

(MT-604) Neural Computing

Artificial Neural Networks and Neural Computing: A Brief Overview of Neural Computing, ANNs: The Mappings Viewpoint ,ANNs: The Structure Viewpoint ANN Learning Approaches, Mathematical Fundamentals for ANN Study:, Vector and Matrix Fundamental, Geometry For State-Space Visualization, first and second order optimization procedures for neural computing.

Single-Unit Mappings and the Perception: Linear Separability, Multilayer Perceptrons (MLPs), Gradient Descent Training Using Sigmoidal Activation Functions;

Feedforward Networks and Training: Feedforward Networks, Part 2: Extensions and Advanced Topics: Weight Space, Error Surfaces, and Search, Stochastic Optimization for Weight Determination The Network Architecture Determination Problem, Genetic Algorithms for Network Training, Back-Propagation Algorithm, Back-Propagation and Differentiation, Hessian Matrix, Generalization.

Radial Basis Function(RBF) Networks and Time Delay Neural Networks (TDNNs): Cover's Theorem on the Separability of Patterns, Interpolation Problem, Supervised Learning as an Ill-Posed Hyper surface Reconstruction Problem, Regularization Theory, Regularization Networks, Generalization Radial-Basis Function Networks

Recurrent Networks: basic parameters and RNN design, Energy function characterization, Bidirectional association memories.

Competitive and Self-Organizing Networks: Two Basic Feature-Mapping Models, Properties of the Feature Map, Learning Vector Quantization.

Advanced topics: Deep learning neural networks; convolution neural networks. Research Papers related to course topics for the PhD thesis.

References:

1. Rober J. Shalkoff, Artificial Neural Networks, McGraw-Hill International Edition. 1997.
2. Vojislav Kecman, Learning and Soft Computing, Pearson Education, 2001.
3. J.S.R. Jang, C.T.Sun, E.Mizutani, Neuro-Fuzzy and Soft Computing, Prentice Hall, 2003.
4. Laurene Fausett, Fundamentals of Neural Networks, Pearson Education, 2006.
5. Simon Haykin, Neural Networks, Pearson Education, 1996.