

# Joint Math/Computing Colloquium

Monday, Dec 9	Tuesday, Dec 10	Wednesday, Dec 11
11:15-12:45	11:15-12:45	11:15-12:45
Build. 51 Room 1104	Build. 51 Room 1104	Math Lab 14E/2743

\* A review of previous lectures will be provided, so you can join us on any day!

## Processes Inspired by the Functioning of Living Cells: Natural Computing Approach

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**Abstract:** Natural Computing is an interdisciplinary research field that investigates human-designed computing inspired by nature as well as computation taking place in nature, i.e., it investigates models, computational techniques, and computational technologies inspired by nature as well as it investigates phenomena/processes taking place in nature in terms of information processing.

One of research areas from the second strand of research is a computational understanding of the functioning of the living cell. We view this functioning in terms of formal processes resulting from interactions

between (a huge number of) individual reactions. These interactions are driven by two mechanisms, facilitation and inhibition: reactions may (through their products) facilitate or inhibit each other.

We present a formal framework for the investigation of these interactions. We motivate this framework by explicitly stating a number of assumptions that hold for processes resulting from these interactions, and we point out that these assumptions are very different from the ones underlying traditional models of computation. We discuss some basic properties of these processes, and demonstrate how to capture and analyze, in our formal framework, some notions related to cell biology and biochemistry.

Research topics in this framework are motivated by biological considerations as well as by the need to understand the underlying computations. The models we discuss turned out to be novel and attractive from the theory of computation point of view.

The lectures are of interest to mathematicians and computer scientists interested in formal models of computation as well as to bioinformaticians, biochemists, and biologists interested in foundational/formal understanding of biological processes. They are of a tutorial style and self-contained. In particular, no prior knowledge of biochemistry or cell biology is required.

The presented framework was developed jointly with A. Ehrenfeucht from University of Colorado at Boulder.