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| **Course Name:** | **ANNFS** | **Semester:** | **VII** |
| **Date of Performance:** |  | **Batch No:** | **A1** |
| **Faculty Name:** | **Dr. Jagannath Nirmal** | **Roll No:** | **1912052** |
| **Faculty Sign & Date:** |  | **Grade/Marks:** | **/25** |

**Experiment No: 5**

**Title: Multi-Layer Perceptron**

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| **Aim and Objective of the Experiment:** |
| **Implementation of XOR Gate Using Multi-Layer Perceptron/ Error Back Propagation** |

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| **COs to be achieved:** |
| **CO1:** Understand the role of neural networks in engineering, artificial intelligence, and cognitive modeling  **CO2:** Design artificial neural networks of the Back-prop, Hopfield, RBF and SOM for particular applications.  **CO3:** Develop concepts and techniques of neural networks through the study of the most important supervised and unsupervised neural network models. |

**Apparatus / Software tools used: VLAB**

**Link: http://vlabs.iitb.ac.in/vlabs-dev/labs/machine\_learning/labs/exp2/simulation.php**

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| **Theory:** |
| A **MultiLayer Perceptron (MLP)** is a feedforward artificial neural network model that maps sets of input data onto a set of appropriate outputs. An MLP consists of multiple layers of nodes in a directed graph, with each layer fully connected to the next one. Except for the input nodes, each node is a neuron (or processing element) with a nonlinear activation function. MLP utilizes a supervised learning technique called backpropagation for training the network. MLP is a modification of the standard linear perceptron and can distinguish data that are not linearly separable. The multilayer perceptron consists of three or more layers (an input and an output layer with one or more hidden layers) of nonlinearly-activating nodes and is thus considered a deep neural network. Since an MLP is a Fully Connected Network, each node in one layer connects with a certain weight wij t{\displaystyle w\_{ij}}to every node in the following layer. Some people do not include the input layer when counting the number of layers and there is disagreement about whether wij {\displaystyle w\_{ij}}should be interpreted as the weight from i to j or the other way around.  **FeedForward MultiLayer Perceptron:-** This class of networks consists of multiple layers of computational units, usually interconnected in a feed-forward way. Each neuron in one layer has direct connections to the neurons of the subsequent layer. In many applications, the units of these networks apply a **sigmoid** function as an activation function. In the mathematical theory of artificial neural networks, the **Universal Approximation Theorem** states that a feed-forward network with a single hidden layer containing a finite number of neurons can approximate continuous functions on compact subsets of Rn, under mild assumptions on the activation function. The theorem thus states that simple neural networks can represent a wide variety of interesting functions when given appropriate parameters; however, it does not touch upon the algorithmic learnability of those parameters. |

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| **Block Diagram/Program flowchart:** |
| A Simple Overview of Multilayer Perceptron (MLP) Deep Learning |

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| **Observation:** |
| Attach program and its results after execution |

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| **Post Lab Subjective/Objective type Questions:** |
| Pre Test:    Post Test:    Feedback: Fill the feedback and attach screenshot (feedback link http://vlabs.iitb.ac.in/feedback/) |

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| **Conclusion:** |
| Hence, we studied about Multilayer Perceptron through virtual lab. |

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| **Signature of faculty in-charge with Date:** |