Neural Networks (CSC-311)
Tribhuvan University
Institute of Science and Technology
Soch College of Information Technology

Course Title: Neural Networks
Course no.: CSC-311 ---------- Full Marks: 60+20+20
Credit hours: 3----------**Pass Marks: 24+8+8**
Nature of course: Theory (3 hrs.) + Lab (3 hrs.)
Course Synopsis: This course contains concepts of Neural Networks.
Goal: To provide the knowledge of Neural Networks and more emphasis on back propagation algorithm.

Course Contents:

Introduction (6 Hrs.)
Neural computing, Neural computing applications, Overview of neural computing, Engineering approaches to neural computing, ANNs: The mapping viewpoint, The structure viewpoint, learning approaches, Relationship of ANN to other technologies, Historical efforts.

Mathematical Fundamental for ANN (6 hrs.)
Vector and Matrix fundamentals, Geometry for state- space visualization, optimization, Graphs and diagraphs.

ANN Building Blocks (5 Hrs.)
Overview and objectives, Biological neural units, Artificial unit structures, Unit net activation to output characteristics, Artificial unit model extension

Single-Unit Mapping and the Perception (6 Hrs.)
Introduction, Linear reparability, Techniques to directly obtain linear unit parameters, Perceptions and Adaline/Madaline units and networks, Multilayer perceptrons (MLPs), Gradient descent training using sigmoidal activation functions. Neural Mapping and Pattern Associator Applications (5 Hrs.)
Neural network-based pattern associators, The influence of psychology on PA design and evaluation, Linear associative mapping, training, and examples, Hebbian or correlational-based learning.
Feed-forward Networks and Training
Multilayer-feed-forward network structure, The delta rule and generalized delta rule, Architecture and training extensions, Ramifications of hidden units, General multilayer FF network mapping capacity, Examples of FF network design.

Feed-forward Network: Extensions and Advanced topics (8 Hrs.)

Feed-forward pattern associator design: Achieving desired mapping, Weight space, effort spaces, and search, Generalization, Non-Euclidean (output) error norms, Higher-order derivatives-based training, Stochastic optimization for weight determination, The network architecture determination problem, Genetic algorithms for network training, Cascade correlation networks and algorithms, Network minimization, Network inversion.

Introduction to Fuzzy Neural Networks (2 Hrs.)
Warning, The strict Pragma, Other Perl Pragmas, Perl Internals, Perl's Internal Structures, Extending Perl; Embedding Perl, Cooperating with other languages.

Laboratory: Exercises covering all features of above.

Reference Books:
Artificial Neural Networks, Robert J. Schalkoff, McGraw-Hill International Editions, Computer Science Series, 1997.
Neural Networks and Fuzzy Systems, Bart Kosko, Prentice Hall of India Private Limited, 1996.
Neural Networks for Pattern Recognition, Christopher M. Bishop, Indian Editions, Oxford University Press, 2003.