## Department of Artificial Intelligence & Data Science

### III Year VI Semester

### 6AID5-11: Artificial Neural Network

**Note:** Each assignment of Maximum Marks 10.All question carries equal marks.

### ASSIGNMENT-I

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| Q1. When comparing neural networks and the human brain, focus on aspects such as neurons, synapses, learning mechanisms, and parallel processing. | BLT-2 | CO-1 |
| Q2. Compare and contrast neural networks with the human brain. Discuss the similarities and differences in their structure and function. How do these similarities inspire the design and application of artificial neural networks in solving complex problems? | BLT-4 | CO-1 |
| Q3. Use diagrams to illustrate different network architectures and discuss their specific use cases, such as image recognition for convolution neural networks (CNNs) and time-series prediction for recurrent neural networks (RNNs). | BLT-2 | CO-1 |
| Q4. Explain how neural networks can be viewed as directed graphs. Discuss the different types of network architectures and their respective applications. | BLT-2 | CO-1 |

### ASSIGNMENT-II

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| Q1. Use diagrams and flowcharts to explain the XOR problem and back propagation. Include pseudocode or actual code snippets for the back propagation algorithm. For the computer experiment, detail the dataset, network architecture, training process, and results. | BLT-4 | CO-2 |
| Q2. Include mathematical derivations and examples to clarify how the LMS algorithm functions. Use plots to show how weights converge over iterations | BLT-5 | CO-2 |
| Q3. Explain output representation and decision rules in the context of multilayer perceptrons. How do these concepts affect the network's ability to generalize? | BLT-2 | CO-2 |
| Q4. Discuss the relationship between a perceptron and the Bayes classifier in a Gaussian environment. How does the perceptron approximate the Bayes decision boundary under these conditions? | BLT-2 | CO-2 |
| Q5. Explain the concept of linear least square filters. How are they used in the context of single layer perceptrons? | BLT-2 | CO-2 |

### ASSIGNMENT-III

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| Q1. Provide a detailed mathematical derivation of the back propagation algorithm, highlighting the role of the chain rule in computing gradients. Illustrate your explanation with a simple neural network example. | BLT-4 | CO-3 |
| Q2. Identify and discuss the limitations of back propagation. What challenges are associated with its use? | BLT-4 | CO-3 |
| Q3. Summarize the key benefits of back propagation, such as efficiency and adaptability to different architectures. Highlight limitations like vanishing gradients and computational complexity. | BLT-3 | CO-3 |
| Q4. Discuss how it is used to analyze the curvature of the error surface. | BLT-1 | CO-3 |

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**ASSIGNMENT-IV**

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| Q1. Define Self-Organizing Maps (SOM) and explain their significance in artificial intelligence. | BLT-1 | CO-2 |
| Q2. Explain the two basic feature mapping models used in SOMs. | BLT-2 | CO-2 |
| Q3. Provide a step-by-step description of the SOM algorithm. | BLT-4 | CO-3 |
| Q4. Explain how the topological properties of the input space are preserved in the feature map. | BLT-2 | CO-3 |

**ASSIGNMENT-V**

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| Q1. Compare Hopfield models with other types of recurrent neural networks. | BLT-4 | CO-3 |
| Q2. Design a computer experiment to simulate a Hopfield network. | BLT-5 | CO-3 |
| Q3. Describe the setup of the experiment, including the choice of parameters and initial conditions. | BLT-1 | CO-2 |
| Q4. Explain the structure and functioning of a Hopfield network. | BLT-2 | CO-3 |

*BLT: BLT shows the **Bloom's taxonomy** levels.