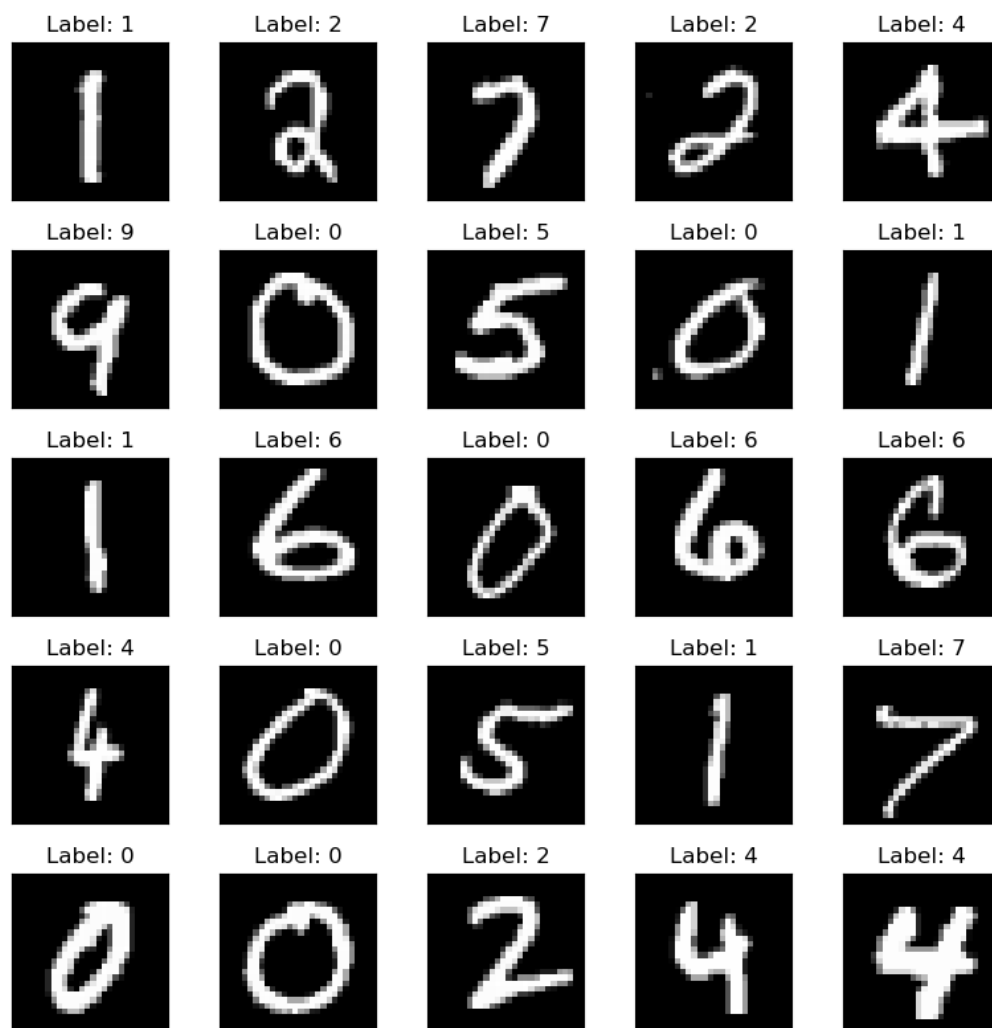Report OF Assignment Four

Autoencoder over MNIST Dataset

1 Introduction

Convolutional neural networks are networks processing data that have the topology of grids, the first example that can pop in mind is images, also time series can be considered one dimensional grids and many other examples. "Convolutional" indicate the usage of the covolution mathematical operation which is applied on two functions (f and g) that produces a third function expressing how the shape of one is modified by the other. This operation is used over at least one layer in the network. The motivation behind using convulution operation is the fact that it cam improve machine learning algorithms through: sparse interactions,parameter sharing and equivariant representations in addition to the flexibility with input sizees.

1.1 Data Processing

THe MNIST dataset is very compatible with the nature of convolutional neural networks thus, the data only need to be loaded into data loaders that are used for training.

2 Methods

2.1 AutoEncoder

The learning algorithm in this part is an autoencoder which is an unsupervised method of learning aiming to lean a representation of the dataset in the form of dimensionality reduction by training the network to ignore noise. This process takes the form of two stages, Encoding then decoding, by encoding the dimensions are reduced so that the model is fed only the valuable information, we see that as thee input image has dimension of 28*28*1 but the encoded output only has dimension of 7*7*4, in the code this is done over teo steps, first is encoding and second is max pooling.

2.2 Denoiser

Denoisers have very similar structure of network but use input data that have added noise which will lead into higher loss.
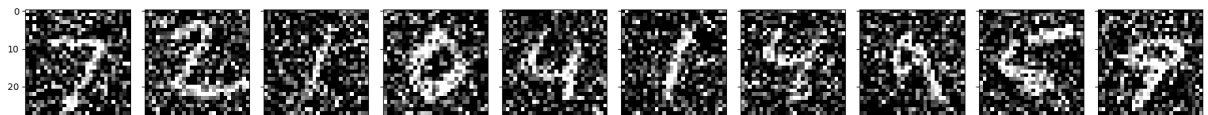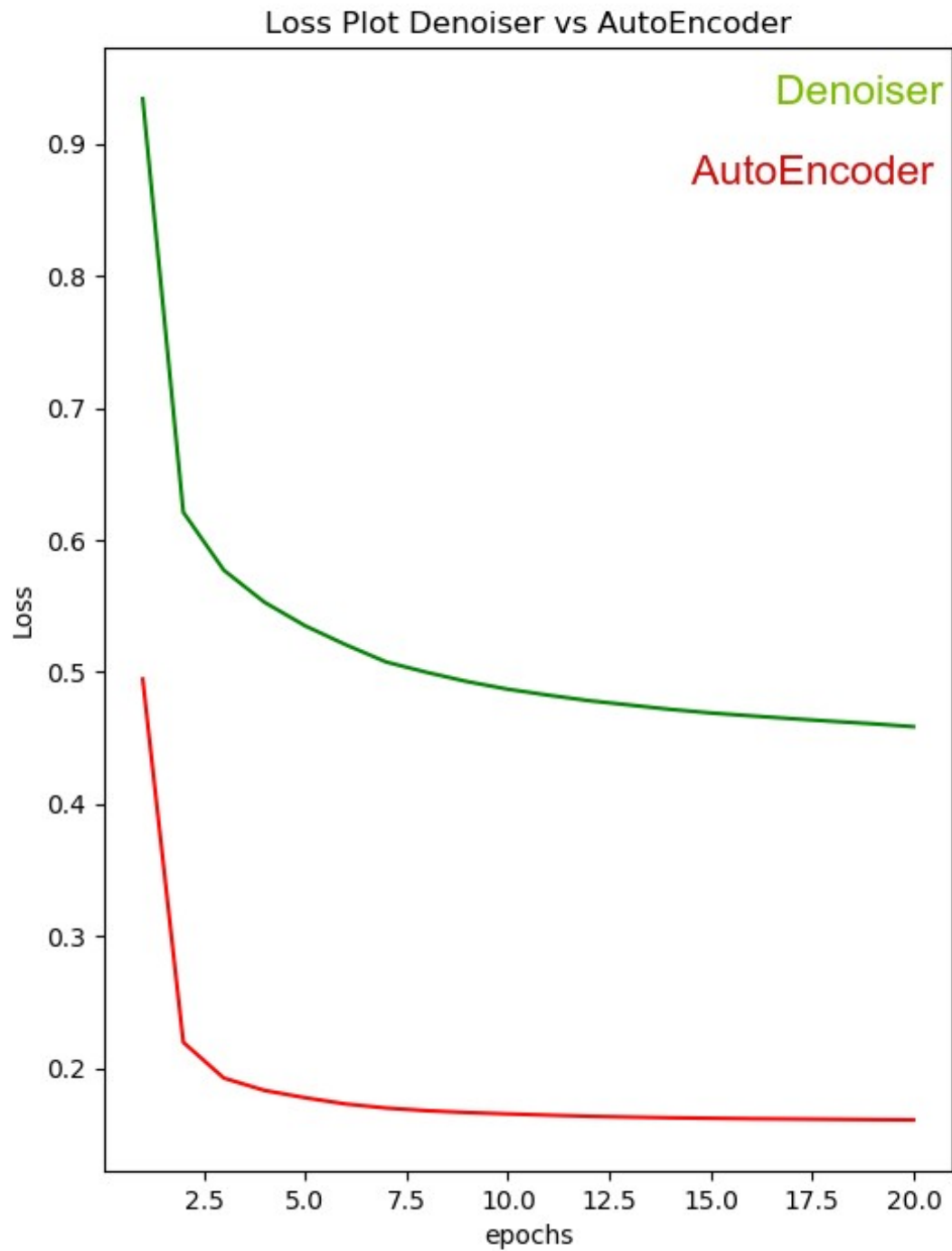
3 Figures

Figure 1: Noisy Pictures (Denoiser Input)

Figure 2: Loss plots of Denoiser vs AutoEncoder