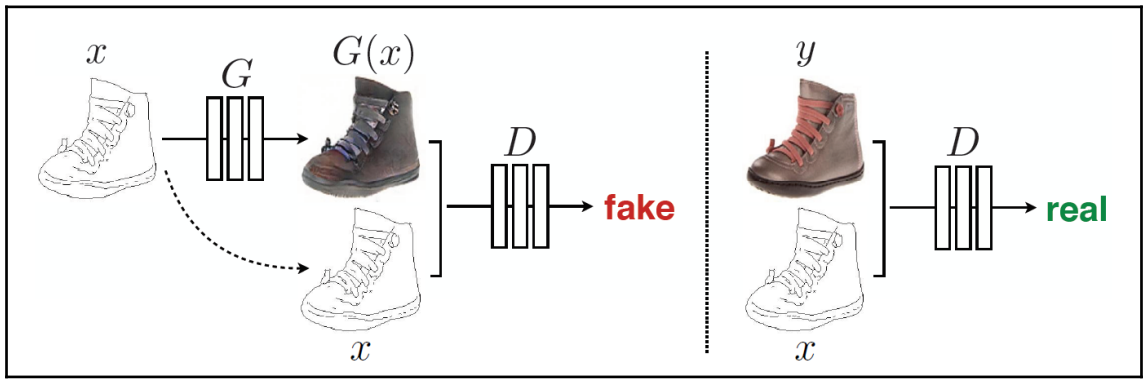

Generator Examples
Epoch 0
Epoch 1
Epoch 15
Epoch 50
Batch Examples

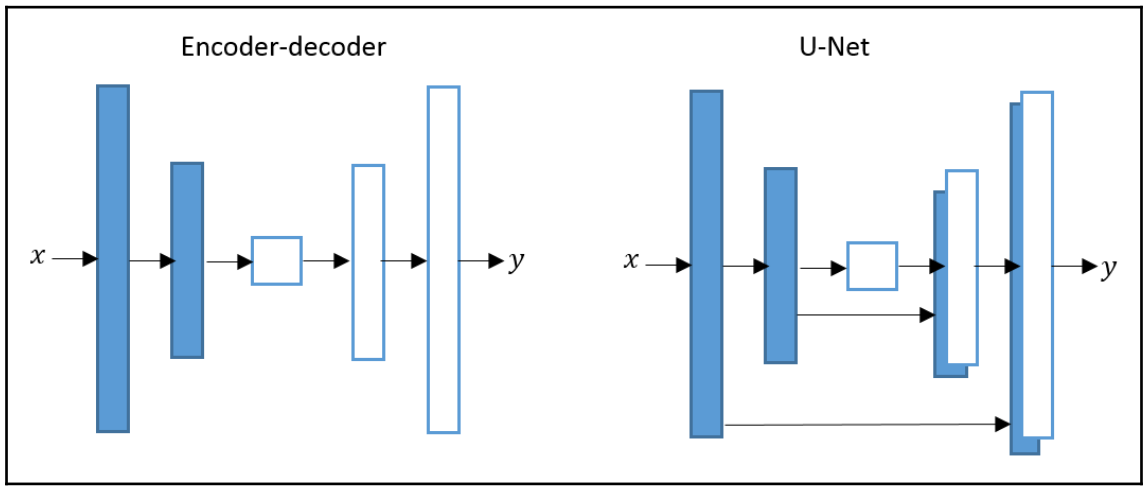
Chapter 5: Pix2Pix Image-to-Image Translation



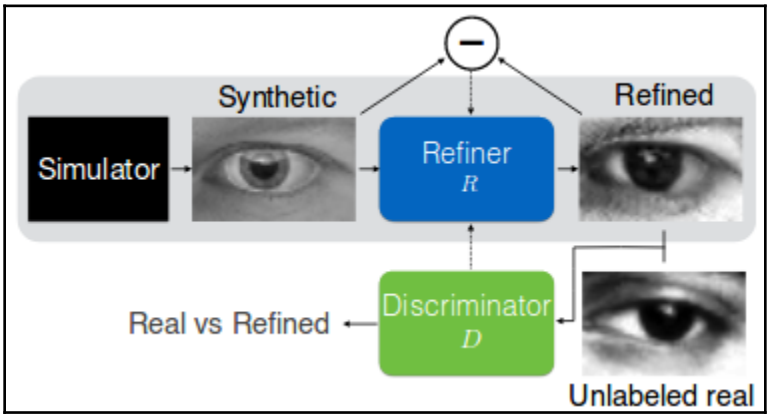

Original
Translated
Reconstructed

Chapter 6: Style Transfering Your Image Using CycleGAN





Chapter 7: Using Simulated Images To Create Photo-Realistic Eyeballs with SimGAN



Algorithm 1: Adversarial training of refiner network $R_{\boldsymbol{\theta}}$

Input: Sets of synthetic images $\mathbf{x}_i \in \mathcal{X}$, and real images $\mathbf{y}_j \in \mathcal{Y}$, max number of steps ($T$), number of discriminator network updates per step (K_d), number of generative network updates per step (K_g).

Output: ConvNet model $R_{\boldsymbol{\theta}}$.

for $t = 1, \ldots, T$ **do**

  for $k = 1, \ldots, K_g$ **do**

    1. Sample a mini-batch of synthetic images $\mathbf{x}_i$.
    2. Update $\boldsymbol{\theta}$ by taking a SGD step on mini-batch loss $\mathcal{L}_R(\boldsymbol{\theta})$ in (4).

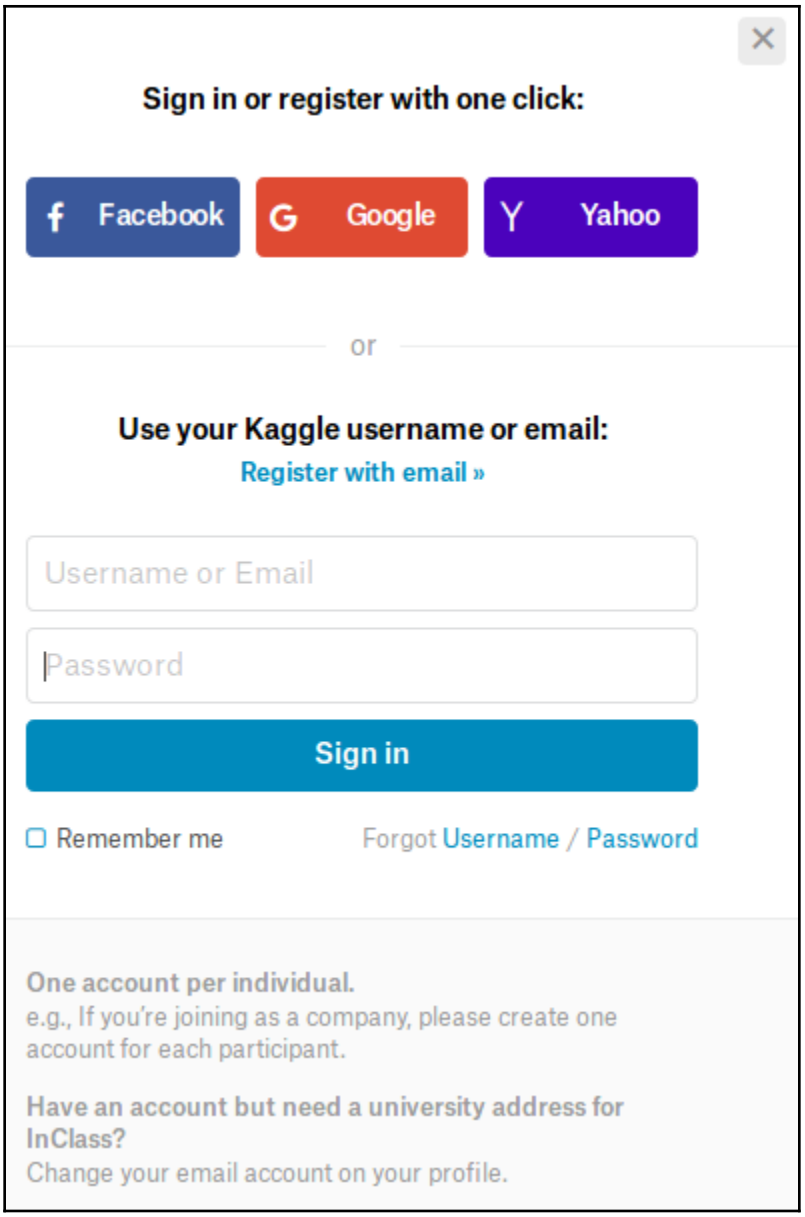
  end

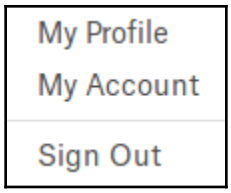
  for $k = 1, \ldots, K_d$ **do**

    1. Sample a mini-batch of synthetic images $\mathbf{x}_i$, and real images $\mathbf{y}_j$.
    2. Compute $\tilde{\mathbf{x}}_i = R_{\boldsymbol{\theta}}(\mathbf{x}_i)$ with current $\boldsymbol{\theta}$.
    3. Update $\boldsymbol{\phi}$ by taking a SGD step on mini-batch loss $\mathcal{L}_D(\boldsymbol{\phi})$ in (2).

  end

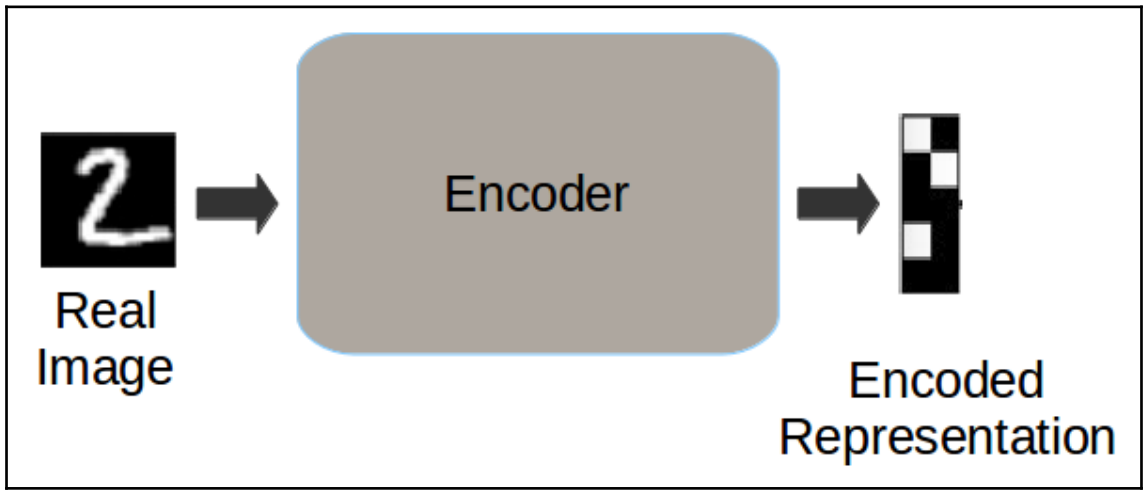
end

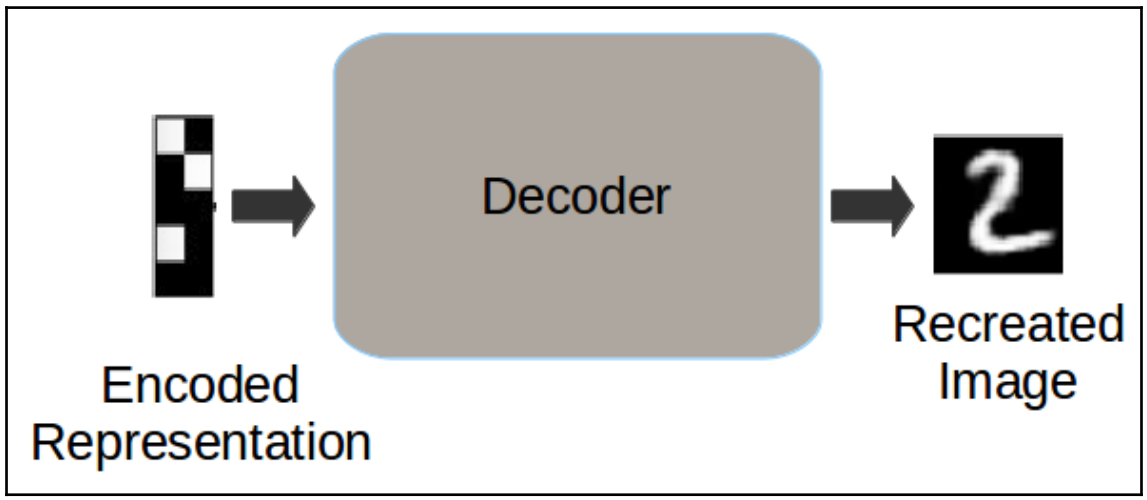

Sign in or register with one click:
Facebook
Google
Yahoo
or
Use your Kaggle username or email:
Register with email »
Username or Email
Password
Sign in
Remember me
Forgot Username / Password
One account per individual.
e.g., If you're joining as a company, please create one account for each participant.
Have an account but need a university address for InClass?
Change your email account on your profile.

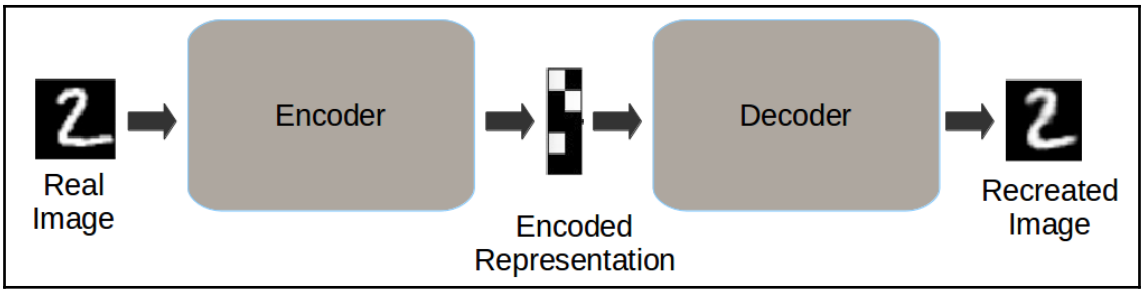

My Profile
My Account
Sign Out

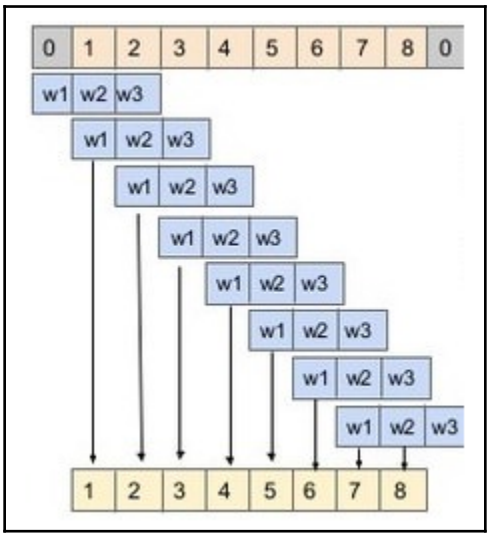

API
Using Kaggle's beta API, you can interact with Competitions and Datasets to download data, make submissions, and more via the command line. Read the docs
Create New API Token
Expire API Token

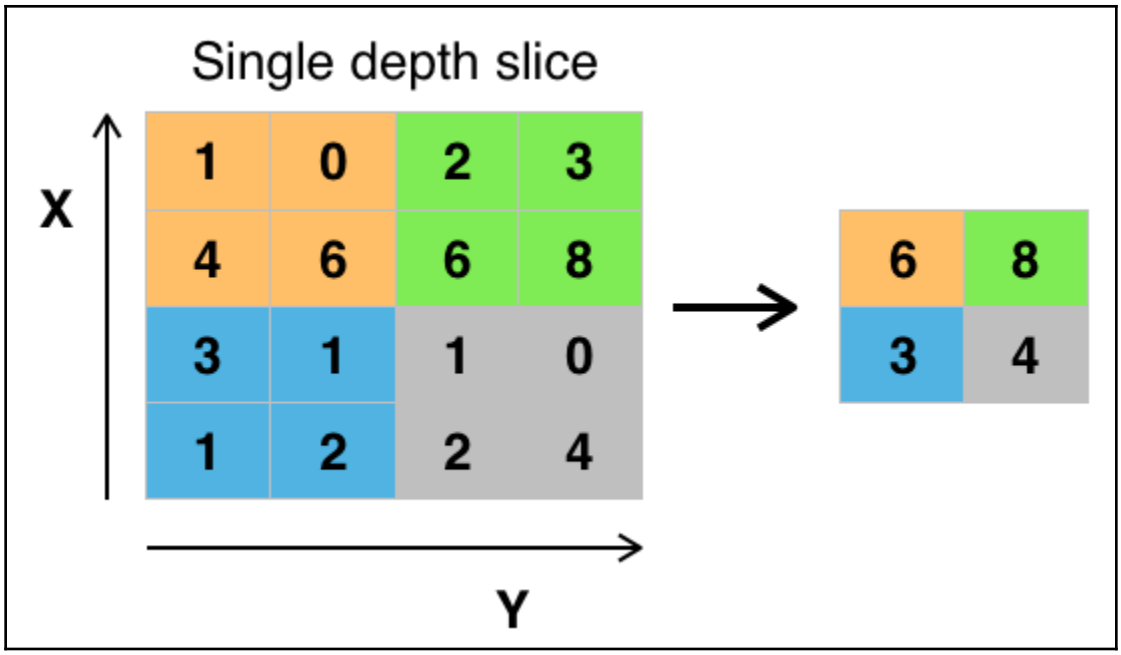
Chapter 8: From Image to 3D Models Using GANs






Real Image
Encoder
Encoded Representation
Decoder
Recreated Image


0 1 2 3 4 5 6 7 8 0
w1 w2 w3
w1 w2 w3
w1 w2 w3
w1 w2 w3
w1 w2 w3
w1 w2 w3
w1 w2 w3
w1 w2 w3
1 2 3 4 5 6 7 8


Single depth slice
X
Y
1 0 2 3
4 6 6 8
3 1 1 0
1 2 2 4
6 8
3 4