

Neural Network

Objective: The objective of this hands-on workshop is to give insight to MATLAB for Artificial Neural Network & Fuzzy Logic and provide hands-on experience in selected applications. This leads to solve the complex and dynamic real time problems. This workshop provides a vibrant opportunity for researchers and faculty members.

Topics to be covered in Workshop

1. Introduction

- Biological Neuron
- Dendrites
- Axon
- Synapse

2. Introduction Neural Network

- BASIC introduction Neuron
- Activation function
- The Neuron Diagram
- Neuron Models
- step function
- ramp function
- sigmoid function
- Gaussian function

3. Network Architectures

- single-layer feed-forward
- multi-layer feed-forward
- recurrent

4. **Neural Network Learning Rules**

- Supervised and Unsupervised Learning
- Hebbian Learning Rule
- Perceptron Learning Rule
- Delta Learning Rule
- Winner Take All Learning Rule

5. **Fuzzy Logic**

- Definition of fuzzy
- Fuzzy Logic Representation
- Fuzzy Logic Example

Introduction of MATLAB

- About MATLAB.
- MATLAB Screen
- Variable , array , Matrix , Indexing
- Operators (Arithmetic, relational, Logical).
- Display Facilities
- Flow Control (IF, Switch, For, While, Break).
- Command line
- M-File
- Mat-file.
- Scripts and Functions.

- Data storage.
- Input/output capability.

Working on MATLAB Environment:

- How to open, quit and work on command window.
- Introduction of MATLAB Screen.
- Command Window.
- Current Directory.
- Workspace.
- Command history.
- Introduction of useful command.

Getting Started with Neural Network Toolbox

- Classify Patterns with a Neural Network
- Neural Network Pattern Recognition Tool.
- Neural Network Fitting Tool.
- Network Time Series Tool.
- Parallel Computing on CPUs and GPUs

Neural Networks: MATLAB examples

- Calculate the output of a simple neuron
- Classification of linearly separable data with a perceptron
- Classification of a 4-class problem with a 2-neuron perceptron
- ADALINE time series prediction with adaptive linear filter
- Classification of an XOR problem with a multilayer perceptron

- Classification of a 4-class problem with a multilayer perceptron
- Radial basis function networks for classification of XOR problem
- 1D and 2D Self Organized Map