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[19]: import tensorflow as tf
      from tensorflow import keras
      from keras.models import Sequential
      from keras.layers import Input,Dense
      import matplotlib.pyplot as plt
      import numpy as np

[11]: mnist = tf.keras.datasets.mnist;
      (x_train_full,y_train_full),(x_test_full,y_test_full) = mnist.load_data()

[12]: x_train_full = x_train_full.astype('float32') / 255.0
      x_test_full = x_test_full.astype('float32') / 255.0

[13]: x_train_full = x_train_full.reshape(-1,784)
      x_test_full = x_test_full.reshape(-1,784)
      len(x_test_full[0])

[13]: 784
```

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[59]: plt.figure(figsize=(12,30))
      # plt.figure(figsize=(12, 6))
      for i in range(10):
          x_train = x_train_full[y_train_full == i]
          x_test = x_test_full[y_test_full == i]
          input_shape = 784
          encoder = Sequential([
              Input(shape=(input_shape,)),
              Dense(128,activation="relu"),
              Dense(64,activation="relu"),
              Dense(32,activation="relu"),
          ])
          decoder = Sequential([
              Input(shape=(32,)),
              Dense(64,activation="relu"),
              Dense(128,activation="relu"),
              Dense(input_shape,activation="sigmoid")
          ])
          autoencoder = Sequential([encoder,decoder])
          autoencoder.compile(optimizer = "adam",loss="mean_squared_error",metrics=["accuracy"])
          autoencoder.fit(x_train,x_train,epochs=10,batch_size=32,shuffle=True,verbose=0)
          y_pred = autoencoder.predict(x_test)

          mse = np.mean(np.power(x_test - y_pred , 2) , axis = 1)
          threshold = np.percentile(mse,95)
          anomalies = mse > threshold
          plt.subplot(5,2,i+1)
          plt.plot(mse,marker=".",linestyle="")
          plt.xlabel("MSE ")
          plt.ylabel("Sample Index")
          plt.title(f"for digit: {i}")
          plt.axhline(threshold,color="r",linestyle="--")
          plt.legend(["MSE of Samples","Anomaly Threshold"],loc="upper right")

      plt.show()
```

```
31/31 ————— 0s 3ms/step
36/36 ————— 0s 3ms/step
33/33 ————— 0s 3ms/step
32/32 ————— 0s 3ms/step
31/31 ————— 0s 3ms/step
28/28 ————— 0s 3ms/step
30/30 ————— 0s 3ms/step
33/33 ————— 0s 3ms/step
31/31 ————— 0s 3ms/step
32/32 ————— 0s 2ms/step
```





