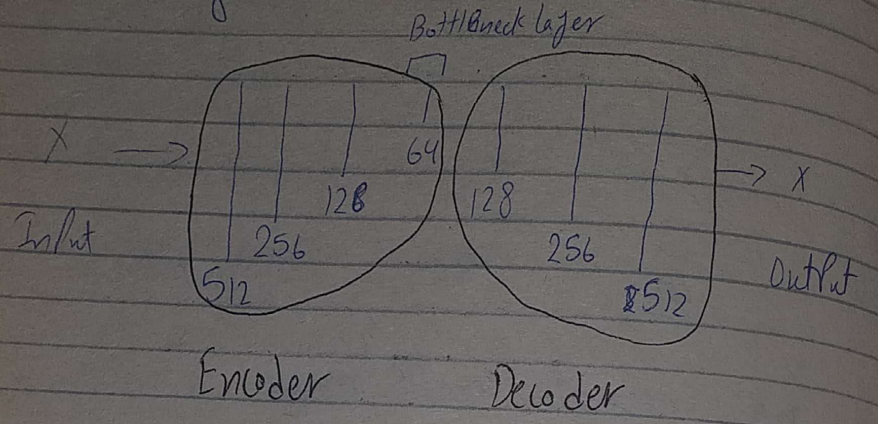
14-12-2021 Tuesday

week # 16 lecture #22

## Auto-Encoder:

Loss usually used = MSE




① Compression of Image & Sending as encrypted & then Decode it

② Use as layer feature extraction & use features as input in training.

③ Fast approach.

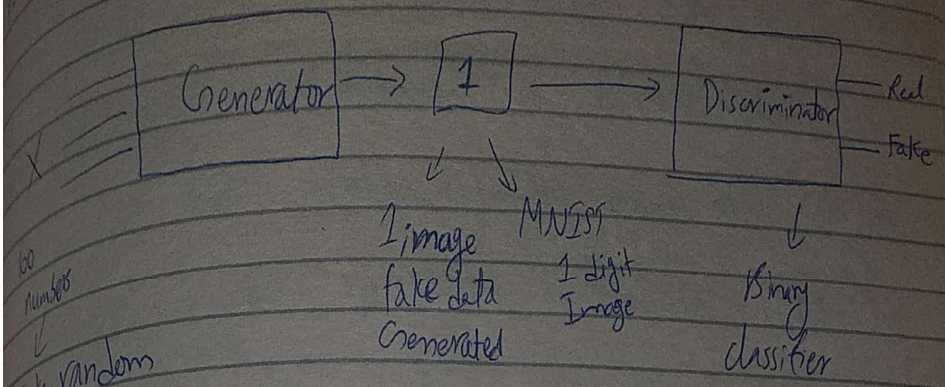
④ Dimensions are reduced

## Generative Adversarial Networks. (GANs)

Generator → Generates fake data s.t Discriminator does identify it

Enemy/Discriminator ⇒ Checks data if it is fake or not

For example:




for each set of random numbers, Generator makes a fake image

Discriminator Training:

Give MNIST 128 images & give it to Discriminator & give label 1

Give Generator 128 images & give it to Discriminator & give label 0

This is for 1 Iteration.

Its loss function is binary cross entropy

$L = -y \log \bar{y} - (1-y) \log \bar{y}$

$\bar{y}$ = Predicted label

$y$ = Actual label.

Minimization Problem.

$L = -y_{data} \log(D(x)) - (1 - y_{fake}) \log(D(G(z))$

$D(x)$ = $x$ real dataset image

$z$ = random input to Generator

$G(z)$ = fake image from Generator

$D(G(z))$ = fake dataset output/label.

$y_{data} = 1$

$y_{fake} = 0$

$1\ G(z)$ = gives 1 fake output image

Generator learns when Discriminator gives label as fake.

" doesn't Learn " " " " " Real.

Loss of Discriminator

$L_{Dis} = y_{data} \log(D(x)) + (1 - y_{fake}) \log(D(G(z))$

Maximization Problem.

Discriminator now maximizes this function & Generator

Loss of Generator.-

$L_{Gen} = -\log(D(G(z)))$

Generator tries to minimizes this function

first we will only train Discriminator for 1 epoch
for weights updation use $L_{Gen}$ derivative
when updating G W's, don't update Discriminator W's.
This is vanilla GAN.

bcz we can't control randomly generated images
either 1 label, 0 label image
So we give input a label with random Z vector,
then CAN would generate that label fake
images. This is called Conditional GAN.

our Goal is to make Discriminator give
0.5 Probability so that it is confused that
image is either fake or real.

we don't train Discriminator fully so that Generator is not demotivated.

Z $\begin{bmatrix} a_1 & a_2 & \dots & a_{256} \end{bmatrix}$ $\frac{1}{1}$ Z=1 image
if we change 1 value in vector we get another image