NPTEL ONLINE CERTIFICATION COURSES

Course Name: Deep Learning

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Topic

Lecture 28: Autoencoder

CONCEPTS COVERED

Concepts Covered:

- Back Propagation Learning in MLP
- Autoencoder
  - Undercomplete Autoencoder
  - Autoencoder vs. PCA
  - Sparse Autoencoder
  - Denoising Autoencoder
  - Contractive Autoencoder
  - Convolution Autoencoder

Autoencoder

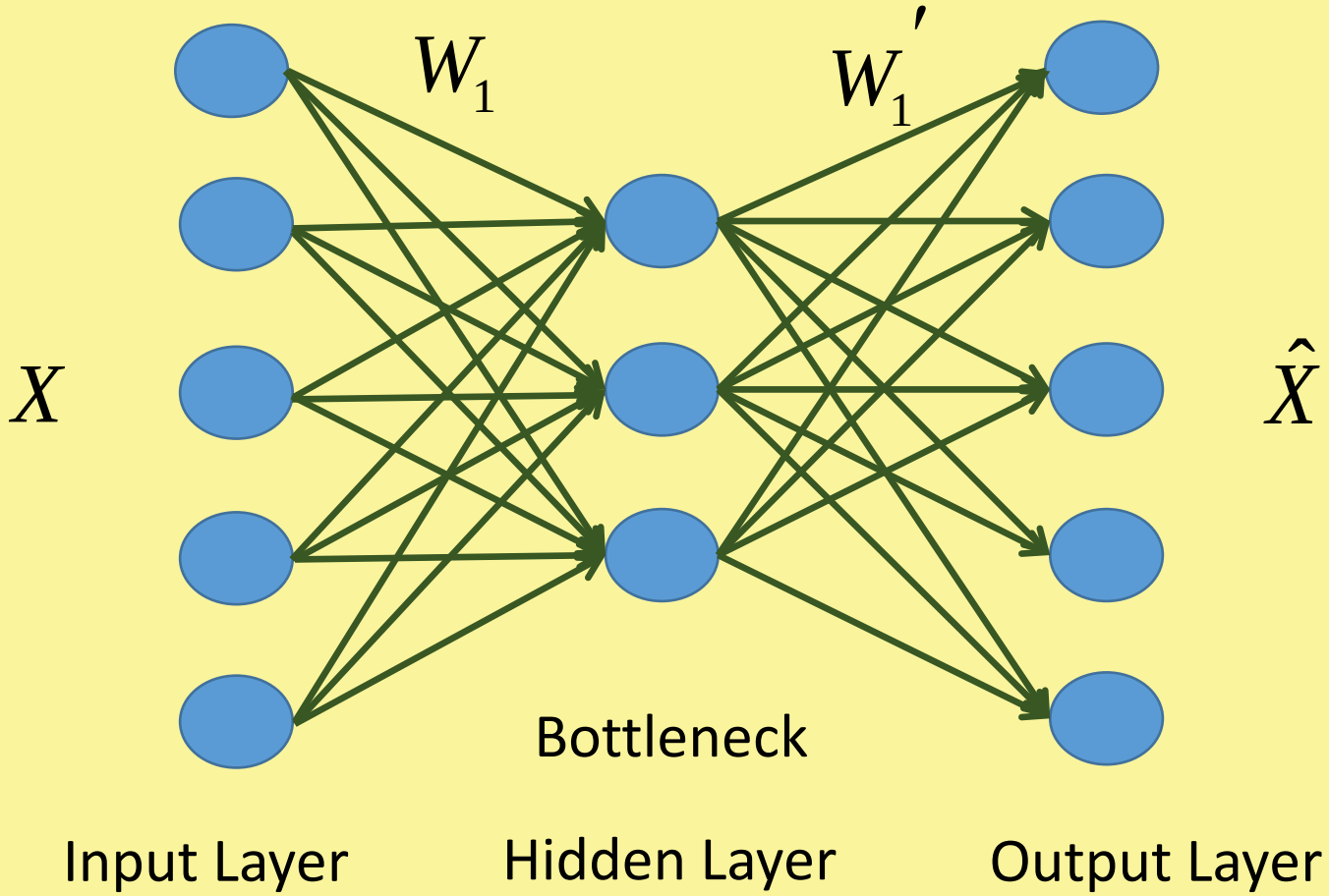
- Unsupervised Learning where Neural Networks are subject to the task of representation learning.
- Impose a bottleneck in the network
- The bottleneck forces a compressed knowledge representation of the input.

Autoencoder

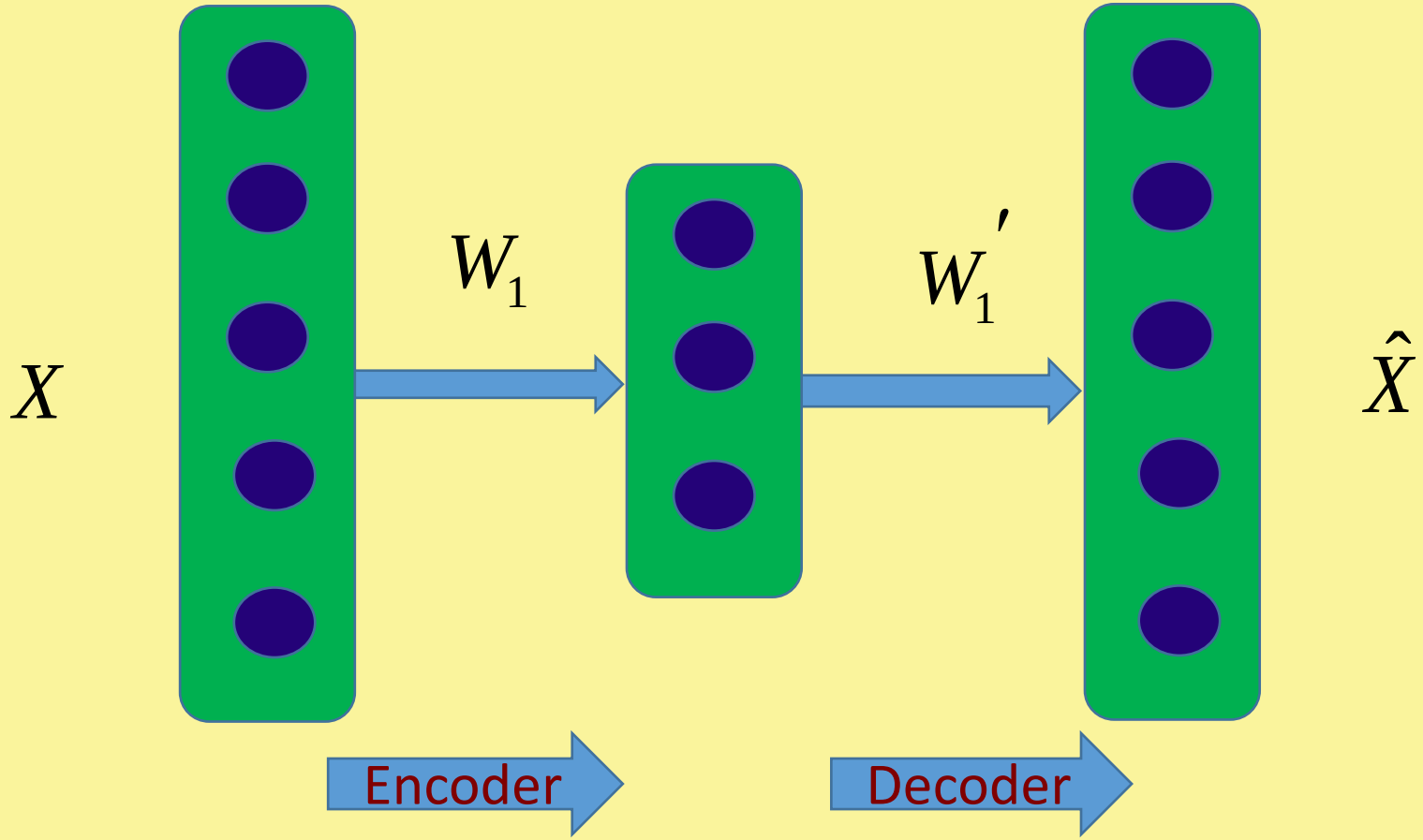
Assumption:

- High degree of correlation/structure exists in the data.
- For uncorrelated data (input features are independent), then compression and subsequent reconstruction would be difficult.

Autoencoder



Autoencoder

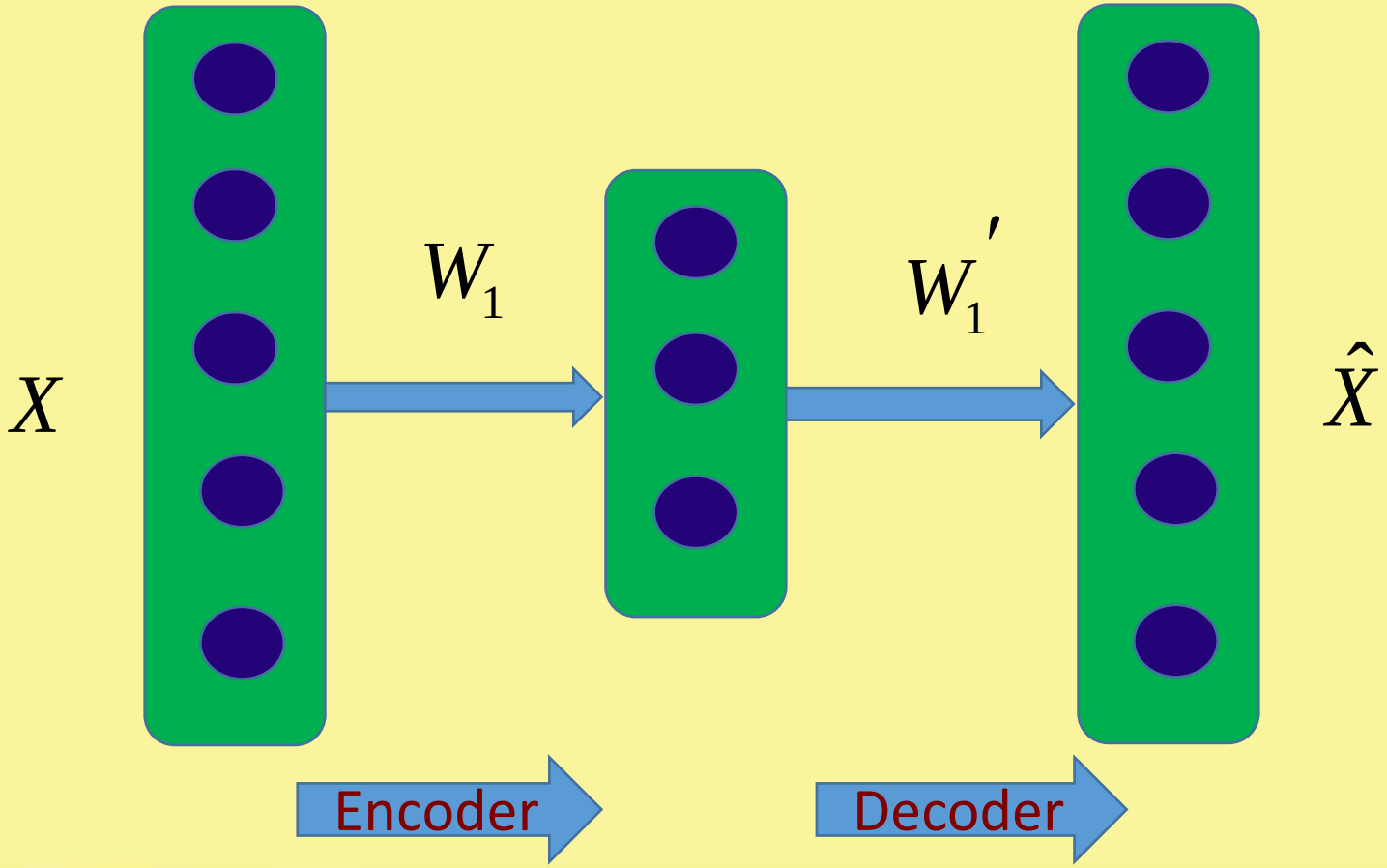


Expectation

- Sensitive enough to input for accurate reconstruction
- Insensitive enough that it does not memorize or overfit the training data

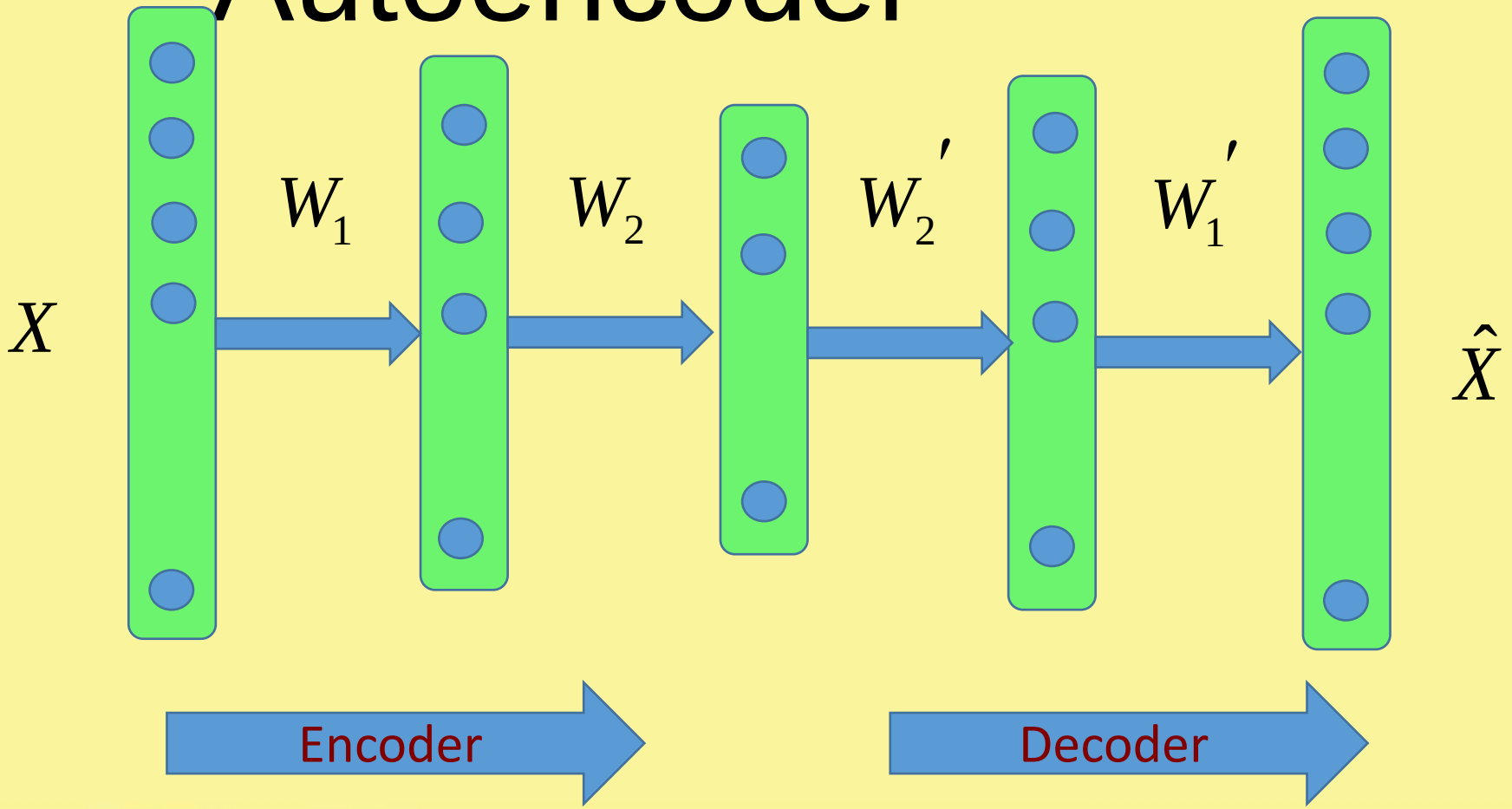
$$\text{Loss Function} \Rightarrow L(X, \hat{X}) + \text{Regularizer}$$

Undercomplete Autoencoder



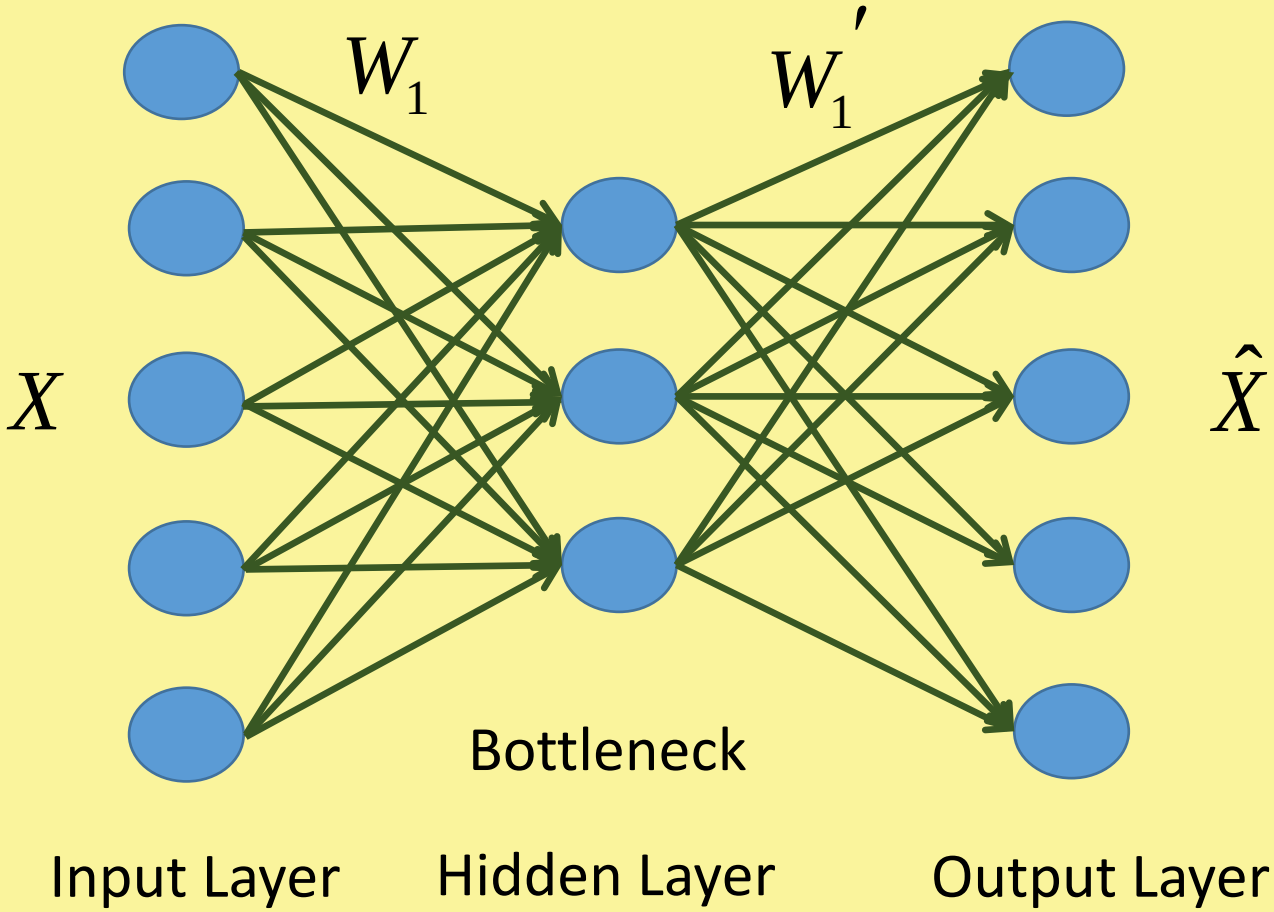
$$L(X, \hat{X}) = \frac{1}{2}\sum_{N}\left\|X - \hat{X}\right\|^2$$

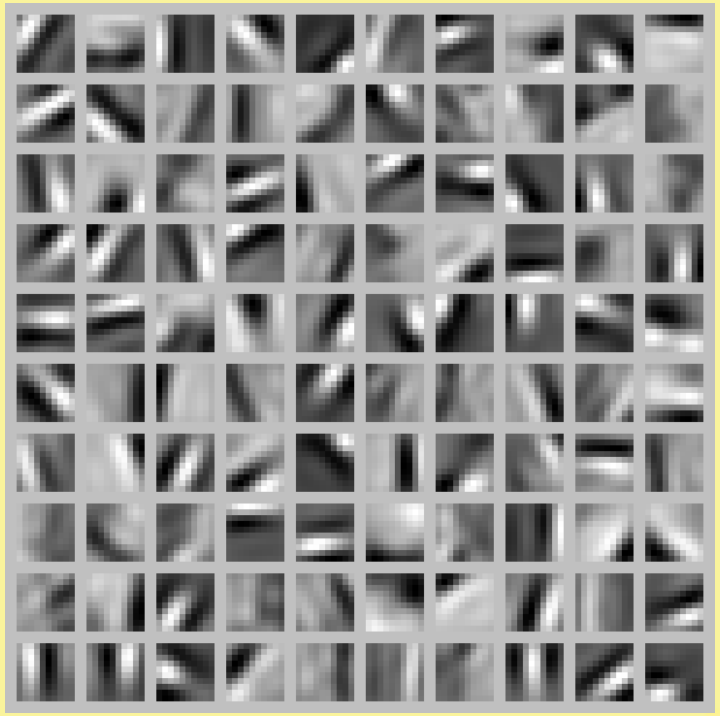
Stacked Autoencoder



$$L(X, \hat{X}) = \frac{1}{2} \sum_{N} \left\| X - \hat{X} \right\|^2$$

Autoencoder





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Thank you