Complexity and Non-linear dynamics in biological systems

Overview

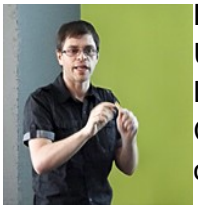
A system where the whole is much more than the sum of its integrating parts is known as Complex System. The climate, the formation of stable biological patterns, or the human brain are examples of some of the most remarkable natural complex systems. These systems exhibit a rich, non-trivial spatio-temporal dynamics that often questions simple thinking and description. The reason is that the constituents of the complex system, as well as the interactions between them, obey a non-linear behavior that need specific tools to be treated and modeled. The beauty of physics is that it facilitates, in the framework of complex networks, dynamical systems, and noise theory, a remarkable number of tools to model these systems, predict their behavior, and even uncover hidden mechanisms. Additionally, the physical environment is sufficiently general and powerful to be applied, with few variations, to systems as different as lasers or the brain, shaping a fascinating set of tools that are the core in present-day research worldwide. This course aims at introducing the students to this beautiful world of complexity and non-linearity, making them aware of its power, and motivating them to deepen into it in their future studies.

The course is planned to have a duration of 5 days comprising 10 hours of lectures and 6 hours of turorial including assignment and discussion.

Modules	The course will cover: Introduction to complexity and nonlinear science, Emergence of order from disorder: Turing patterns, Importance of noise and fluctuations, Multicellular organization and Hydra regeneration, Brain functioning and its challenges, Networks in the context of neuroscience, Neurons as a prominent non-linear system: from Integrate-and-fire to FitzHugh-Nagumo, Percolation in simple living networks, Information theory: application to connectivity inference. **Number of participants for the course will be limited to thirty.**
You Should Attend If...	▪ you are a researchers from government/private organizations/industry including R&D sector ▪ you are a faculty from from reputed academic institutions and technical institutions ▪ you are a student (B. Tech. / M. Sc./ M. Tech. / Ph D)
Fees	The participation fees for taking the course is as follows: **Participants from abroad : US $400** **Indian Participants** **Industry Organization : INR 10,000** **Research Scientists/ Faculty : INR 5,000** **Students : INR 2,500** The above fee include all instructional materials, computer use for tutorials & and assignments, 24 hr free internet facility, accommodation and meals.

Time frame of the course & Venue	**September 12-16, 2016** Department of Mathematics, National Institute of Technology Durgapur Mahatma Gandhi Avenue, Durgapur, West Bengal, India htpp://www.nitdgp.ac.in

The Faculty



Dr. Jordi Soriano Fradera is an Associate Professor of the Facultat de Física, Universitat de Barcelona, Spain. His research interests include Connectivity in Living Neuronal Networks, Activity and Dynamics in Engineered Neuronal Cultures, Excitability and Synchronization in Neuronal Networks, Self-organization in Biological Systems.

Dr. Pinaki Pal is an Assistant Professor of the Department of Mathematics of National Institute of Technology Durgapur, West Bengal, India. His research interests are collective phenomena in complex networks and convective instabilities.

Course Co-ordinator

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