	NOISE REDUCTION.	50
	IMAGE DENOISING WITH AUTOENCODERS	1
The state of the s	USING TENSOR-FLOW	E .
	Objective - Train a newal notwork to	
· ·	identify images number displayed	
1 (now)	in handweitten images (mnist) Dataset Same we used in	777
A service	Bosic Image Classification coith knowflow.	
	with ensorgious.	
,	- Add noise and denoise the data.	
	So that we can teach our network what important things	
	the data which will be	
	guen in seal time.	
	guen .	
	TACK-1 Import Libraries	
	TASK-2 Data Reprocessing	
	X-train, Y-train) 1 (x-test, Y-kest) = mist - lood-datel	) 1
5		1
	values, ale in range of 0-255 50 we will normalize them next.	
	- [x-kair = + kair - astype ('float') /255	
	Lt-1621 X-1621- costyple ( floor) / 265	
	Normalizing the data the getting them	10
	in large O-1. This is not a good	19
	U	

approach and only valid when the data shorts from o and we know on upper limit. A B 6 6 F IS 1- 19ain = np. roshape (x-teain, (6000, 784)) F 3 X-fest = np. leshape (x-kst, (10000, 784)) F FI 7 Keshaping ferom (6000, (28,28)) to (6000,784) FI Original shape 28x28 - 78 4. . This TASIL - 3 ADDING NOISE: is done so

Random values b/wob! How we can

Random values b/wob! How we can

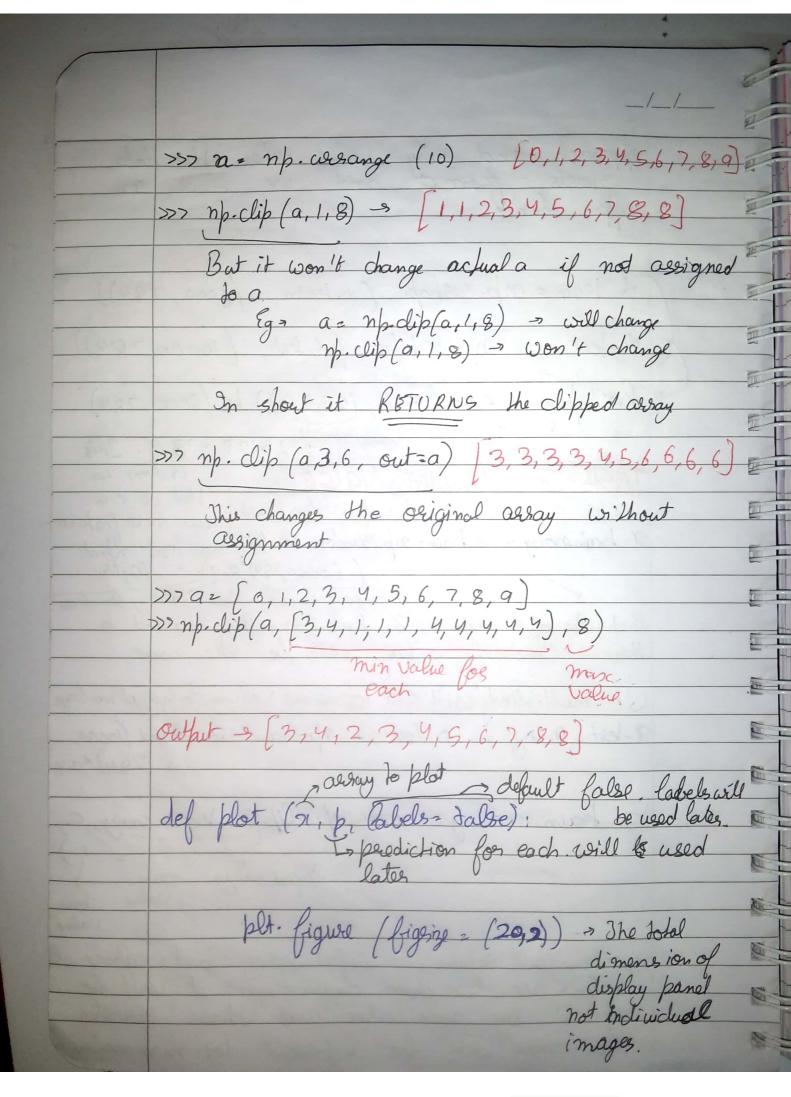
Random values b/wob! How of features

1 - Leain moisy = 2- Leain + np. sandom values in first in first

Shape of sandom values is Scaling Homodom

Lach value of 2 - Leain will have some thing added to

them landomly his will be the noise. 1 We multiplied with 0-9 toens use values do not get too large Il-lest-noisy 2 t-feet + mp. Random. Found (10000, a-kain-noisy = x te np. clip (21-brain-noisy, o. Input orday min Value max value. rp. clip will return the input warray but where values are less than minimum it will be replaced by min value and those greater 1 سل How mose will be replaced by max value.



Show () displaye the figure you should n't call; I until you have plotted things and wan thom to be desplayed. bl. imshow()

draws an image blt. Subplot (1,10, i+1)

on whom figure.

plt. imshow just finishes

1200 to columns from 1 as

drawing a picture instead of printing

it. plt. show will print

getting back borigin gelting back borighal plt. imshow (seli). reshape (29, 29), shape of tiches by fiches volues orne-ones libe 0, 10, 20 etc. (map comp) and principal plt. 91 fiches ([)) ? Remoning 21 tiches & ytickes ([)) ore there then plt. a label (mp-argman (p[i]))

display on x-axis

plt. show () > Finally display plot. plot (d-kain, None) TAS12-4 Building & Training a Classifies 100 We will brain a classifier on non-noisy data and we will see how it does on noisy data. 1

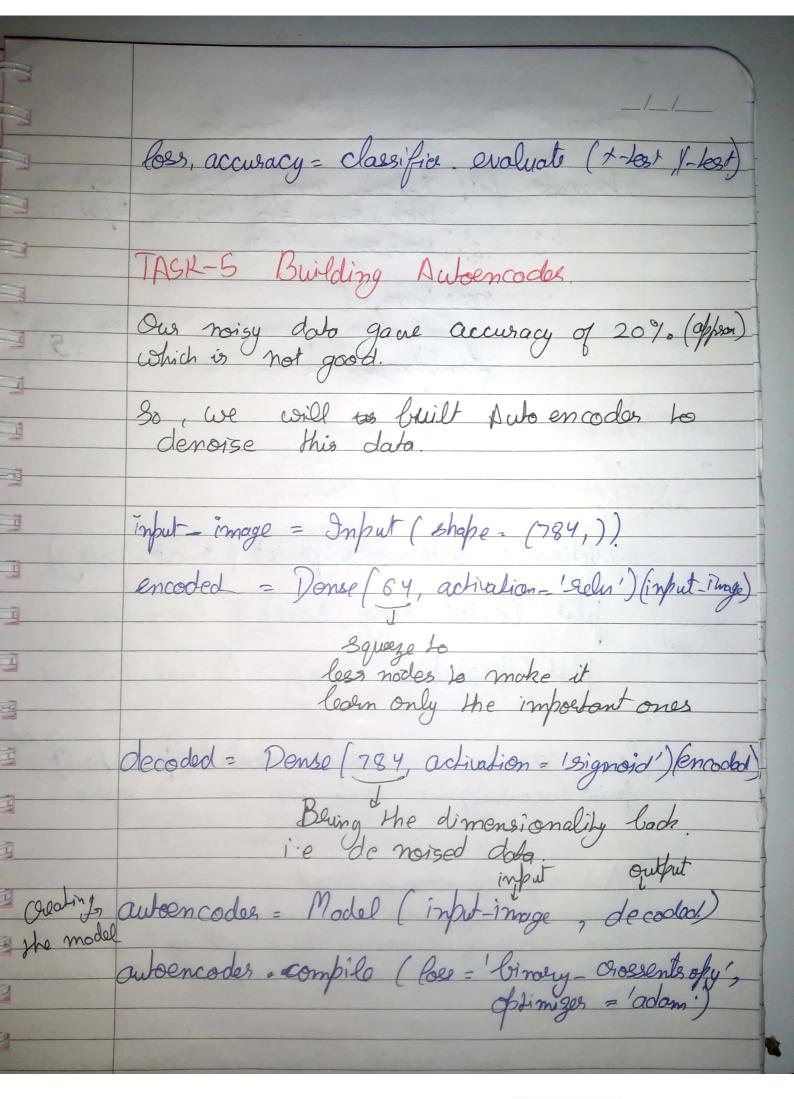
Model of Respos in which we only need to input the hours of layers as Dense (258, activation 2 solu 1 input

Dense no of activation sectified 1

layer nodes function linear Input

unit nodes

nodes. classifies = Sequential ([ First leyer > Dense (256, activation = redu'), Second layer -Dense (10, activotion = 'softmai') 10 l'ecause to get 10 classes in probability endie 1 to 10 score classifier - Compile (
ofptimizes = 'adam' loss function adaptive moment estimate loss: Sparse: categorical Ordselntropy; mobiles = ['accusacy'] Bit ( x-leain, y-leain, batch- 9ng: 512, epoche = ? classifier. epocho=3)



TASK-6 Training the Encodes autoencodes. fit (X-Dain noisy X-Dain chochs=100, 1 batch-5ize=512, Volidation Split=02, 1 Call backer 2 [ Early stopping months = 'val - loss' phione of Lambda callback - - -TASIL-7 Donoised Images. > priedictions = autoencoder predict ( a lest nois y) Denoised plot (x-lest-noisy, None) - Noisy data smager plot (peredictions, None) - De noised images loss, accuracy: classifies. evaluate (predictions) = print (accuracy) -> from 20% to 90% approx. Combine classifier and encodes to first denoise then classify images. This will be a Composite model which completes the prediction hipeline. So we send whether noisy or non noisy data the Model works.

input - image = Input (shape = (784,)) > x = cutoencoder (input-image) Denois ed classifier (21) denoise-and-classify = Model (input-image, y) model name. Here it is 1 to 10 predictions 2 denoise and classify. product (91 lest-noise) plot ( n-test-noisy, productions, True) These a help in composition ledwar expected and 2 1 to-calegorical (y-test), Drue) output plot (n-test Original test set. one hot encoded values X = np. Leshape (x, (10009, 74)) and X = X. Leshape ((10000, 74)) are same things. Point 2 mp. augman (v) > St lections the index of max Point 3-7 When classification problem eg = 10 classes, lasses, we use these loss functions

Les function 1 > Sporse Calégorical crossentes, when labels are not encoded Loss function 23 Calegorical cross entropy after one-hot encoding labels. Point 3>>> Auto encoding can be used for lossy data compression where the compression is dependent on data itself. " Duto encoding is also to help reduce dimensionality of data. H- H- B-A This algo to reduce dimensionality of data, as learned from data itself, can also be used for reducing noise in data.