
FIAP

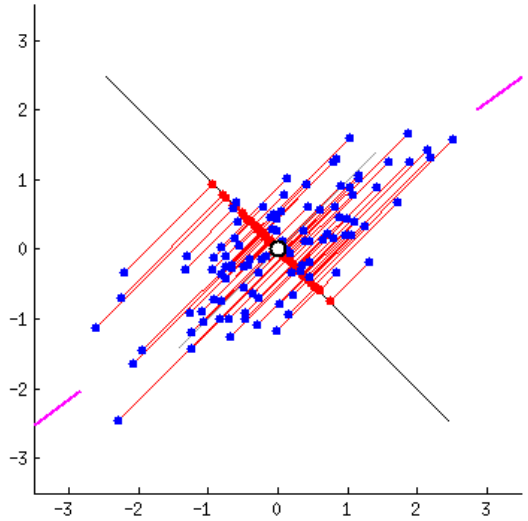
MACHINE LEARNING

E DEEP LEARNING

O PROBLEMA DA ALTA **DIMENSIONALIDADE...**

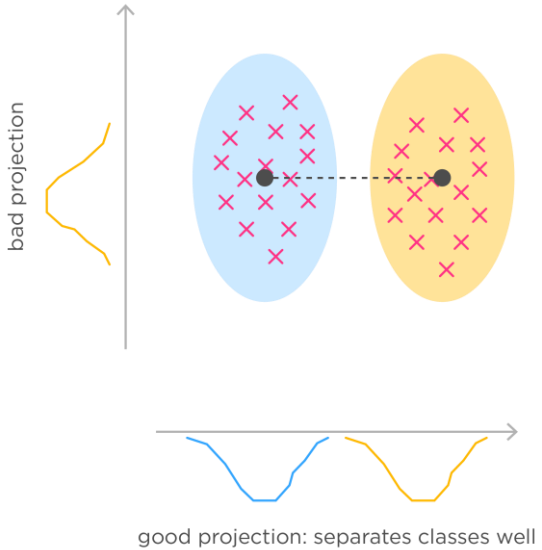
TÉCNICAS TRADICIONAIS DE REDUÇÃO DE DIMENSIONALIDADE / **SELEÇÃO DE CARACTERÍSTICAS – SHORT REVIEW**

- Análise de Componentes Principais (PCA):



TÉCNICAS TRADICIONAIS DE REDUÇÃO DE **DIMENSIONALIDADE / SELEÇÃO DE CARACTERÍSTICAS**

- Análise do Discriminante Linear (LDA).



DEMONSTRAÇÃO

PCA X LDA

TÉCNICAS TRADICIONAIS DE REDUÇÃO DE **DIMENSIONALIDADE / SELEÇÃO DE CARACTERÍSTICAS**

Wrapper Methods:

- Algoritmos Genéticos
- Otimização de Enxame de Partículas
- Seleção Sequencial

TÉCNICAS TRADICIONAIS DE REDUÇÃO DE **DIMENSIONALIDADE / SELEÇÃO DE CARACTERÍSTICAS**

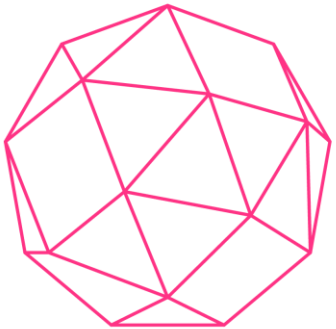
Embedded Methods (implementações específicas):

- SVM
- Redes Neurais Artificiais.

COMO FAZER SELEÇÃO DE CARACTERÍSTICAS ONDE **A AMOSTRA DO NOSSO PROBLEMA É UMA IMAGEM?**

AUTOENCODERS

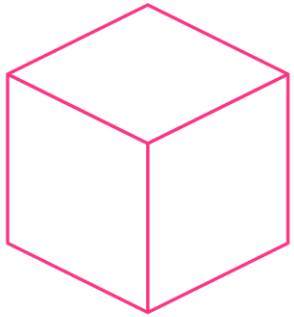
Multidimensional Data



Data represented best

Slow performance, High Precision

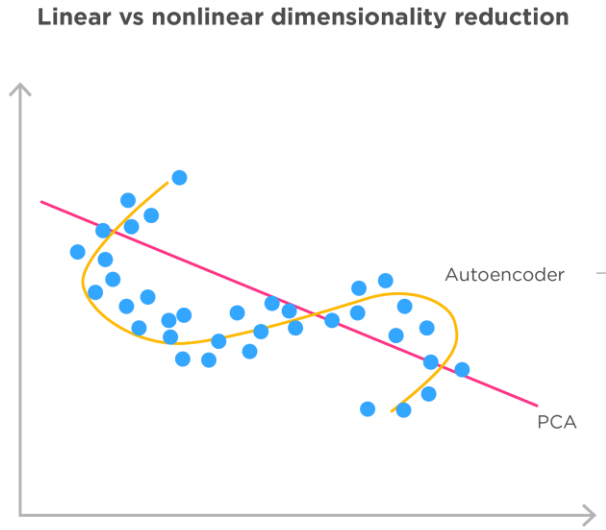
Low Dimensional Data



Reduce Precision

High Performance

AUTOENCODERS



Non-linear Transformations

Non-linear activation function and multiple layers.

Convolutional Layers

An autoencoder doesn't have to learn dense layers.

Higher Efficiency

More efficient to learn several layers with an autoencoder.

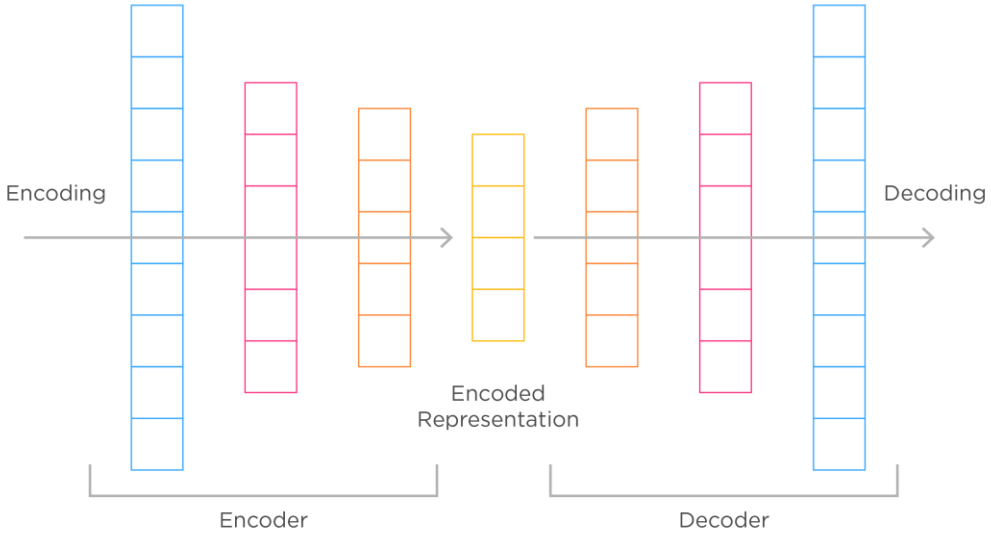
Multiple Transformation

It gives a representation as the output of each layer.

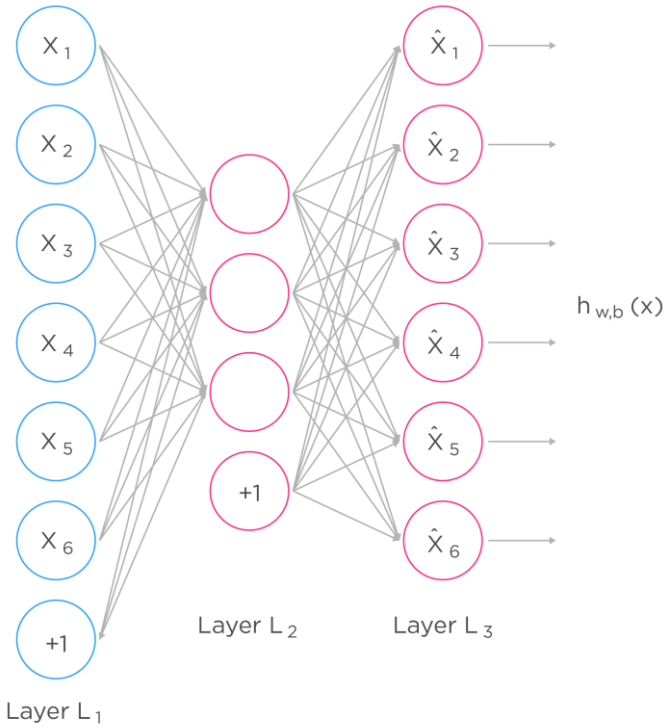
AUTOENCODERS

AUTOENCODERS

An **autoencoder** neural network is an unsupervised Machine learning algorithm that applies backpropagation, setting the target values to be equal to the inputs.



AUTOENCODERS - **DEFINIÇÃO**



Key Facts about Autoencoders

- It is an unsupervised ML algorithm similar to PCA.
- It minimizes the same objective function as PCA.
- It is a neural network.
- The neural network's target output is its input.

AUTOENCODERS

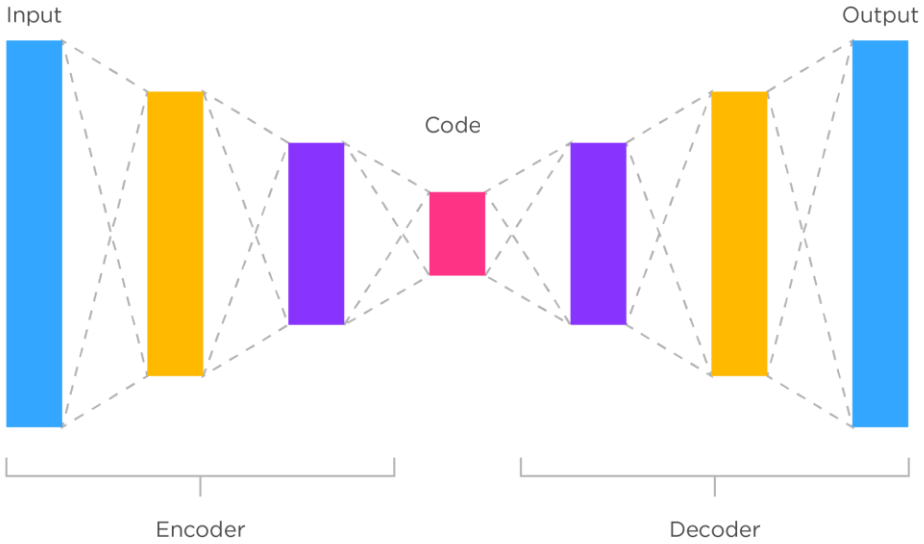
Componentes:

Components of Autoencoders

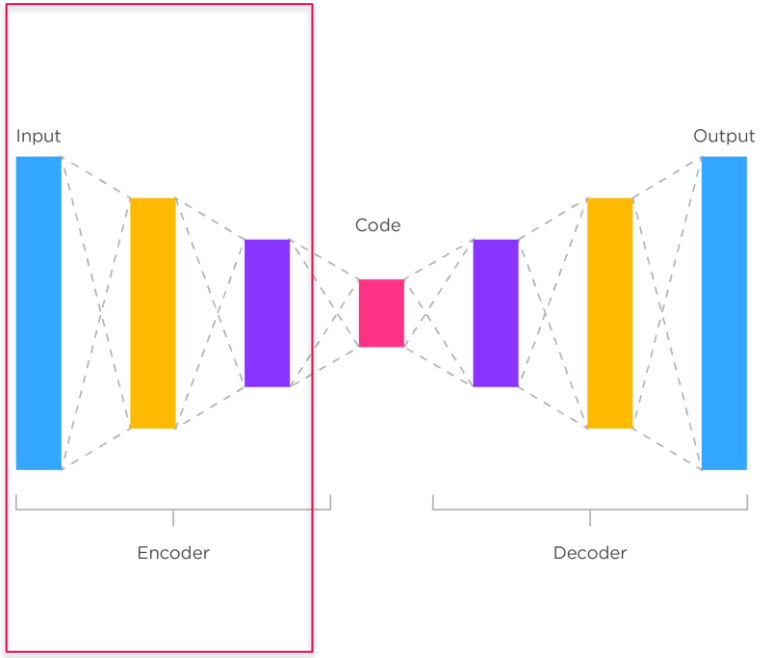
01 Encoder

02 Code

03 Decoder



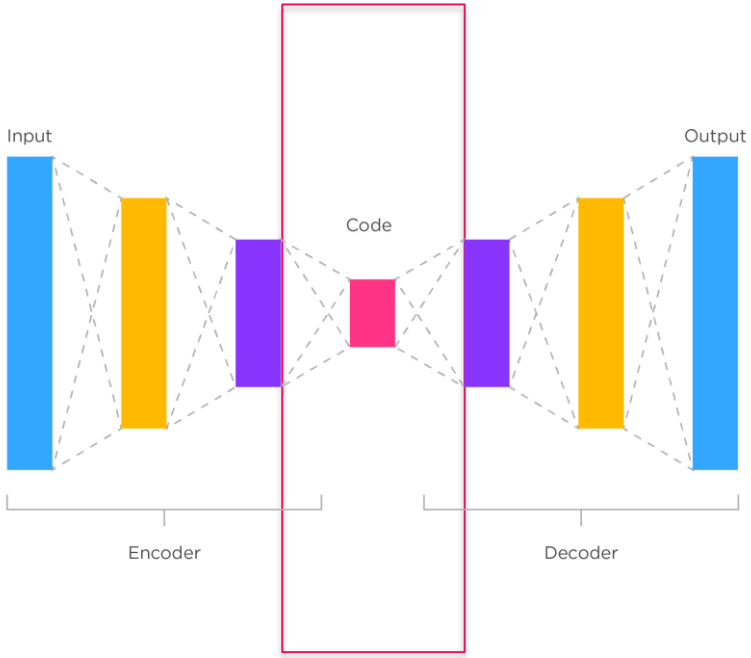
AUTOENCODERS



Encoder

This is the part of the networks that compresses the input into a latent space representation.

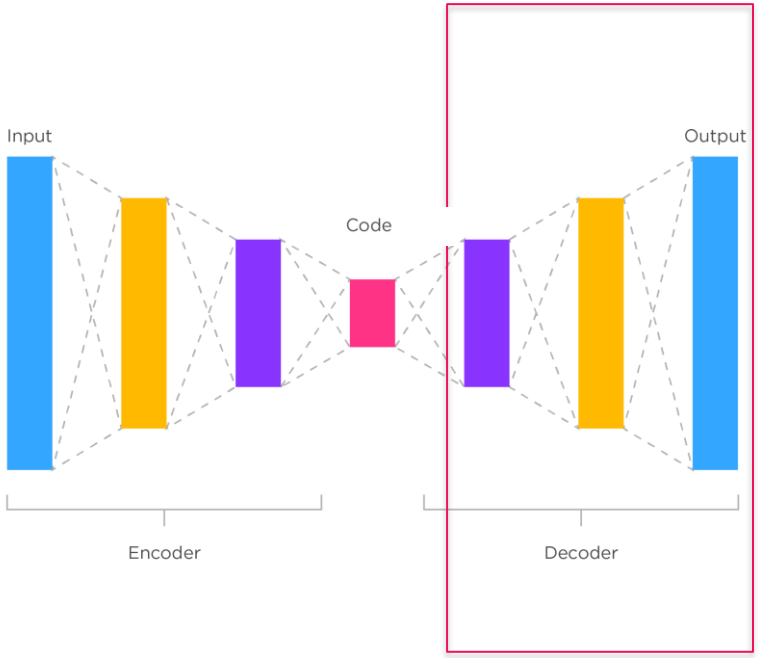
AUTOENCODERS



Code

This is the part of the network represents the compressed input that is fed to the decoder

AUTOENCODERS



Decoder

This part aims to reconstruct the input from the latent space representation.

PROPRIEDADES **DOS AUTOENCODERS**

01 Unsupervised

Autoencoders are considered an unsupervised learning technique since they don't need explicit lables to train on

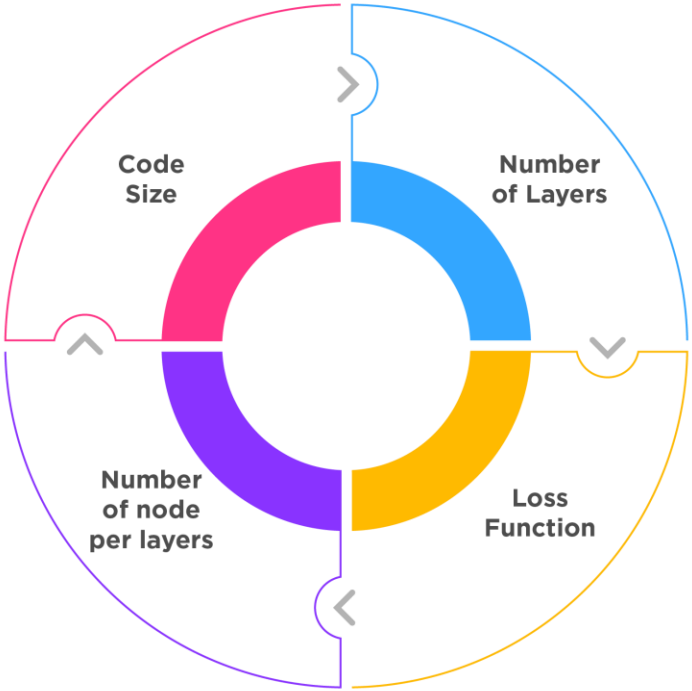
02 Data-specific

Autoencoders are only able to meaningfully compress data similar to what they have been trained on

03 Lossy

The output of the autoencoder will not be exactly the same as the input, it will be a close but degraded representation

PROPRIEDADES **DOS AUTOENCODERS**



Code Size

Smaller size results in more compression

Number of Layers

The autoencoder can have manu layers

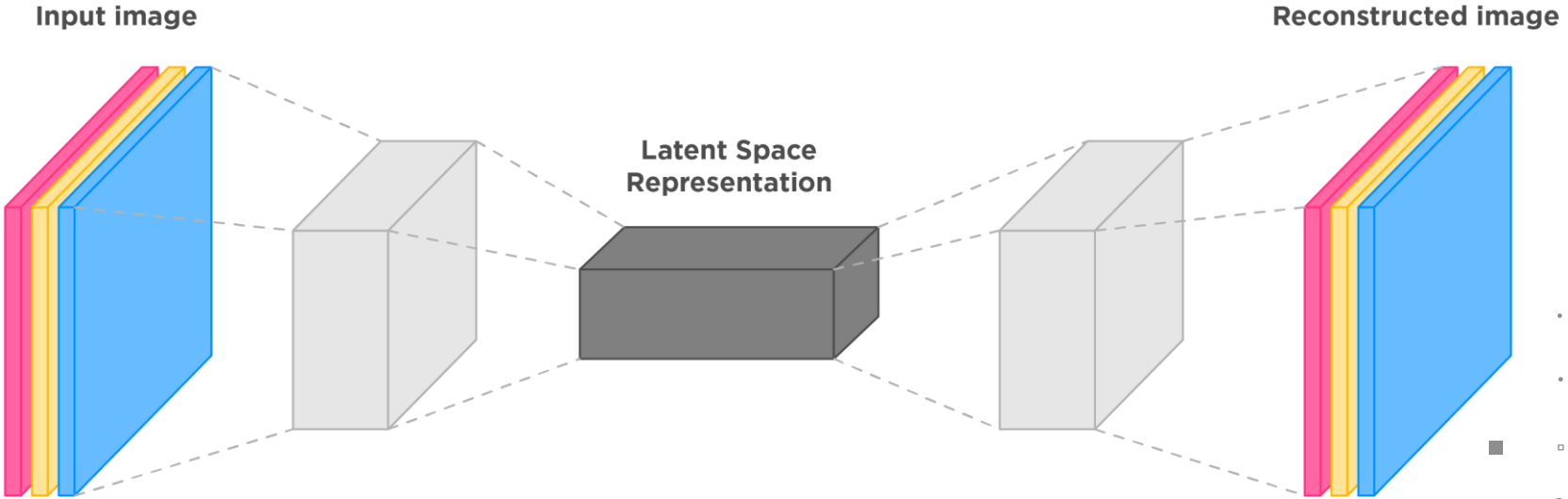
Loss Function

Mean squared error or binary cross entropy

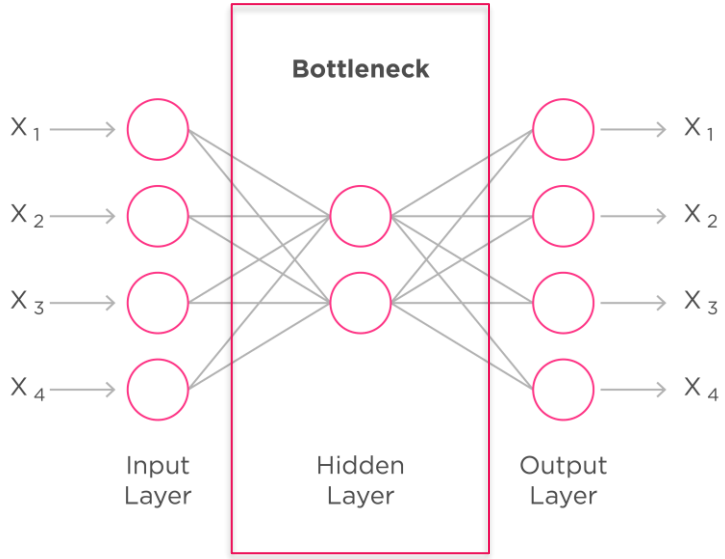
Number of node per layers

Stacked autoencoders look like a sandwich

ARQUITETURA **DOS AUTOENCODERS**



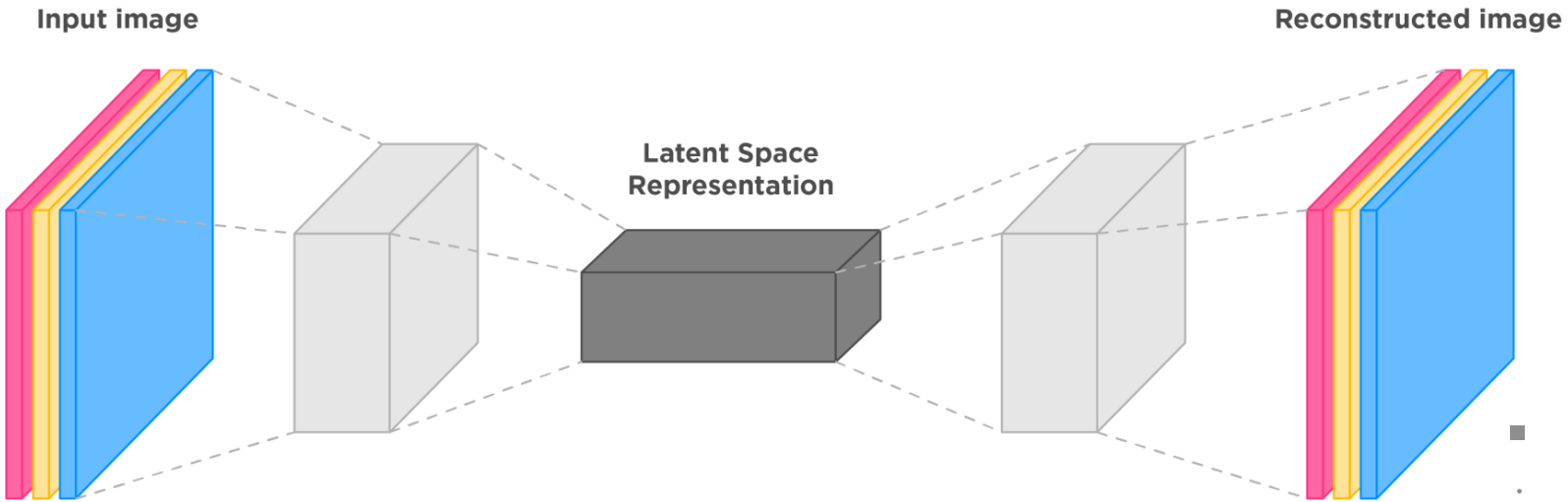
ARQUITETURA **DOS AUTOENCODERS**



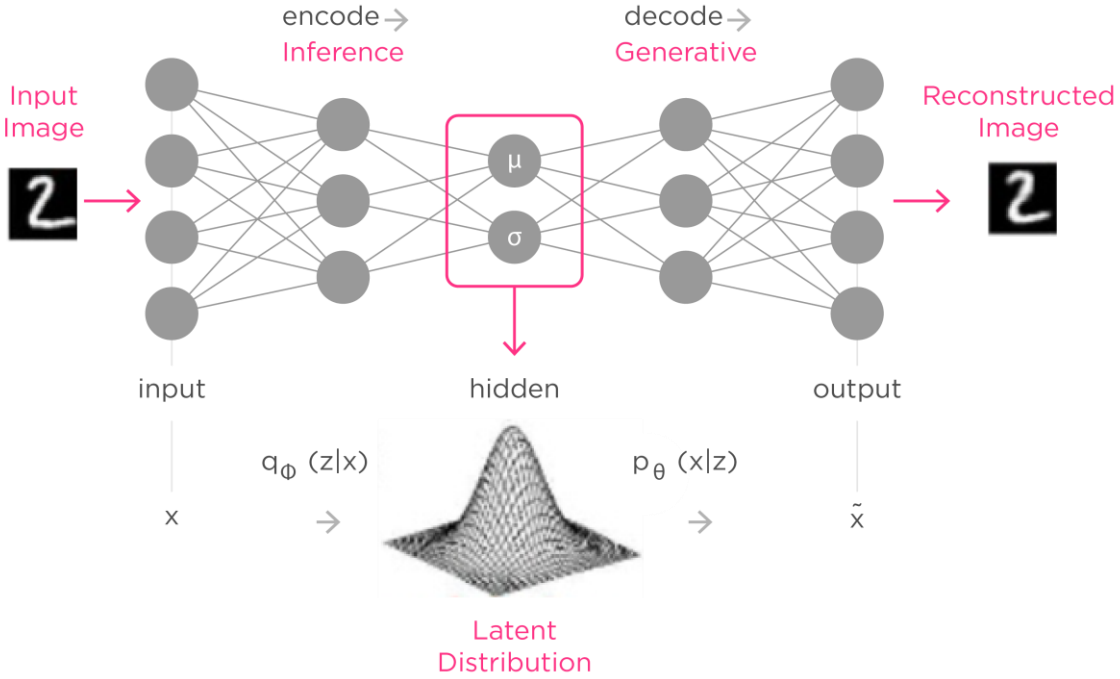
Bottleneck approach is an approach to for deciding which aspects of observed data are relevant information and what aspects can be thrown away.

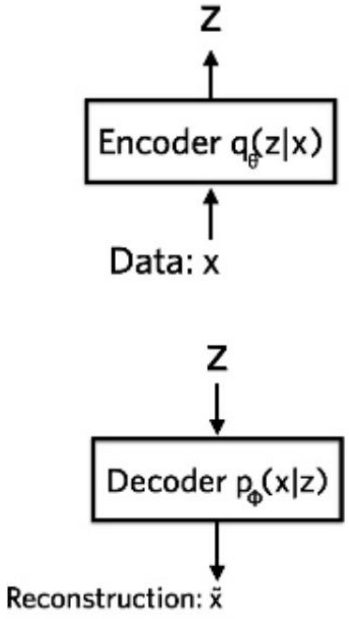
- Compactness of representation, measured as the compressibility.
- Representation retains about some behaviourally relevant variables.

ARQUITETURA **DOS AUTOENCODERS**

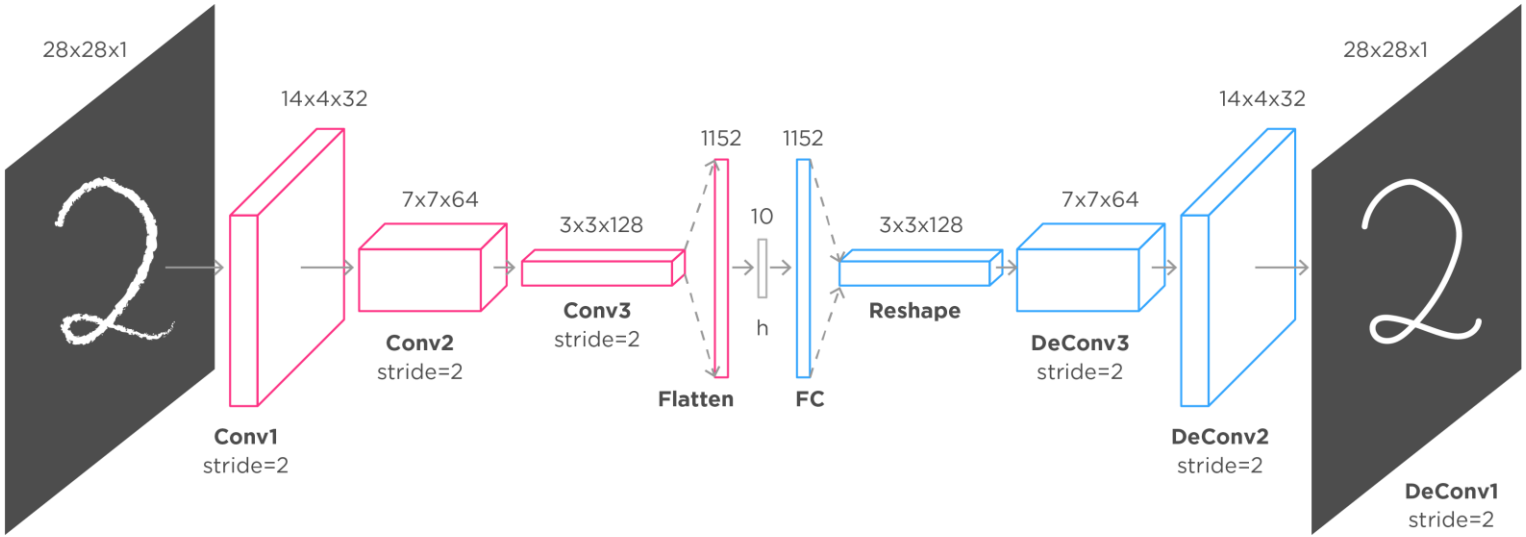


ARQUITETURA **DOS AUTOENCODERS**

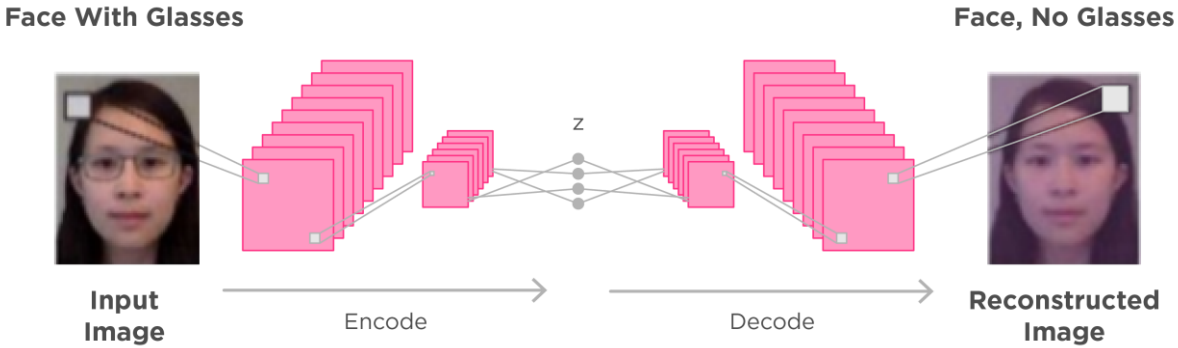




AUTOENCODERS **CONVOLUCIONAIS**



AUTOENCODERS **CONVOLUCIONAIS**

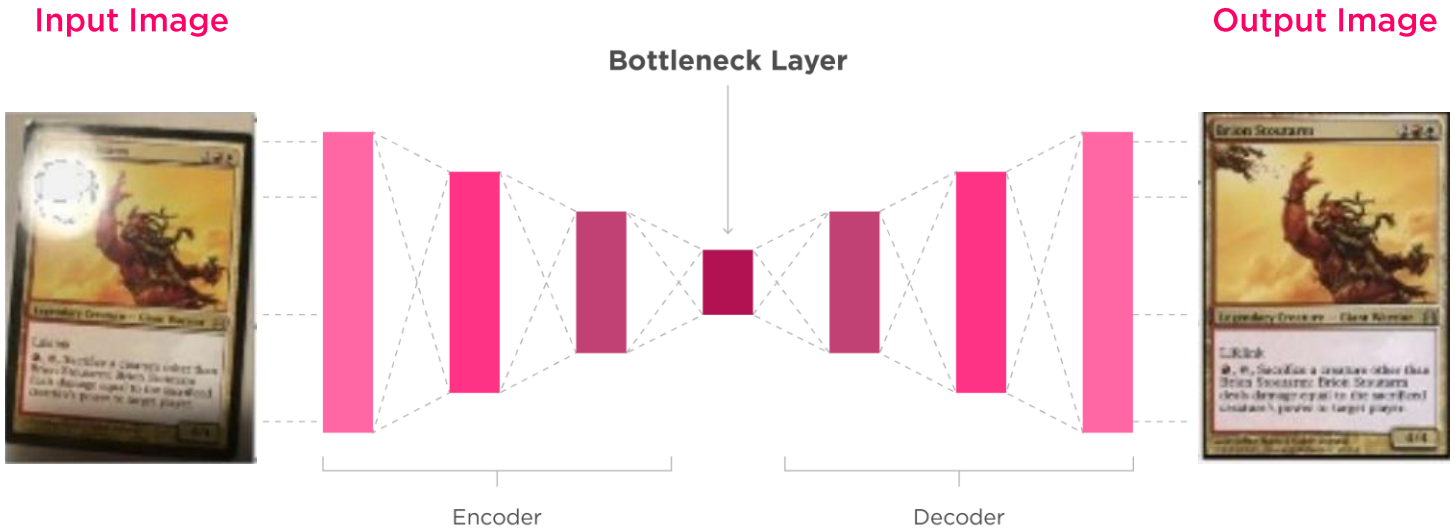


Learns to **remove noise** or **reconstruct** missing parts

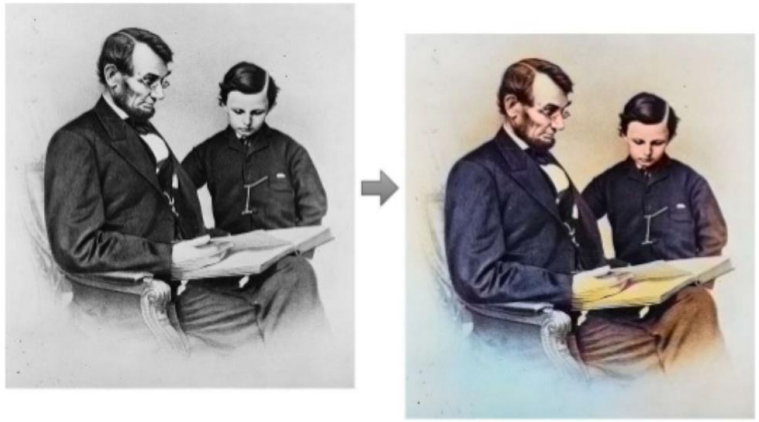
Noisy Version is converted to clean version

The network fills the gaps in the images

AUTOENCODERS **CONVOLUCIONAIS**

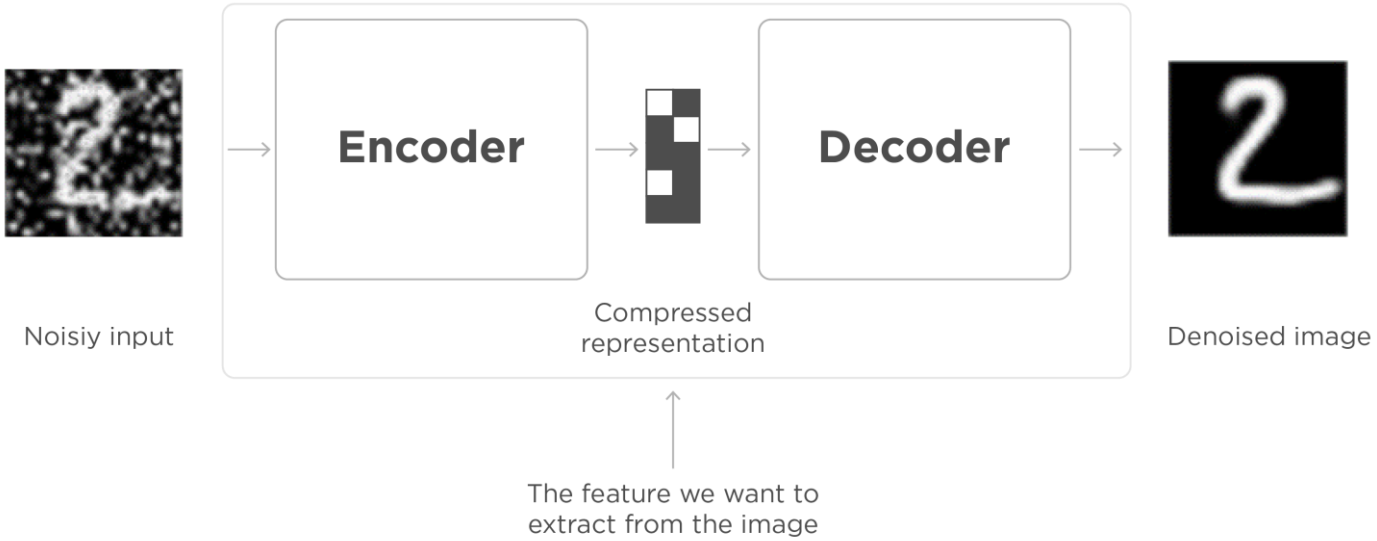


AUTOENCODERS **CONVOLUCIONAIS**



- Maps **circles** and **squares** from na image to the same image but with Colors
- Purple is formed sometimes because of **blend** of colors, where network hesitates between circle or square

AUTOENCODERS **CONVOLUCIONAIS**



AUTOENCODERS

Demonstração simplificada

de Autoencoders com dataset MNIST

AUTOENCODERS

Demonstração remoção de ruídos

Autoencoders com dataset MNIST

OBRIGADO

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