

Artificial Neural Networks (ANN)

1. Introduction

- 1.1 History.
- 1.2 Applications.
- 1.3 Biological Inspiration.

2. Neuron Model and Network Architectures.

- 2.1 Neuron Model.
 - 2.1.1 Single-Input Neuron.
 - 2.1.2 Transfer Functions (Activation Functions).
 - 2.1.3 Multiple-Input Neuron.
- 2.2 Network Architectures.
 - 2.2.1 Single Layer network.
 - 2.2.2 Multiple Layers of Neurons.
 - 2.2.3 Recurrent Networks.

3. Types of Problems.

- 3.1 Classification.
- 3.2 Prediction.
- 3.3 Pattern recognition.
- 3.4 Optimization.

4. Classification Examples (8 examples).

5. Neural Network Learning.

- 4.1 Types of Learning.
 - 4.1.1 Supervised Learning.
 - 4.1.2 Unsupervised Learning.
- 4.2 Learning Rules.
 - 4.2.1 Hebbian Learning Rule.
 - 4.2.2 The Backpropagation Algorithm.

6. Hopfield Network.

- 5.1 Discrete Hopfield Network.
 - 5.1.1 Determining Weights.
 - 5.1.2 Determining Outputs.
 - 5.1.3 Energy function.
 - 5.1.4 Hopfield Network Algorithm.
 - 5.1.5 Types of Update.

References:

1. “**Neural Network Design**”, Martin T. Hagan, Howard B. Demuth, Mark H. Beale and Orlando De Jes’s, Publisher Martin Hagan 2nd edition, eBook, 2014.
2. “**Fundamentals of Neural Networks, Architectures, Algorithms and Applications**”, Laurene V. Fausett , Pearson Publisher, 1st edition, 1993.
3. “**Introduction to Neural Networks for Java**”, Jeff Heaton, Publisher Heaton Research, 2nd Edition, eBook, 2008.