

Decentralized Computations: From Nets to Swarms

Overview

Distributed systems are omnipresent in the current time when almost everything seems to be connected in networks. Such systems are characterized by the presence of communities of networked entities communicating with each other, cooperating toward common tasks or the solution of a shared problem, and acting autonomously and spontaneously. There are a large variety of such systems and a variety of models have been devised to describe them.

Whether over wired or wireless media, whether by static or nomadic code, computing in such environments is inherently decentralized and distributed. This course aims to introduce different paradigms as well to describe techniques for the design of distributed algorithms and for their analysis in those paradigms. Starting from classical message passing networked environments and concluding in computing systems made of swarms of robots, the main objective of this course is to show how to solve problems and perform tasks efficiently in a fully decentralized fashion.

Objectives

The primary objectives of the course are as follows:

- introduce basic models for decentralised computation,
- discuss solutions to some fundamental problems,
- introduce the relatively new and exciting paradigm of swarm robotics,
- familiarise the students with problem solving, and
- discuss a variety of open problems in the area.

Schedule	December 04, 2017 to December 08, 2017 Number of participants for the course will be limited to fifty.
You Should Attend If...	<ul style="list-style-type: none">• You are a student of Computer Science, Information Technology or related subjects at any level (Bachelors/Masters/Doctoral/Post-doctoral) or a Faculty member from a reputed academic University/Institution or Technical Institutions.• You are an executive, engineer or researcher from IT industry, service or government organisation including R&D laboratories
Fees	<p>The participation fees for taking the course is as follows:</p> <ul style="list-style-type: none">• Participants from abroad: US \$250• Industry/ Research Organizations: Rs. 10000/-• Academic Institutions:<ul style="list-style-type: none">➤ Faculty/Research Staff: Rs. 5000/-➤ Student: Rs. 1000/- (Refundable) <p>The above fee includes all instructional materials, computer use for tutorials and assignments (if any), laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.</p>

The Faculty



Nicola Santoro (NS) is a Distinguished Research Professor of Computer Science at Carleton University. Initially interested in philosophy, he is one of the first computer science graduates in Italy (Pisa'74), discovering the beauty of algorithms and data structures. During his PhD on information structure (Waterloo '79), he discovered the net (then called ARPANET) and email, and started thinking in distributed terms. He contributes seminal papers focusing on the algorithmic aspects and started some of the main theoretical conferences in the field (PODC, DISC, SIROCCO), as well as some in the more general algorithmic area (WADS, FUN). He is the author of the book *Design and Analysis of Distributed Algorithms* (Wiley 2007). In 2010 he has been awarded the SIROCCO Prize for Innovation in Distributed Computing. The award acknowledges “his

overall contribution on the analysis of the labeled graph properties which has been shown to have a significant impact on computability and complexity in systems of communicating entities. . . . By his results and ideas, Nicola Santoro has enriched Distributed Computing considerably, providing innovative concepts at the source of an extremely large number of current investigations, ranging from compact routing to mobile computing. His pioneering investigations of distributed computing in labeled networks are among the most influential ones, and have opened a vast domains of promising researches, aiming at capturing and understanding the central notion of ‘local knowledge’.” Professor Santoro has co-authored more than 400 publications (over 7500 citations, h-index 46 and i10 index 151). He has also written two books in the area of Distributed Computing. His current research interests include distributed computations by mobile entities (agents, robots, sensors) and in time-varying networks (dynamic, delay-tolerant, vehicular).



Krishnendu Mukhopadhyaya (KM) is a Professor in the Advanced Computing and Microelectronics Unit of the Indian Statistical Institute. He obtained his Bachelor of Statistics (Hons.), Master of Statistics, Master of Technology in Computer Science and Ph.D. in Computer Science all from the Indian Statistical Institute, Kolkata. He also worked at the Jadavpur University as a Lecturer during 1993-1999. He is a recipient of the Young

Scientist Award of the Indian Science Congress Association. He visited University of Florida, Gainesville, USA, for a year, as a BOYSCAST Fellow of the Govt. of India.

Course Coordinator

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<http://www.isical.ac.in/~acmu/GIAN.html>