Computing with Evolving Data

Professor Eli Upfal
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Date: 16 May 2012 (Wednesday)
Time: 4.30pm – 5.30pm
Venue: MAS Executive Classroom 1, MAS-03-06
School of Physical and Mathematical Sciences

We formulate and study a new computational model for dynamic data. In this model, the data changes gradually in time and the computation has access to only a small part of the data in each step. The goal is to design algorithms that output solutions to computational problems on the data at any given time. As the data is constantly changing and the algorithm may not be unaware of these changes, it cannot be expected to always output the exact right solution; we are interested in algorithms that guarantee good approximate solutions.

We study fundamental computation problems, including sorting and selection, where the true ordering of the elements changes in time and the algorithm can only probe in each step the order of a few pairs; and connectivity and minimum spanning trees in graphs where edges’ existence and weight change over time and the algorithm can only track these changes by probing a few vertex or edges per step. This framework captures the inherent trade off between the complexity of maintaining an up-to-date view of the data and the quality of results computed with the available view.

(Joint work with Aris Anagnostopoulos, Ravi Kumar, Mohammad Mahdian, and Fabio Vandin).

Speaker Biography
Eli Upfal is a professor of computer science at Brown University. He was department chair from 2002-2007. Before coming to Brown in 1998 he was a researcher and project manager at the IBM Almaden Research Center in California, and was the Norman D. Cohen Professorial Chair of Computer Science at the Weizmann Institute of Science from 1992-1997.
He is an ACM Fellow and IEEE Fellow. He is a winner of the IBM Faculty Award in (2003, 2005), IBM Research Division award (1997), the Levinson Prize in Mathematical Sciences (1994), IBM Outstanding Innovation Award (1993).
His research focuses on the design and analysis of algorithms, in particular, randomized algorithms and probabilistic analysis of algorithms. Applications range from combinatorial and stochastic optimization to routing and communication networks, computational biology, and computational finance.

Host: Assistant Professor Gopal Pandurangan, Division of Mathematical Sciences, School of Physical and Mathematical Sciences