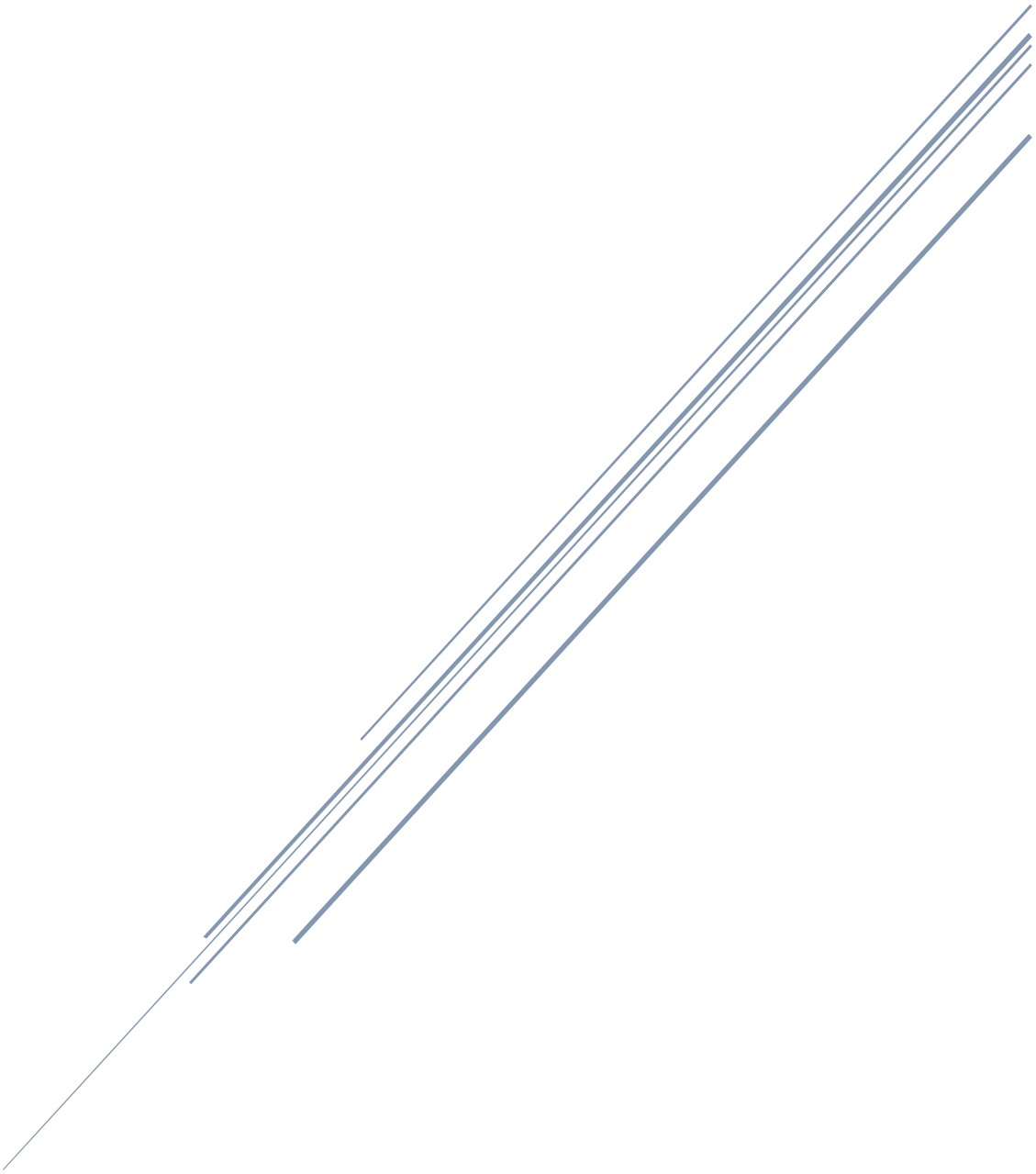
AUTOENCODERS

Module 5



v-cardona

Deep Learning with Tensorflow

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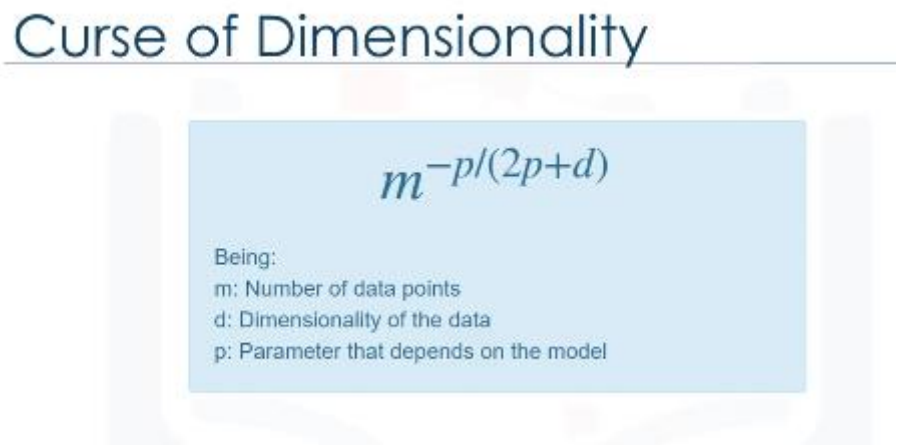
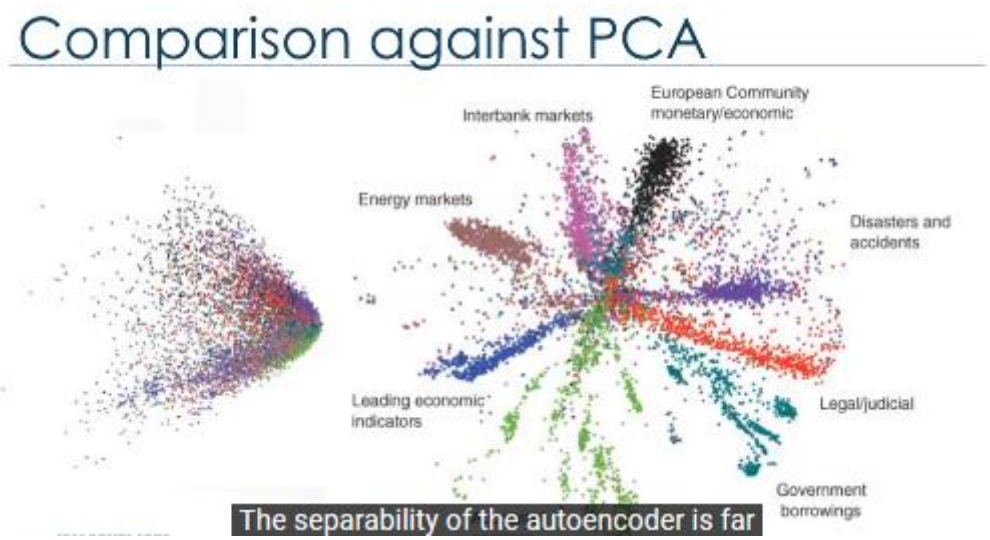
Intro to Autoencoders

An autoencoder is a type of unsupervised learning algorithm that will find patterns in a dataset by detecting key features. It is a type of neural net that analyses all of the images in your dataset and extracts some useful features automatically in such a way that it can distinguish images using those features. Generally speaking, autoencoders excel in tasks that involve feature learning or extraction, data compression, and learning generative models of data and dimensionality reduction.



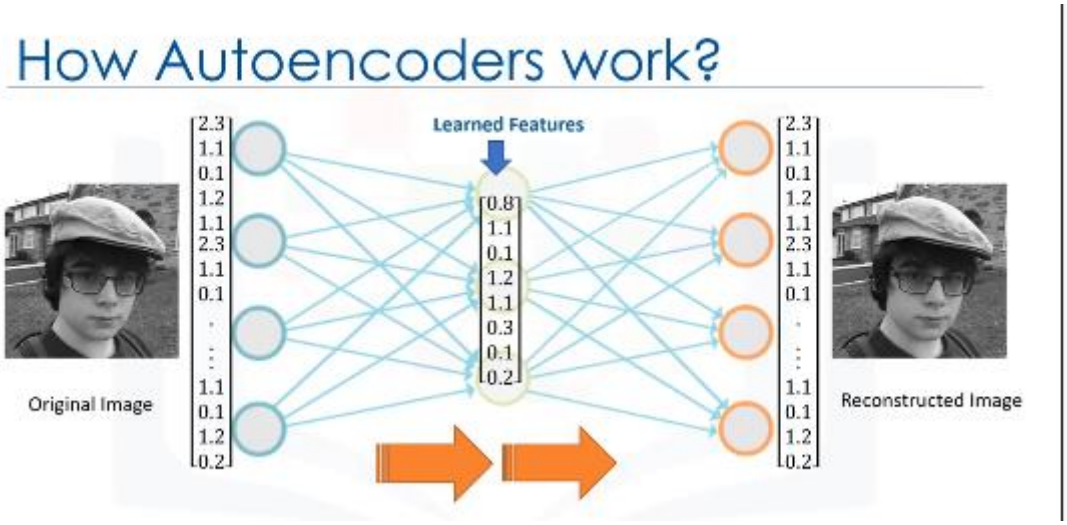
If we have a huge number of dimensions, our data will start to get sparse, which results in an over-allocation of memory and slow training time. We run into additional problems when we try to reduce the dimensions. If we have a small number of dimensions, our data could overlap, resulting in a loss of data characteristics.



An autoencoder can extract key image features, improve training times of other networks, and improve the separability of reduced datasets when compared to other methods.

Autoencoders

An autoencoder neural network is supposed to represent the images in a dataset with a low dimension feature set. For example, it extracts the most important features of faces, for an arbitrary task such as face recognition. Also, it is supposed to do it in an unsupervised manner, that is, “feature extraction” without provided labels for images.

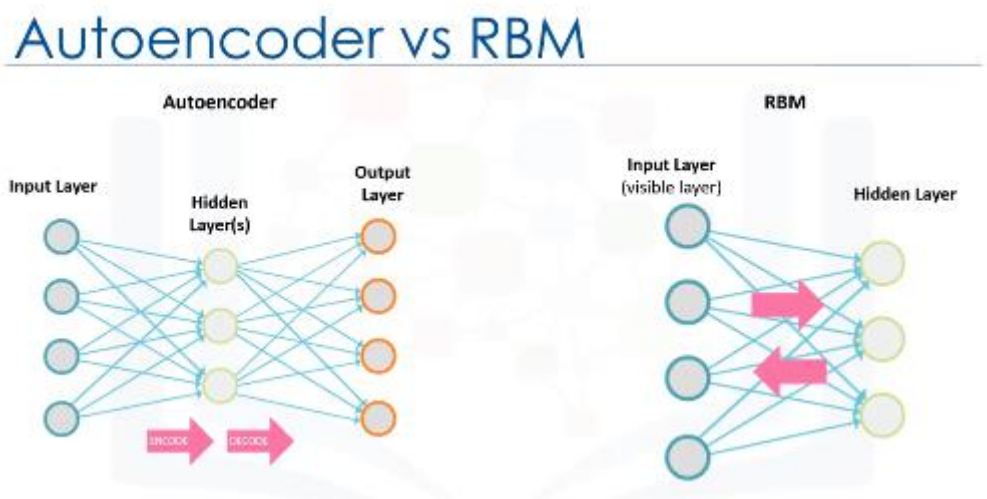


An autoencoder is an artificial neural network that’s designed to find important features by recreating the given input. Generally speaking, the main goal of Autoencoders is to take unlabeled inputs, encode them, and then try to reconstruct them afterwards, based on the most valuable features identified in the data.

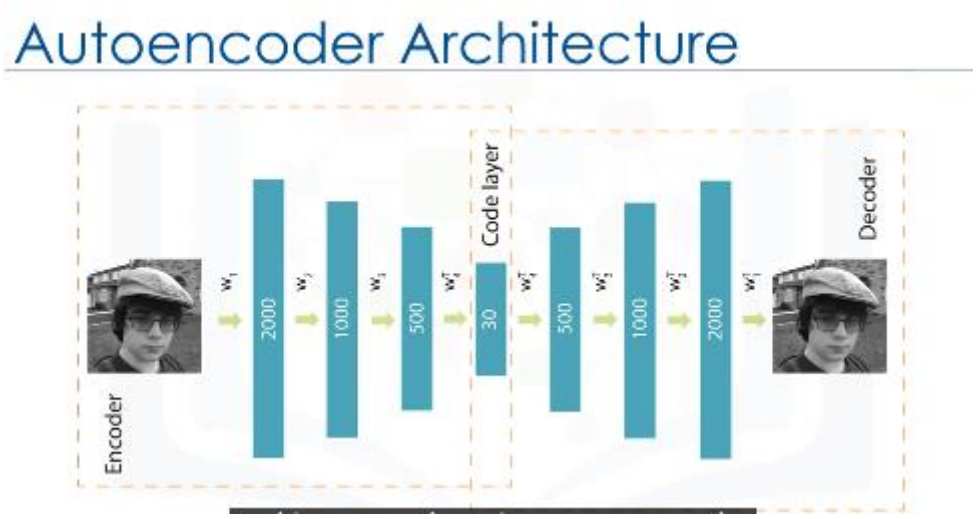
In fact, Autoencoders are based on Restricted Boltzmann Machines, or in other words, Restricted Boltzmann Machines are a type of Autoencoder.

Differences with RBMs:

1. Most autoencoders are shallow networks with an input layer, a few hidden layers, and an output layer. RBMs, on the other hand, are autoencoders with only two layers.
2. Autoencoders differ from Restricted Boltzmann Machines because they use a deterministic approach, rather than a stochastic approach.



Autoencoder architecture, an autoencoder can be divided into two parts, the encoder and the decoder. The encoder needs to compress the representation of an input. The decoder is a reflection of the encoder's network. It works to recreate the input as accurately as it can. It has an important role during training, and that is to force the autoencoder to select the most important features in the compressed representation.



We really do not care about the reconstructed image in this network. What we do care about, though, is the code layer values, which represents the input layer. That is, if the network has learned enough that it can generate the replica of input images only based on the code-layer value.

After the training is complete, you can use the encoded data that has been dimensionally reduced for the application of your choosing. This can include clustering, classification, or visualization of your data.