

# GLOBAL INITIATIVE FOR ACADEMIC NETWORKS



National Institute of technology durgapur

[www.nitdgp.ac.in](http://www.nitdgp.ac.in)

## From Data to Knowledge: State-of-the-Art Tools to Analyze Static and Dynamic Data

### Overview:

With most of the transactions done electronically, sensors continuously collecting data from every corner and transporting it over wireless networks, we are overwhelmed with ever-increasing data, both of static and dynamic types. Data, spatially and temporally diverse, is generally unorganized. Steps like data cleaning, preprocessing and management are necessary, to create useful information of organized structure congruent to the target task. Data is fact. Information is created, based on data, to a suitable format for specific applications. Integrating information, updating over time, maintaining its integrity, transporting it securely, are of utmost importance for running and management of any system or organization. Simple decisions could be made from a unit or a small set of Information. To accomplish complex tasks, or to make complex decisions, one needs to perceive the situation which requires prior knowledge. One needs to acquire knowledge of the world around us from a host of information. In this series of lectures, we will introduce different state-of-the-art machine learning algorithms, including soft-computing tools, explaining with application examples using real-life data. There is no single algorithm which could solve a variety of problems. On our way, we will select a particular tool and specify corresponding tasks for which it is suitable, and why it is so, such that one could select proper tool for the problem to be solved. The problems include clustering, pattern recognition, searching, optimization and mining of data. At the end of the course, the students will learn how to acquire knowledge or make a model from information, as warranted by the task. The course will consist of lectures and tutorials. The program will be set as per the norms set by NIT, Durgapur.

### Modules

Part A: Date: 28.08.17 - 01.09.17 & 04.09.17 - 05.09.17

- Explaining the fundamentals of data, information and knowledge.
- Feature extraction, feature selection, dimension/feature reduction- why they are important and algorithms to accomplish that.

- Unsupervised data -Top down and bottom up Clustering, k-means, x-means, Fuzzy clustering, competitive learning and self-organizing maps, Vector quantization, Auto encoders, Applications
- Supervised data - mapping from features to class.
- Pattern Recognition tools and applications:
  - (i) Artificial Neural Networks - Single-layer Perception, Multi-layer Perceptron, Gradient descent training, Error Back propagation, quicklearning, Kernel function networks, Radial Basis function networks -Generalization, Risk minimization in classification.
  - (ii) Recursive Neural Network - a memory preserving classification tool.
  - (iii) Support vector Machines- problem of feature extraction
  - (iv) Restricted Boltzman machines, Convolution Neural Networks, Deep learning.

Part B: Date: 06.09.17 - 08.09.17

- Constrained optimization problems
- Soft Computing tools: Genetic Algorithm, Particle Swarm Optimization, Ant colony optimization
- Applications: Bioinformatics, Data mining, Community detection in networks, etc.

**Number of participants for the course will be limited to fifty.**

**You Should attend if**

- You are an engineer or research scientist interested in Machine Learning and Optimization.
- You are a student or faculty from academic institution interested in Soft Computing and Optimization Techniques and related Applications.

**Fees**

The participation fees for taking the course is as follows:

Participants from abroad : US \$400

Industry/ Research Organizations: Rs. 10000

Academic Institutions:

a) Institute Faculty: Rs. 8000

b) Student: Rs 4000

The above fees include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24hr free internet facility. The participants will be provided with accommodation on payment basis.

## The Faculty



**Prof. Goutam Chakraborty** received his M.Tech. in computer science in 1981, following which he worked for telecommunication industries for 8 years. Beginning 1990, he joined Tohoku University, Japan, and received his Ph.D. in March, 1993. Presently he is Professor and head of the Intelligent Informatics lab., Department of the Software and Information Science, Iwate Prefectural University, Japan. His main research interests are intelligent algorithms and their applications to optimization problems, pattern recognition problems, including dynamic data modeling, prediction of dynamic systems, scheduling and optimization. One of the important application area of his work is wired and wireless Networking problems, including sensor networks. He is a senior member of IEEE, USA, and a senior life-member of ACM.



**Dr. Samarjit Kar** is an Associate Professor of Department of Mathematics, National Institute of Technology, Durgapur. His research interests are in the areas of Operations Research and Optimization, Multi-criteria Decision Making, Financial Modelling, Soft Computing.

**Course Co-ordinator:**

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