

# Auto-encoders

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March 2023

# Outline

- Learning Goals
- Auto-encoders
- Summary

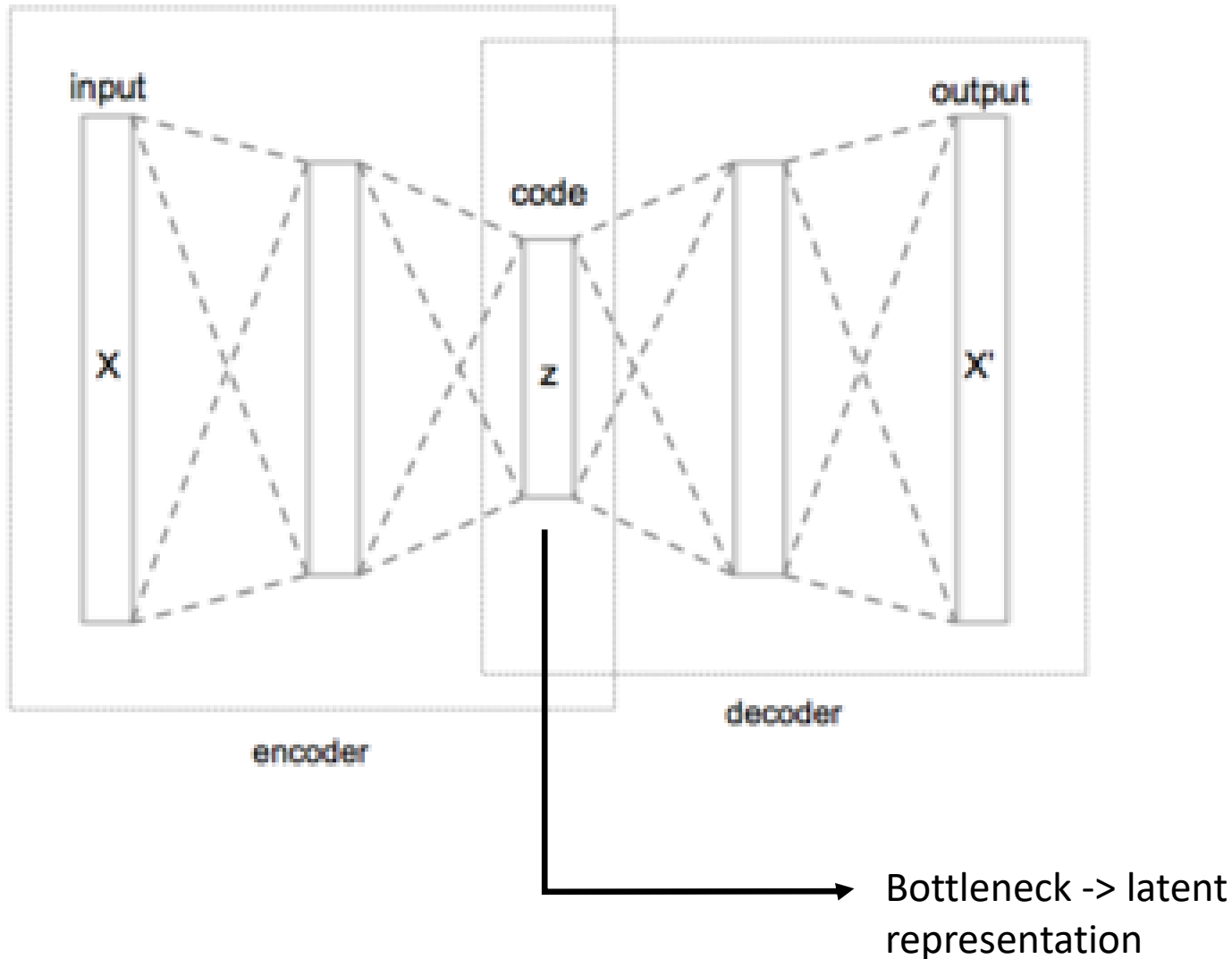
# Learning Goals

- Understand the motivation behind auto-encoders
- Learn different ways to design an auto-encoder model
- Learn potential applications of auto-encoders

# Auto-encoders

- Unsupervised method (i.e., no labelled data)
- Used to learn a representation of your data
- Often the learned representation is in a lower-dimensional space than your input data

# Auto-encoder



Encoder  $\Rightarrow f$

Decoder  $\Rightarrow g$

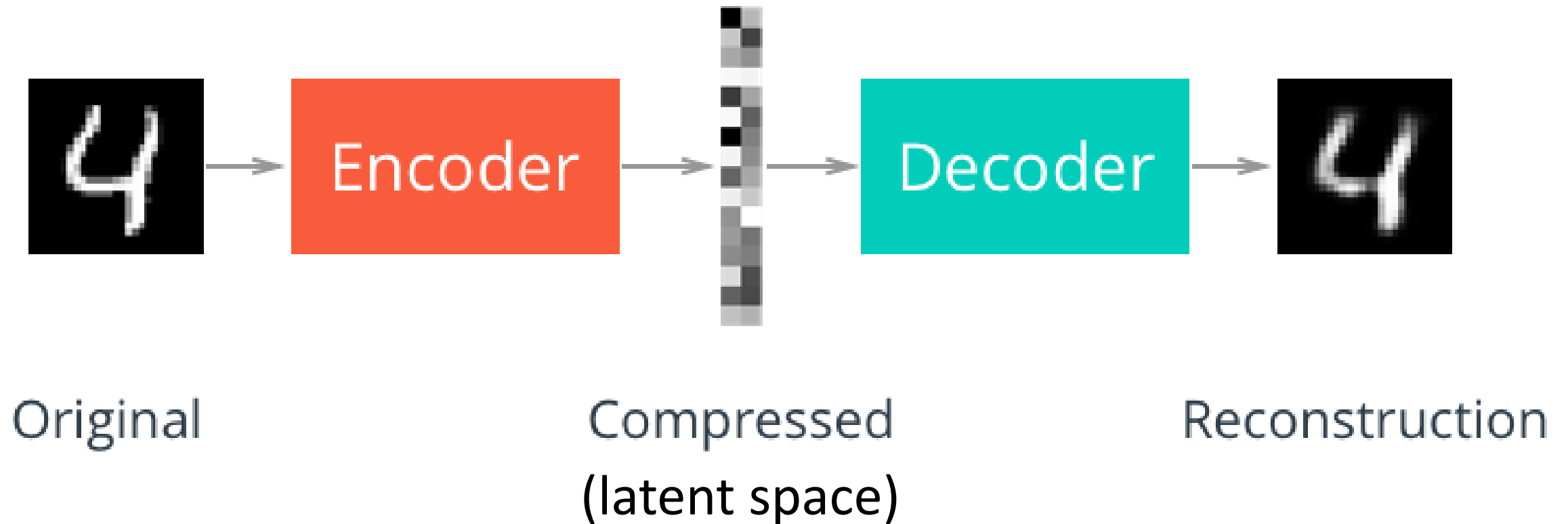
$$Z = f(X)$$

$$X' = g(Z)$$

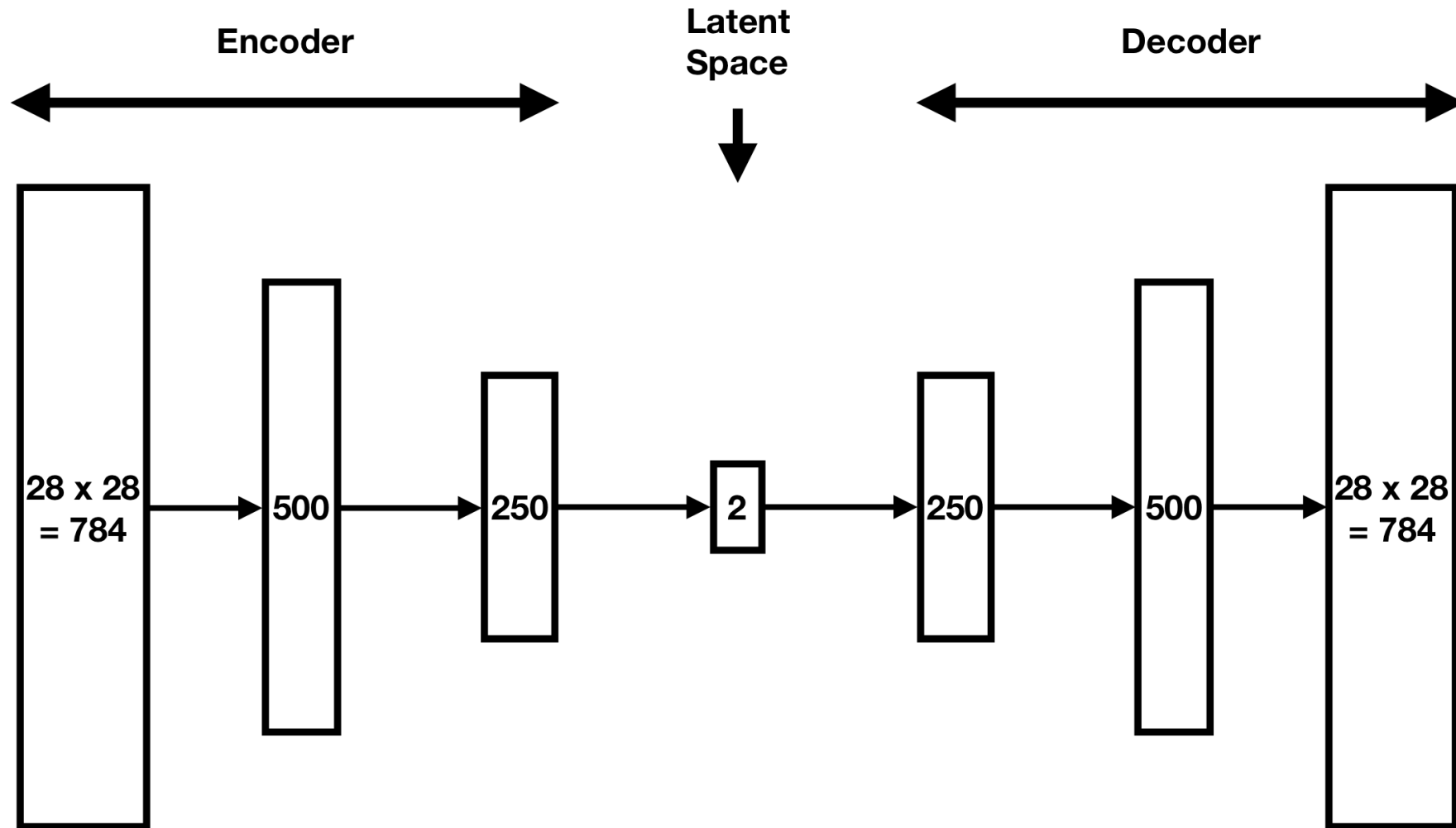
Objectives:  $X \approx X'$

- Mean squared error
- Mean absolute error

# MNIST Auto-encoder

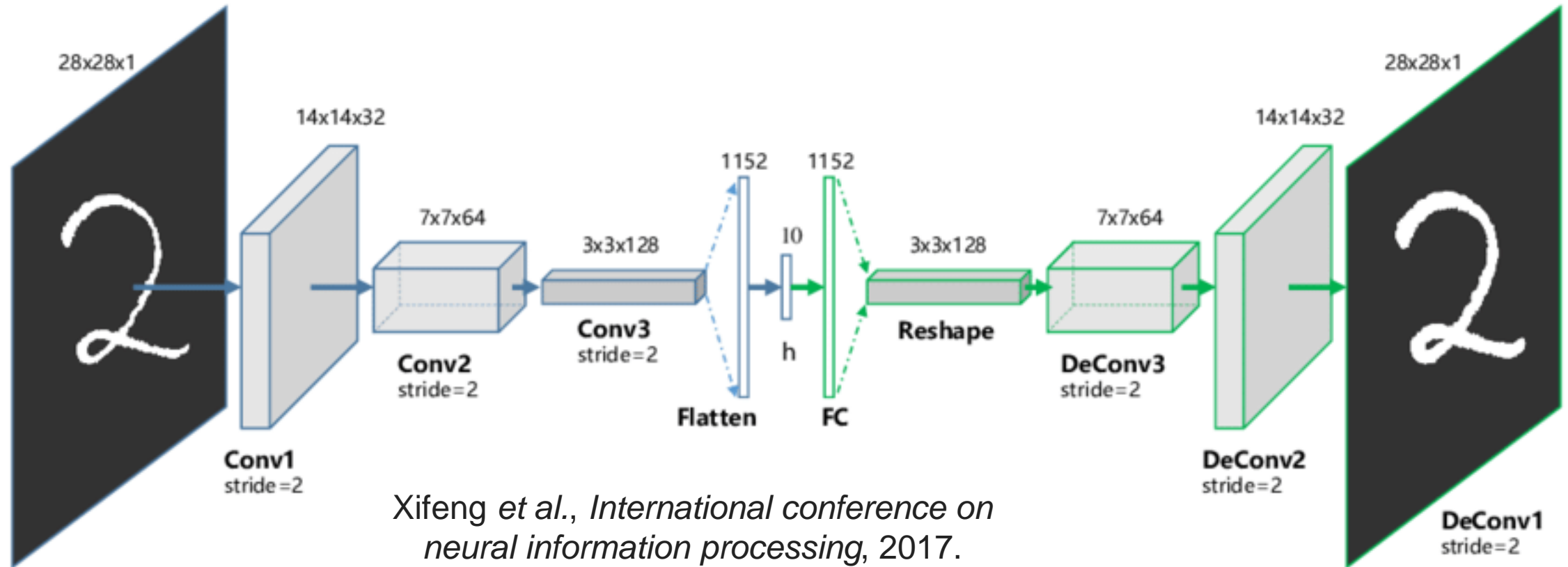


# Fully Connected Auto-Encoder



All layers fully connected

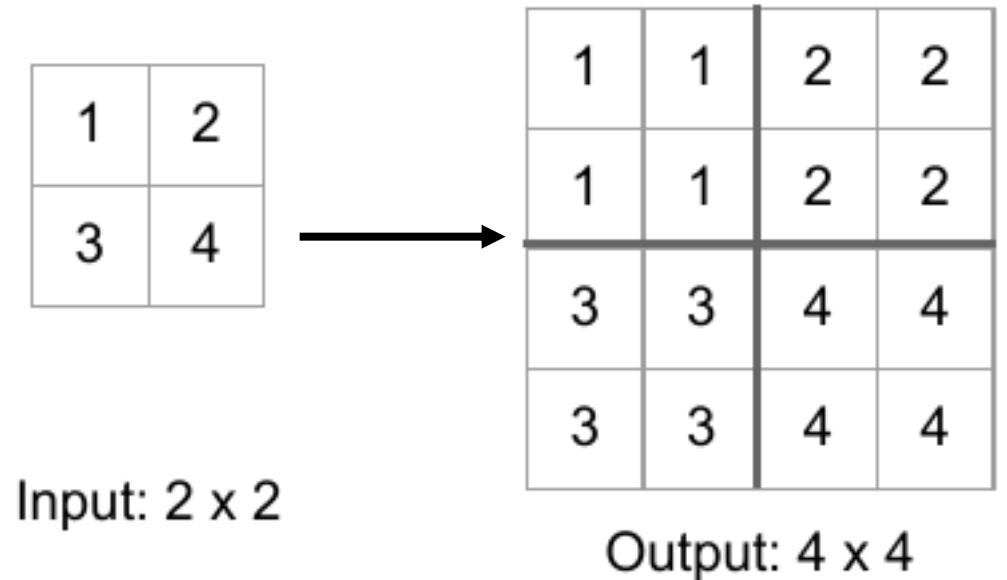
# Convolutional Auto-encoder





# Up Sampling

- Opposite effect of max-pooling
- Many ways to do it
- Simplest way is nearest neighbor interpolation
- UpSampling2D -> Keras layer



# Auto-encoder Applications

- Learning representations
- Data compression
- Denoising
- Learning manifolds

# Summary

- Auto-encoders are unsupervised methods that can be used to learn data representation
- They can be either fully connected models or convolutional models
- They have large applicability for compression, denoising among others

# Thank you!

