Submittee: Petra Berenbrink
Date Submitted: 2014-11-03 13:01
Title: Randomised Algorithms
Event Type: Summer-School

Location:
Simon Fraser University

Dates:
18.8.2014-22.8.2014

Topic:
Randomized Algorithms

Methodology:
Lessons by 5 different lecturers

Objectives Achieved:
Students learned about new methods to analyse randomised algorithms

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Organizers:
Petra Berenbrink, SFU //
Funda Ergun, SFU //
Valerie King, UVic //

Speakers:
Eli Upfal, Computer Science, Brown University. //

The Monte Carlo Method. //

The Monte Carlo method refers to a collection of tools for estimating
values through sampling and simulation. In this class we'll cover the basic Monte Carlo method, discuss its limitation in estimating sparse values, and then study the Monte Carlo Markov chain method that provides a partial solution to this difficulty. //

Seffi Naor, Computer Svience, Technion, Israel. //

Randomized Algorithms: Recent Results and Techniques //

Randomization has evolved by now into a very useful toolbox which is successfully applied to many combinatorial problems. We will present and discuss recent applications of randomization to diverse areas such as maximizing submodular functions, design and analysis of competitive online algorithms, and partitionings of graphs. //

Artur Czumaj, Computer Science, University of Warwick, UK. //

Sublinear Algorithms //

Robert Elsasser, Computer Science, University of Salzburg, Austria. //

Random Walks and Their Applications in Algorithms //

Random walks on graphs play an important role in different scientific fields. In the standard version, at the beginning a particle is situated on a vertex of a given graph. In each time step, the particle moves from its current node to a neighbor chosen uniformly at random. Measures of interest we consider are the mixing time, i.e., how fast the random walk converges to its limiting distribution, and the cover time, i.e., the expected number of steps needed to visit all vertices - maximized over all starting nodes. We will go over several applications of random walks in the theory of algorithms, such as network exploration and distributed voting. We will also consider a number of modifications of the standard version, which allow us to design efficient algorithms for the applications mentioned above. //

Nick Harvey, Computer Science, UBC, Canada. //

Concentration bounds for sums of random variables and matrices

1) Chernoff bounds
3) Talagrand's Inequality
4) Scalar concentration bounds for negatively dependent random variables
5) Pipage rounding
6) Basic concentration for random matrices
7) Tropp's inequality for concentration of random matrices //

Seffi Naor, Artur Czumaj, Robert Elsaesser and Nicht Harvey (UBC) //

Links:
Lecture material can be found on the home pages of the authors.

http://www.cs.sfu.ca/~petra/Eli-SFU-Aug-2014.pdf

http://www.cs.ubc.ca/~nickhar/Publications/PIMS/PIMS.pdf

http://www.dcs.warwick.ac.uk/~czumaj/SFU/Slides.ppsx
