ECE30007 Intro to AI Project

Introduction to NN

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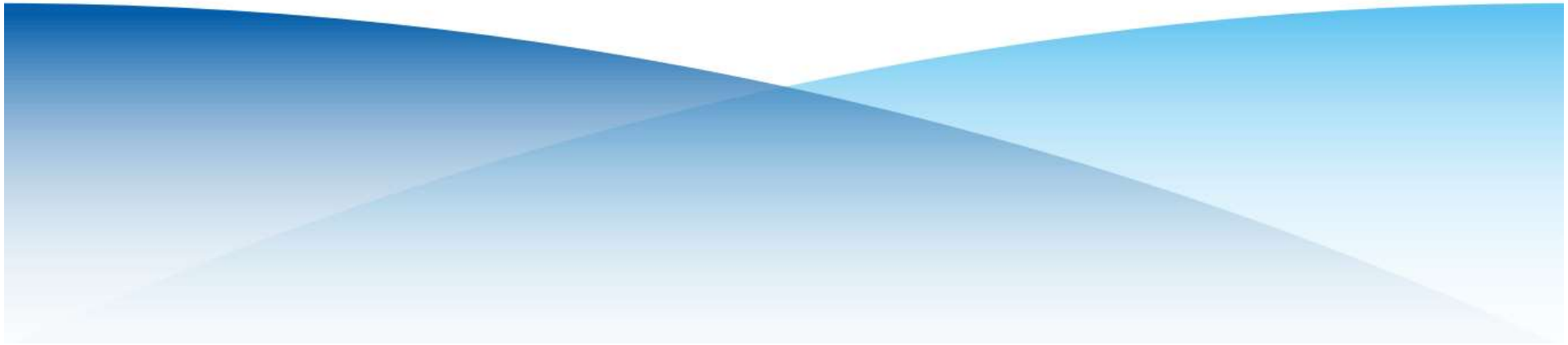
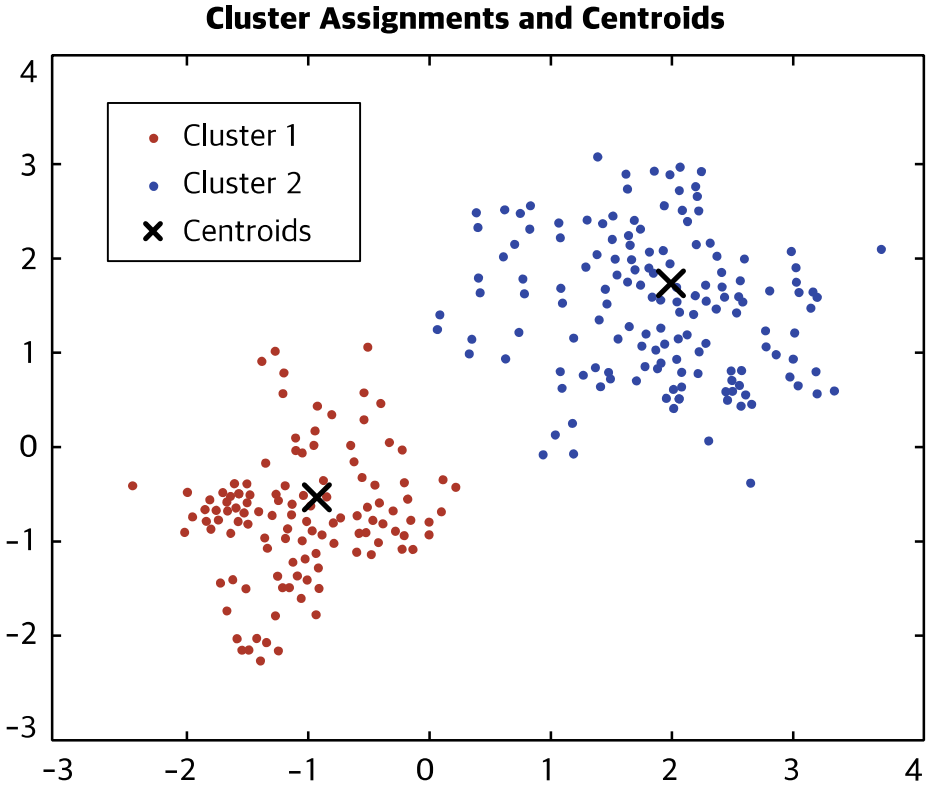


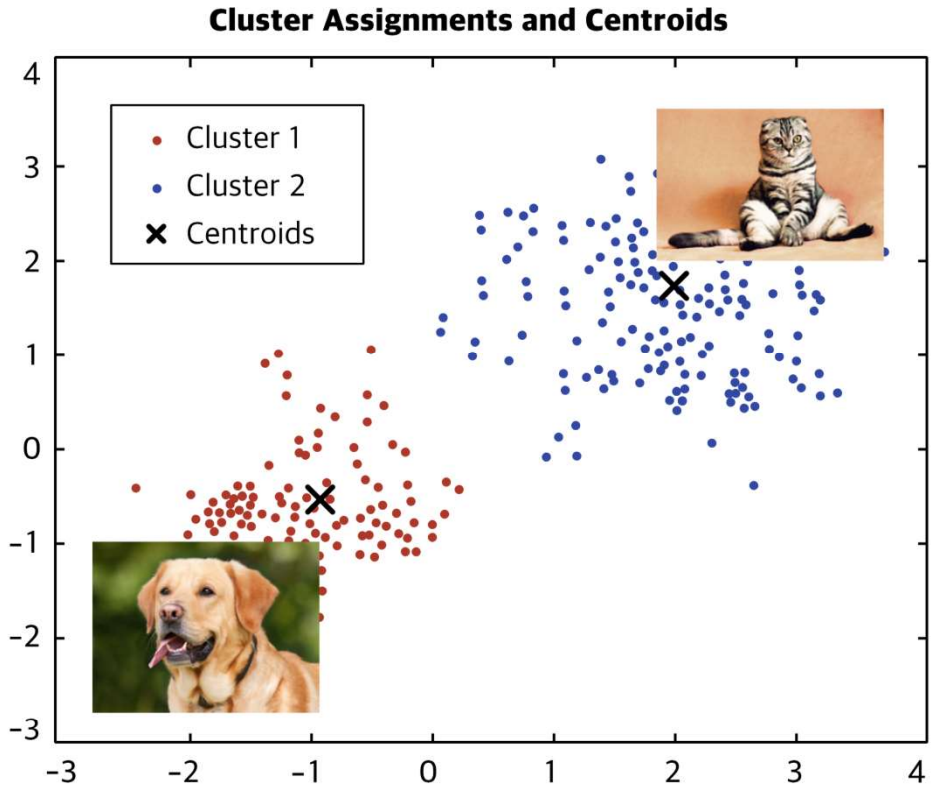
❖ Classification



Sivaraman, K., and P. Arumugam. "Clustering Analysis in Data Mining." *International Journal of Pure and Applied Mathematics* 119.12 (2018): 9639-9649.

❖ Classification

✓ Neural Network



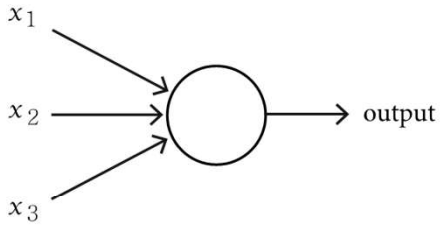
Neural Network (NN)

$y = \boldsymbol{a} \cdot \boldsymbol{x} + b$

or $y = \mathbf{W} \cdot \boldsymbol{x}$

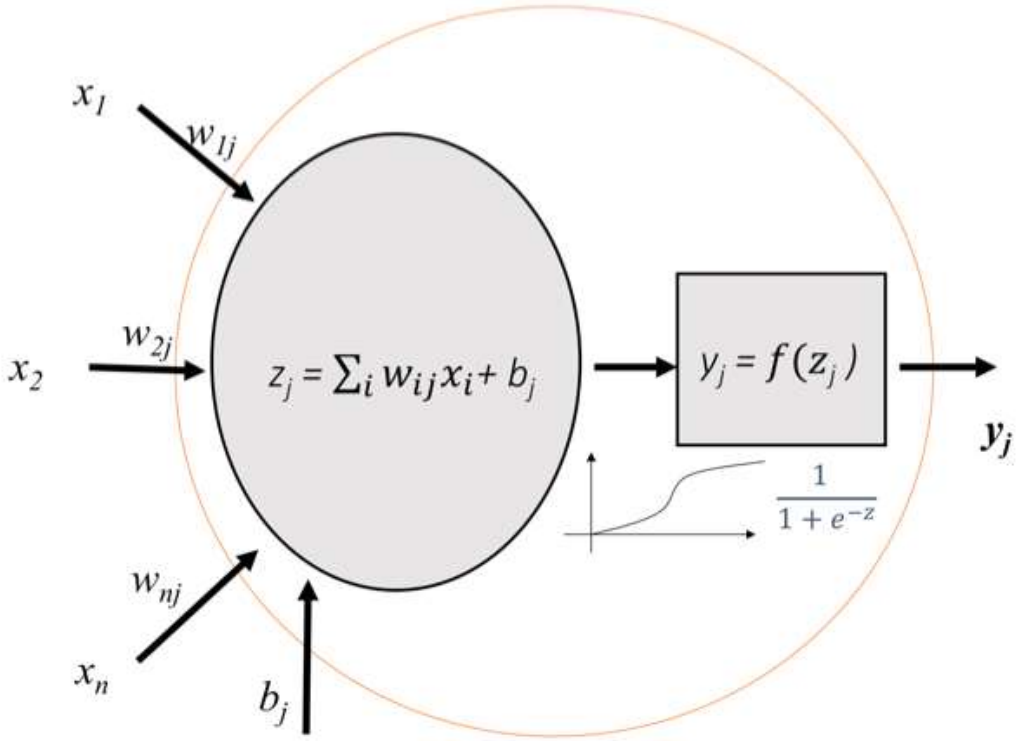
cat if $y_i \geq \mathbf{W} \cdot \boldsymbol{x}_i$

dog if $y_i < \mathbf{W} \cdot \boldsymbol{x}_i$



❖ Classification

✓ Neural Network

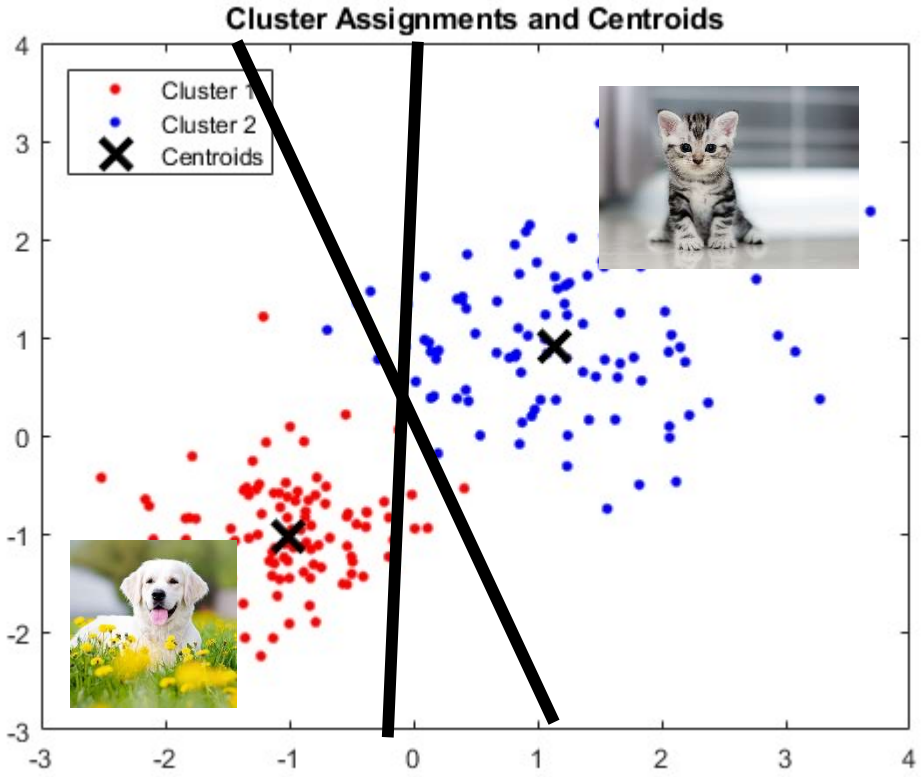


Activation Function

https://towardsdatascience.com/deep-learning-basics-1d26923cc24a

❖ Classification

✓ Neural Network



Neural Network (NN)

$$\text{loss} = \sum(\text{false positive})$$

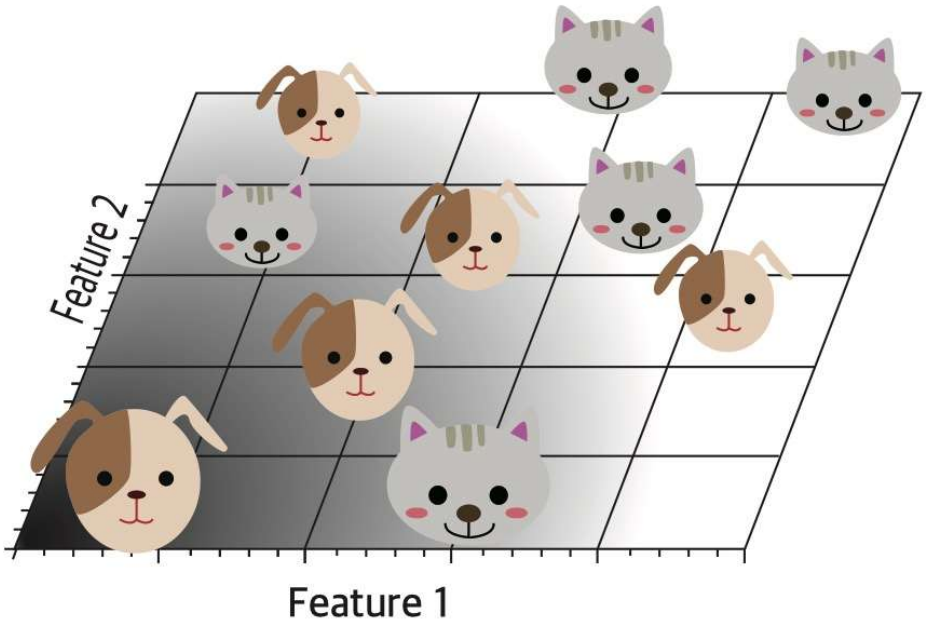
$$\Delta \mathbf{W} = -\eta \frac{\partial \text{loss}}{\partial \mathbf{W}}$$

$$\mathbf{W} = \mathbf{W} + \Delta \mathbf{W}$$

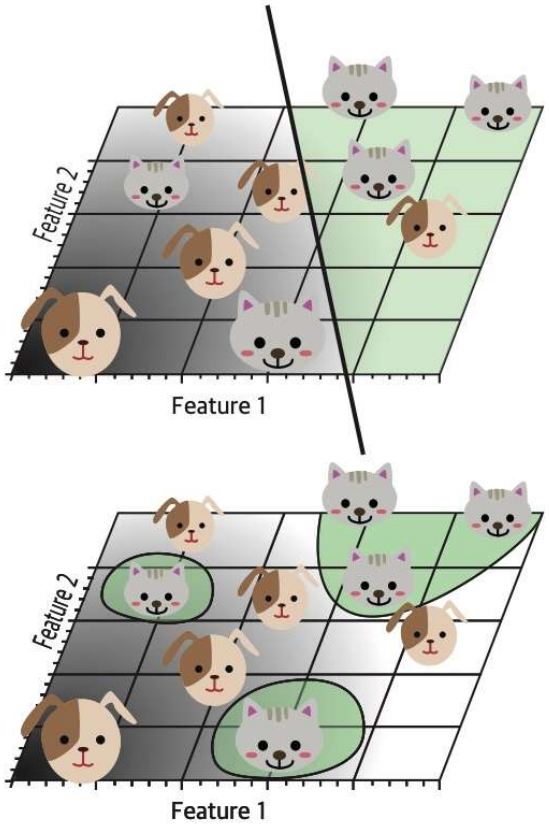
Backpropagation
(Optimization)

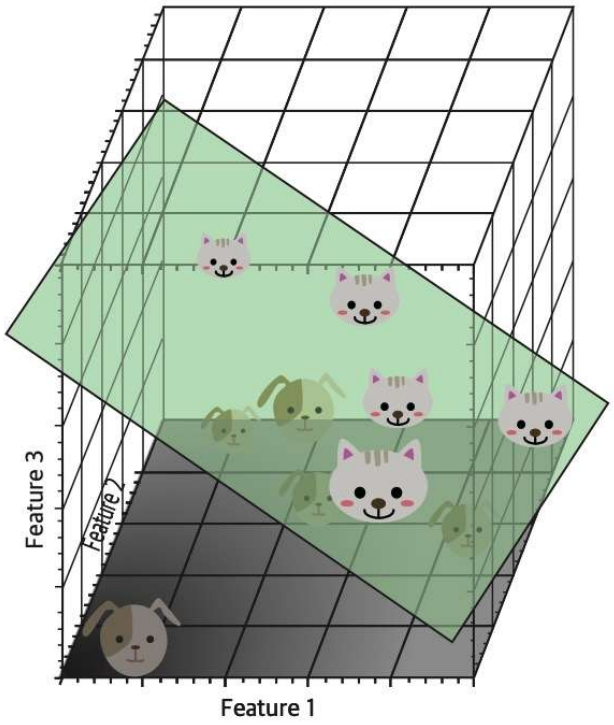
❖ Classification

- ✓ XOR Problem



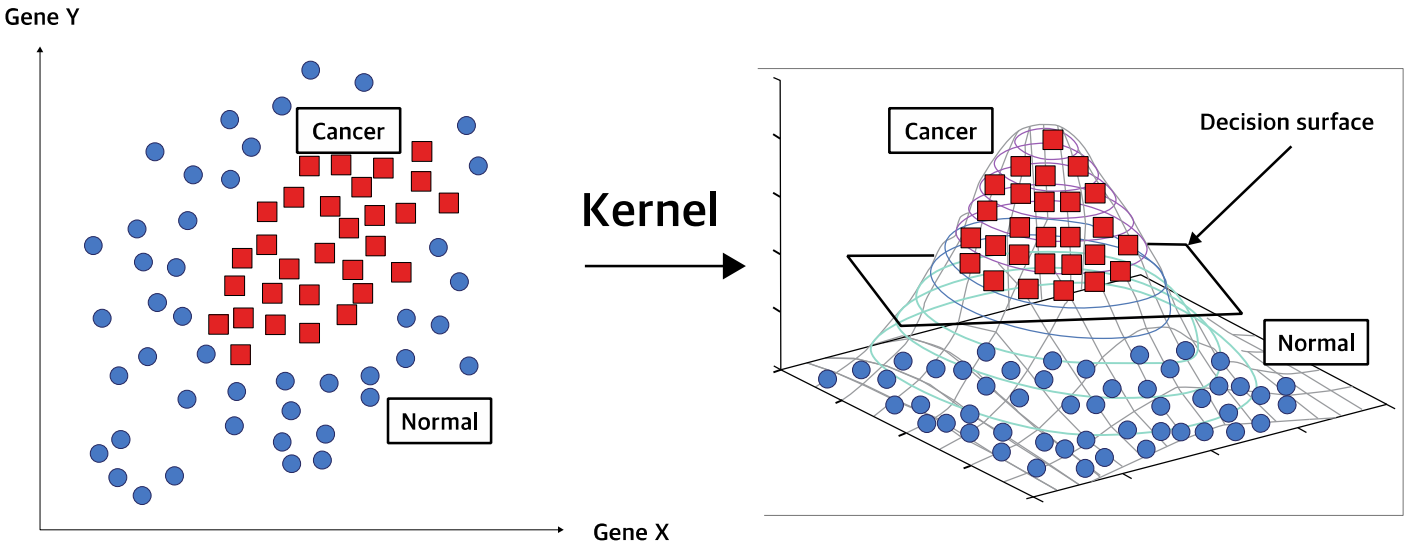
❖ Classification





❖ Classification

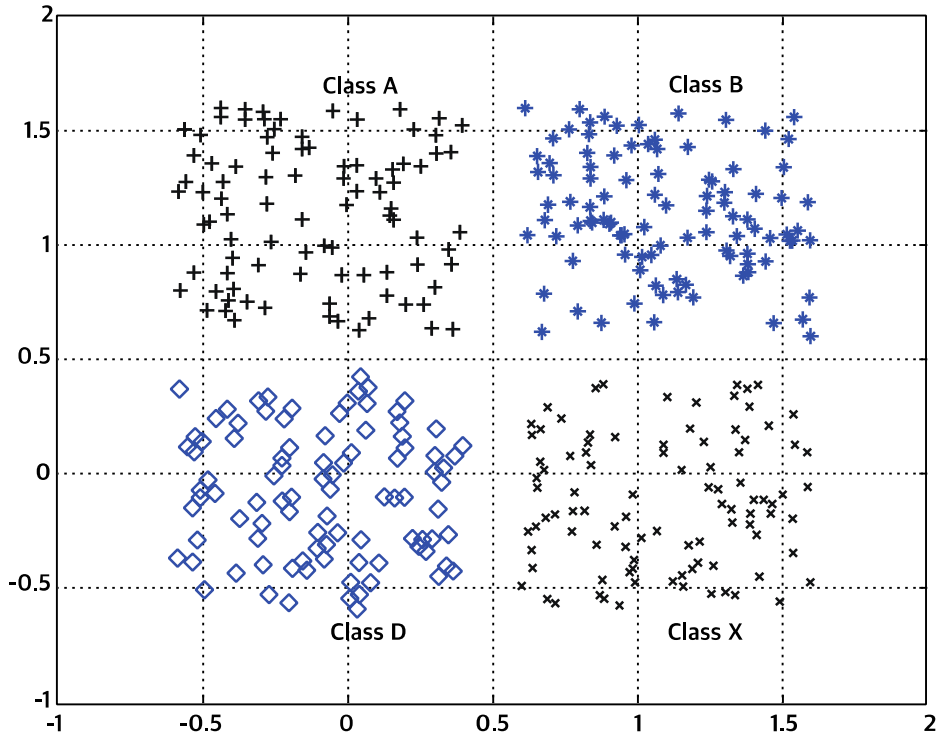
✓ Kernel trick

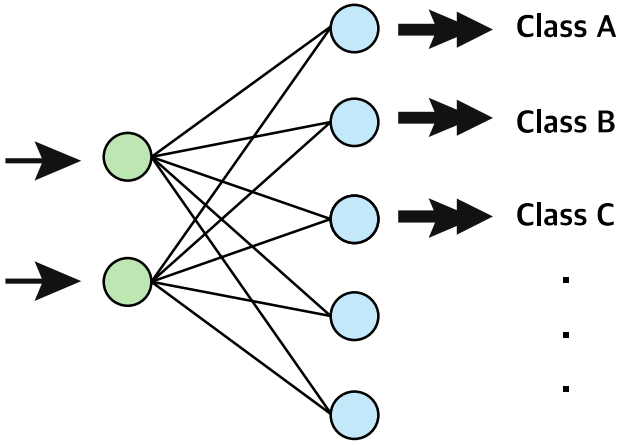


- If such linear decision surface does not exist, the data is mapped into a much higher dimensional space ("feature space") where the separating decision surface is found;
- The feature space is constructed via very clever mathematical projection("kernel trick").

❖ Classification

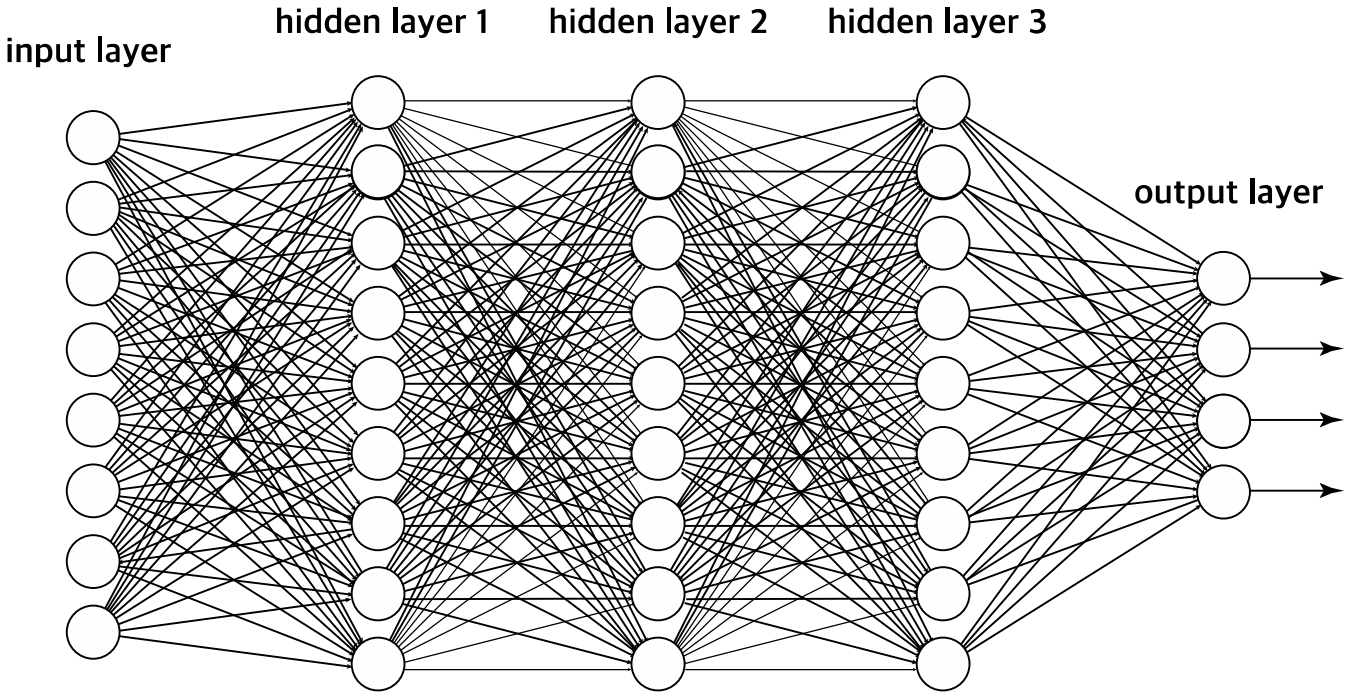
- ✓ Neural Network
  - – Multi-nodes, Multi-layers





❖ Classification

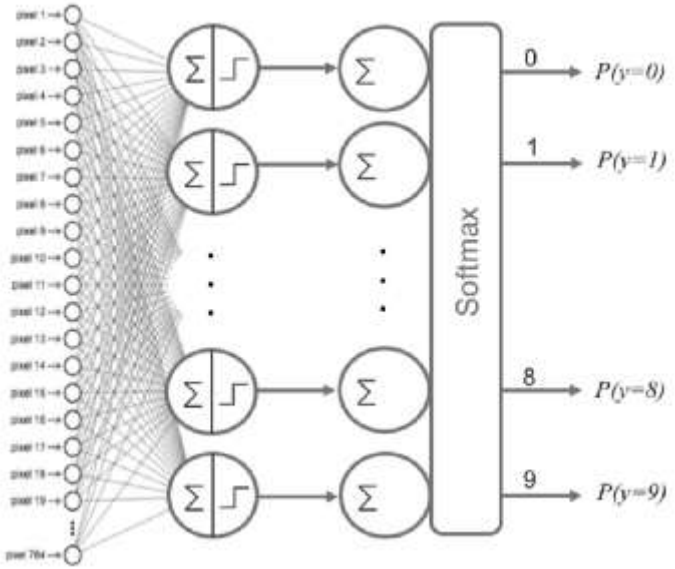
- ✓ Neural Network
  - – Multi-nodes, Multi-layers



Pros: No feature extraction, Accurate
Cons: Large data required, Slow

❖ Classification

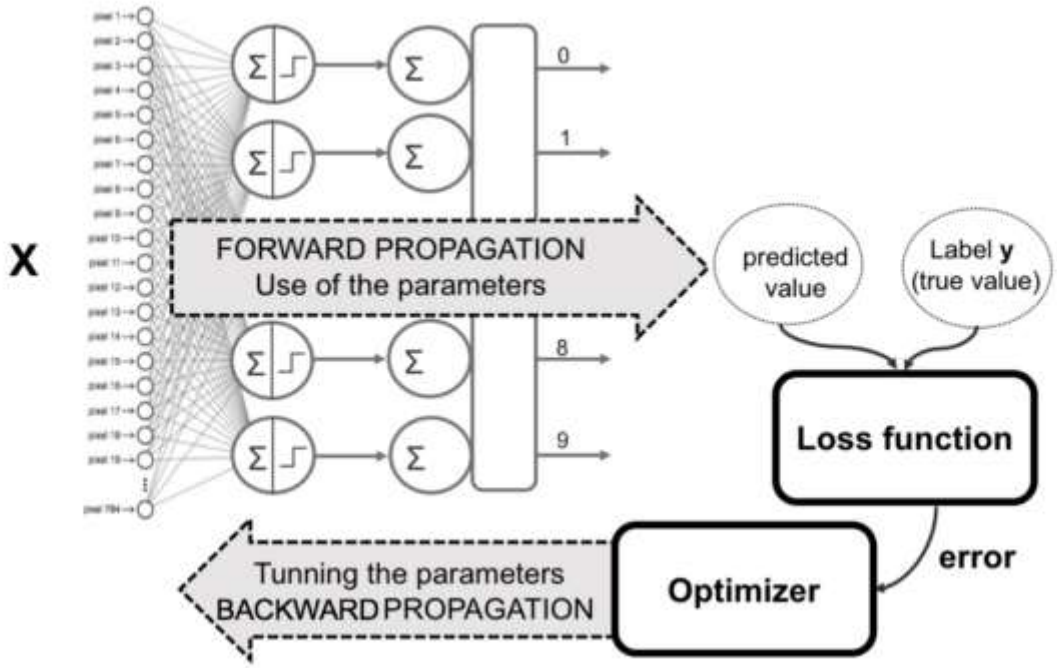
- ✓ Neural Network
  - Multi-nodes, Multi-layers



https://towardsdatascience.com/deep-learning-basics-1d26923cc24a

❖ Classification

✓ Neural Network



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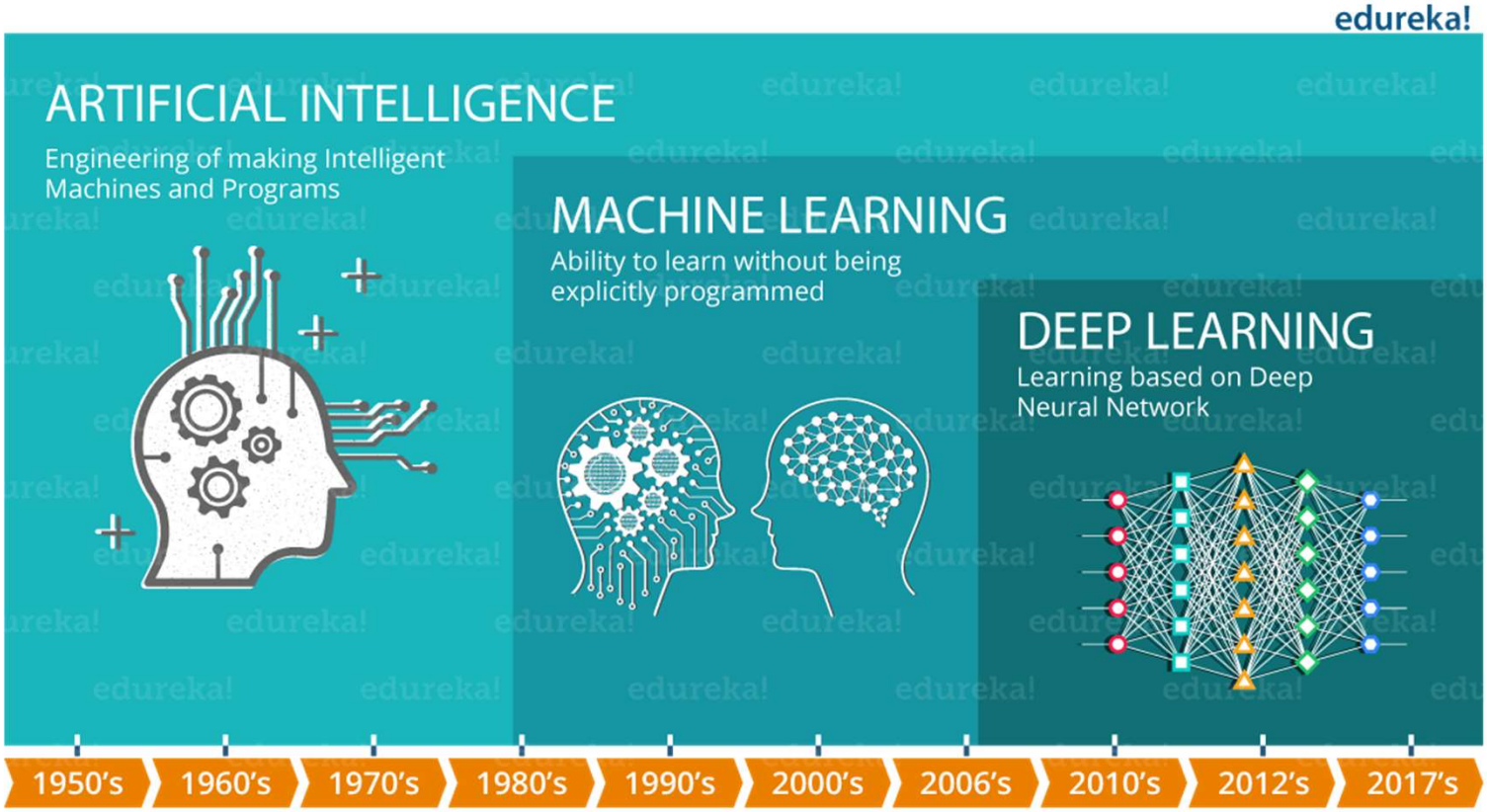
- **Deep learning is**
  - ✓ a data-driven machine learning!



https://www.edureka.co/blog/what-is-deep-learning

INTRODUCTION TO NN

❖ Applications

- ✓ Neural Network
  - *Titanic* survival prediction
- ✓ Convolutional NN
  - Handwriting number classification
- ✓ Recurrent NN
  - Melody learning and prediction
- ✓ AutoEncorder
  - Handwriting number transition

❖ Basic Neural Network Implementation

✓ A question

– Could Jack(Leonardo DiCaprio) have survived from the Titanic cruise ship?

To be continued…


IFU
Thank you!