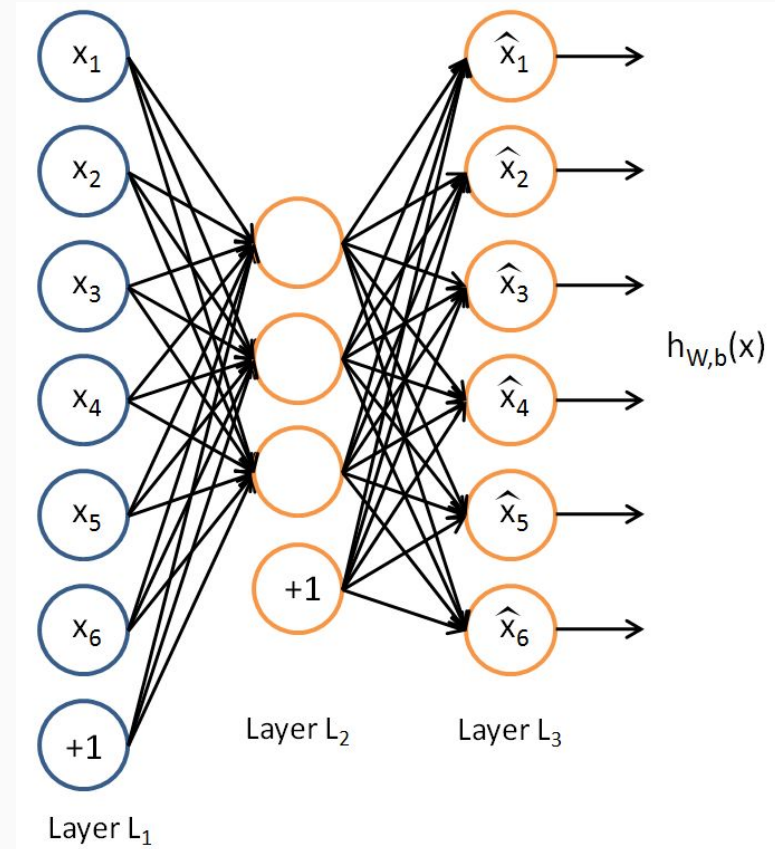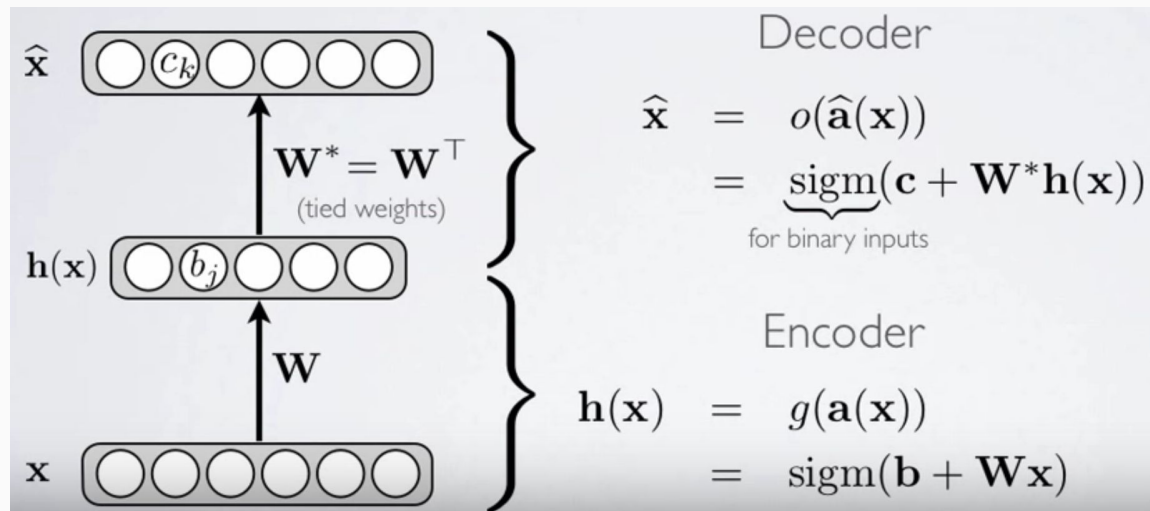# Autoencoders

- Rahul Shah
- Krunal Gala
- Siddhant Doshi
- Sushma Ravichandran
- Himangshu Ranjan Borah

# What is autoencoder ?

Feed forward neural network trained to reproduce its input at the output layer

# Encoding and Decoding



$$\hat{\mathbf{x}} = o(\hat{\mathbf{a}}(\mathbf{x}))$$
$$= \underbrace{\mathrm{sigm}(\mathbf{c} + \mathbf{W}^*\mathbf{h}(\mathbf{x}))}_{\text{for binary inputs}}$$

Decoder

$$\mathbf{W}^* = \mathbf{W}^\top$$
(tied weights)

Encoder

$$\mathbf{h}(\mathbf{x}) = g(\mathbf{a}(\mathbf{x}))$$
$$= \mathrm{sigm}(\mathbf{b} + \mathbf{W}\mathbf{x})$$

$$\phi : \mathcal{X} \to \mathcal{F}$$
$$\psi : \mathcal{F} \to \mathcal{X}$$
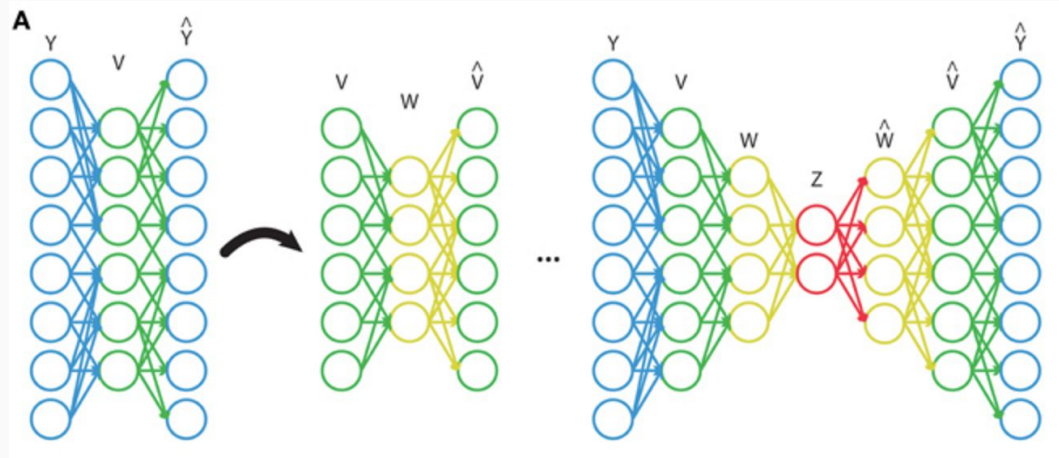$$\arg\min_{\phi,\psi} \|X - (\psi \circ \phi)X\|^2$$

# PCA vs Autoencoders

|  PCA  |  Autoencoders  |
|-------|----------------|
| - Linear Combination of Feature variables | - Non Linear Combination of Feature variables |
| - Computationally more expensive | - Computationally less expensive |

# Stacked Autoencoder

A stacked autoencoder is a neural network consisting of multiple layers of sparse autoencoders in which the outputs of each layer is wired to the inputs of the successive layer.

Thank You