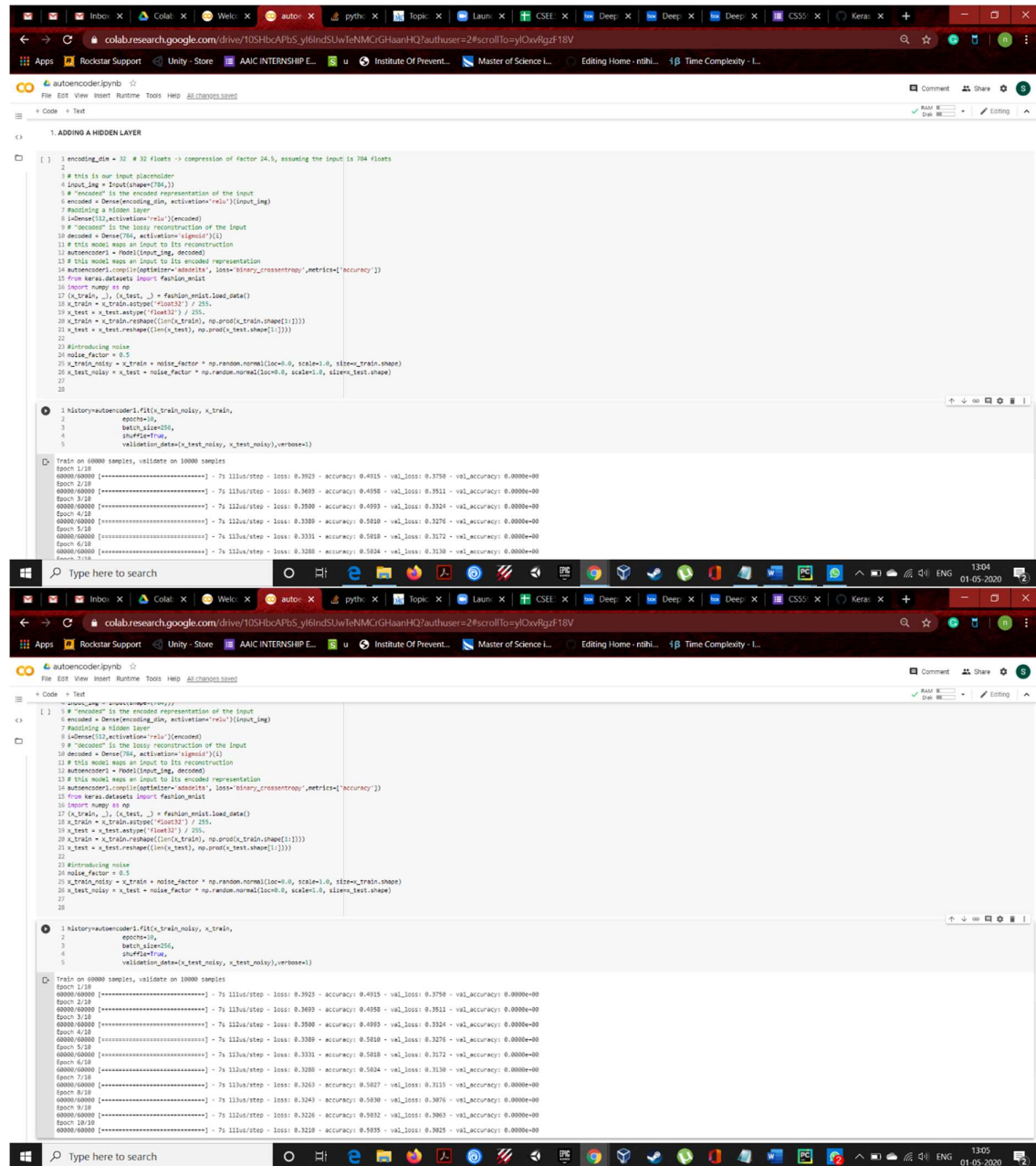


DeepLearning_Lesson 6: Autoencoders

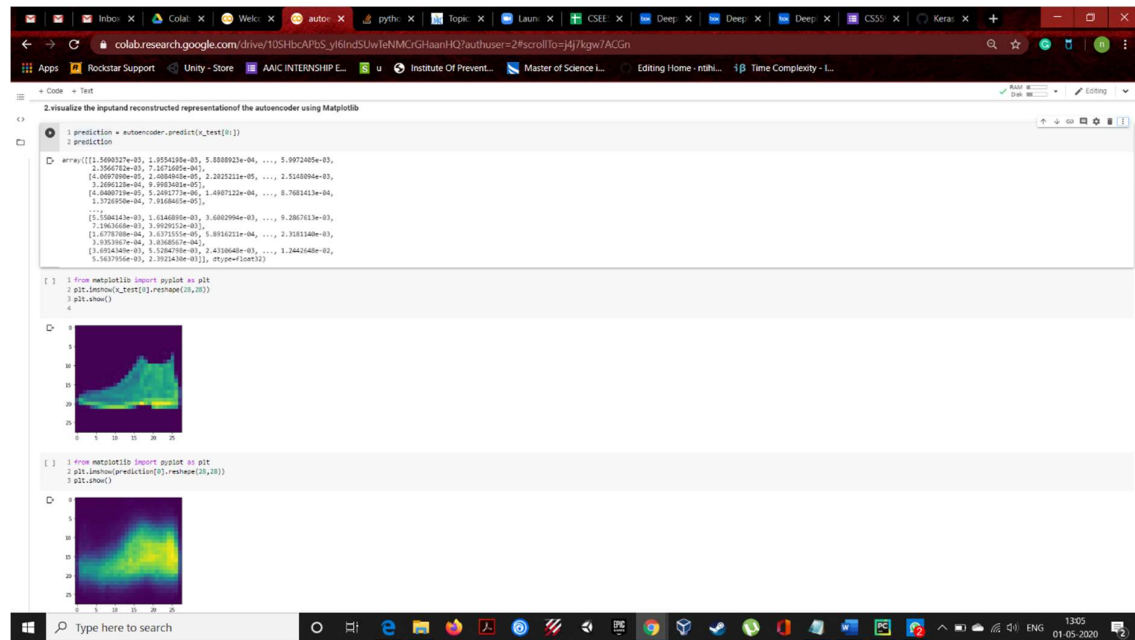
Module 2: ICP 6

1. ADD ONE MORE HIDDEN LAYER TO AUTOENCODER



```
1 encoding_dim = 32 # 32 floats -> compression of factor 24.5, assuming the input is 784 floats
2
3 # this is our input placeholder
4 input_img = Input(shape=(784,))
5 # "encoder" is the encoded representation of the input
6 encoded = Dense(encoding_dim, activation='relu')(input_img)
7 # adding a hidden layer
8 encoded = Dense(128, activation='relu')(encoded)
9 # "decoder" is the lossy reconstruction of the input
10 decoded = Dense(784, activation='sigmoid')(encoded)
11 # this model maps an input to its reconstruction
12 autoencoder = Model(input_img, decoded)
13 # this model maps an input to its encoded representation
14 autoencoder.compile(optimizer='adamax', loss='binary_crossentropy', metrics=['accuracy'])
15 from keras.datasets import fashion_mnist
16 import numpy as np
17 (x_train, y_train), (x_test, y_test) = fashion_mnist.load_data()
18 x_train = x_train.astype('float32') / 255.
19 x_test = x_test.astype('float32') / 255.
20 x_train = x_train.reshape((len(x_train), np.prod(x_train.shape[1:])))
21 x_test = x_test.reshape((len(x_test), np.prod(x_test.shape[1:])))
22
23 # introducing noise
24 noise_factor = 0.5
25 x_train_noisy = x_train + noise_factor * np.random.normal(loc=0.0, scale=1.0, size=x_train.shape)
26 x_test_noisy = x_test + noise_factor * np.random.normal(loc=0.0, scale=1.0, size=x_test.shape)
27
28
29 history = autoencoder.fit(x_train_noisy, x_train,
30                          epochs=10,
31                          batch_size=256,
32                          shuffle=True,
33                          validation_data=(x_test_noisy, x_test), verbose=1)
34
35 train on 60000 samples, validate on 10000 samples
36 Epoch 1/10
37 60000/60000 -> 7s 111us/step - loss: 0.3923 - accuracy: 0.4915 - val_loss: 0.3759 - val_accuracy: 0.0000-00
38 Epoch 2/10
39 60000/60000 -> 7s 113us/step - loss: 0.3693 - accuracy: 0.4959 - val_loss: 0.3511 - val_accuracy: 0.0000-00
40 Epoch 3/10
41 60000/60000 -> 7s 112us/step - loss: 0.3590 - accuracy: 0.4993 - val_loss: 0.3324 - val_accuracy: 0.0000-00
42 Epoch 4/10
43 60000/60000 -> 7s 112us/step - loss: 0.3389 - accuracy: 0.5010 - val_loss: 0.3272 - val_accuracy: 0.0000-00
44 Epoch 5/10
45 60000/60000 -> 7s 113us/step - loss: 0.3331 - accuracy: 0.5018 - val_loss: 0.3172 - val_accuracy: 0.0000-00
46 Epoch 6/10
47 60000/60000 -> 7s 112us/step - loss: 0.3288 - accuracy: 0.5024 - val_loss: 0.3138 - val_accuracy: 0.0000-00
48 Epoch 7/10
49 60000/60000 -> 7s 113us/step - loss: 0.3263 - accuracy: 0.5027 - val_loss: 0.3115 - val_accuracy: 0.0000-00
50 Epoch 8/10
51 60000/60000 -> 7s 113us/step - loss: 0.3243 - accuracy: 0.5036 - val_loss: 0.3076 - val_accuracy: 0.0000-00
52 Epoch 9/10
53 60000/60000 -> 7s 112us/step - loss: 0.3228 - accuracy: 0.5032 - val_loss: 0.3063 - val_accuracy: 0.0000-00
54 Epoch 10/10
55 60000/60000 -> 7s 111us/step - loss: 0.3210 - accuracy: 0.5035 - val_loss: 0.3025 - val_accuracy: 0.0000-00
```

2. VISUALIZE THE INPUT AND RECONSTRUCTED REPRESENTATION OF THE AUTOENCODER USING MATPLOTLIB



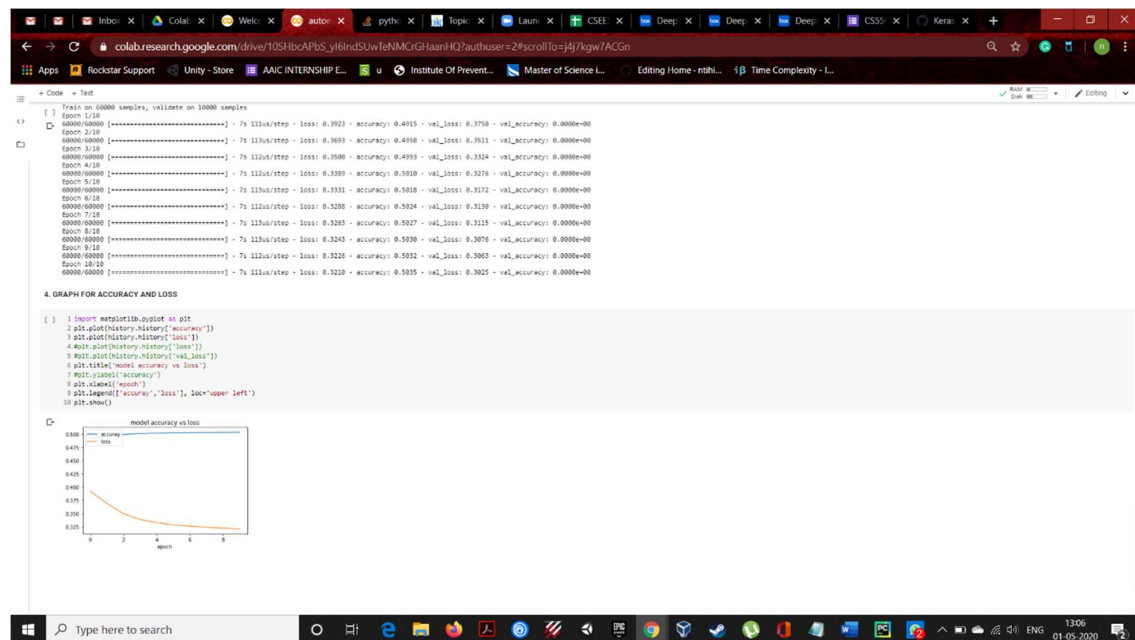
3. VISUALIZE THE INPUT, NOISY INPUT AND RECONSTRUCTED REPRESENTATION (DENOISED OUTPUT) OF THE DENOSING_AUTOENCODER USING MATPLOTLIB

```
3. visualize the input, noisy input and reconstructed representation(denoised output) of the Denosing_Autoencoder using Matplotlib

1 # encoding_dim = 32 # 32 floats -> compression of factor 24.5, assuming the input is 784 floats
2
3 # this is our input placeholder
4 input_img = Input(shape=(784,))
5 # "encoder" is the encoded representation of the input
6 encoded = Dense(encoding_dim, activation='relu')(input_img)
7 # "decoder" is the noisy reconstruction of the input
8 decoded = Dense(784, activation='sigmoid')(encoded)
9 # this model takes an input to its reconstruction
10 autoencoder = Model(input_img, decoded)
11 # this model takes an input to its encoded representation
12 autoencoder.compile(optimizer='adadelta', loss='binary_crossentropy')
13
14 from keras.datasets import fashion_mnist
15 import numpy as np
16 (x_train, y_train), (x_test, y_test) = fashion_mnist.load_data()
17 x_train = x_train.astype('float32') / 255.
18 x_test = x_test.astype('float32') / 255.
19 x_train = x_train.reshape((len(x_train), np.prod(x_train.shape[1:])))
20 x_test = x_test.reshape((len(x_test), np.prod(x_test.shape[1:])))
21
22 # introducing noise
23 noise_factor = 0.5
24 x_train_noisy = x_train + noise_factor * np.random.normal(loc=0.0, scale=1.0, size=x_train.shape)
25 x_test_noisy = x_test + noise_factor * np.random.normal(loc=0.0, scale=1.0, size=x_test.shape)
26
27 autoencoder.fit(x_train_noisy, x_train,
28               epochs=10,
29               batch_size=256,
30               shuffle=True,
31               validation_data=(x_test_noisy, x_test_noisy))
32
33 train on 60000 samples, validate on 10000 samples
34 Epoch 1/10
35 60000/60000 [=====] - 3s 43us/step - loss: 0.5294 - val_loss: 0.4575
36 Epoch 2/10
37 60000/60000 [=====] - 3s 42us/step - loss: 0.4282 - val_loss: 0.4042
38 Epoch 3/10
39 60000/60000 [=====] - 3s 43us/step - loss: 0.3973 - val_loss: 0.3838
40 Epoch 4/10
41 60000/60000 [=====] - 3s 43us/step - loss: 0.3824 - val_loss: 0.3718
42 Epoch 5/10
43 60000/60000 [=====] - 3s 43us/step - loss: 0.3788 - val_loss: 0.3591
44 Epoch 6/10
45 60000/60000 [=====] - 3s 43us/step - loss: 0.3689 - val_loss: 0.3490
46 Epoch 7/10
47 60000/60000 [=====] - 3s 43us/step - loss: 0.3528 - val_loss: 0.3405
48 Epoch 8/10
49 60000/60000 [=====] - 3s 43us/step - loss: 0.3462 - val_loss: 0.3336
50 Epoch 9/10
51 60000/60000 [=====] - 3s 43us/step - loss: 0.3418 - val_loss: 0.3280
52 Epoch 10/10
53 60000/60000 [=====] - 3s 43us/step - loss: 0.3367 - val_loss: 0.3233
54 <keras.callbacks.callbacks.History at 0x7936d7040b>

1 # from matplotlib import pyplot as plt
2 # plt.imshow(x_train[1].reshape(28,28))
3 # plt.show()
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4. PLOT LOSS AND ACCURACY USING THE HISTORY OBJECT



BY

DUKKIPATI SRI SAI NITHIN CHOWDARY

CLASS ID: 4