Sudeepa Roy

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Research Interest My research interests lie primarily in the design and analysis of algorithms and computational complexity.

Education

University of Pennsylvania 2007 - current
Philadelphia, PA.
PhD student, Computer and Information Science
Current CGPA of *4.0 out of 4.0*.
Courses credited: Analysis of Algorithms, Approximation Algorithms, Theory of Computation, Machine Learning, Introduction to Computer Architecture.

Indian Institute of Technology 2004 - 2006
Kanpur, India.
Master of Technology in Computer Science and Engineering
Obtained CGPA of *10.0 out of 10.0*.
Courses credited were Advanced Topics in Algorithms and Data Structures, Computational Complexity, Finite Automata on Infinite Inputs, Parallel Semi Numerical and Non Numerical Algorithms, Knowledge Discovery, Data Streaming: Algorithms and Systems, Advanced Compiler Optimization.

Jadavpur University 2000 - 2004
Kolkata, India.
Bachelor of Computer Science and Engineering
Obtained 89.1% in aggregate and stood *third* among about 60 students.
Relevant courses credited include Design and Analysis of Algorithms, Formal Languages and Automata Theory, Data Communication and Computer Networks, Database Management Systems, Compiler Design, Operating Systems and Computer Architecture.

Experience

Google India Pvt. Ltd. 2006 - 2007
Bangalore, India.
Software Engineer
I worked in Google search quality and Orkut teams.

Honeywell Technology Solutions Lab 2005
Bangalore, India
Summer Intern
Proposed an algorithm for translation and implemented part of a tool that automatically translates a subset of Simulink models used in model based development into input language of a suitable model checker, namely NuSMV, for formal verification.

Patent

Automatic Translation of Simulink Models into Input Language of a Model Checker
Meenakshi B., Abhishek Bhatnagar, Sudeepa Roy
US Patent pending; filed on 10/10/2006

Publication

Automatic Translation of Simulink Models into Input Language of a Model Checker
Meenakshi B., Abhishek Bhatnagar, Sudeepa Roy
Accepted in International Conference on Formal Engineering Methods (ICFEM), 2006 and published in in Springer LNCS, Number 4260, pages 606 to 620.

Research

STCON on Unique Path Graphs 2008
University of Pennsylvania, Philadelphia, PA.
Under the guidance of Prof. Sampath Kannan and Prof. Sanjeev Khanna.
We studied the directed st-connectivity problem (STCON) problem, where given a directed graph and two vertices s and t, we are interested in finding if there is a directed path from s to t. A standard search like BFS or DFS solves STCON using linear space in linear time, on the other hand Savitch's theorem solves STCON using $O(\log^2 n)$ space, but takes $O(n^{\log n})$

time. We studied the space complexity of polynomial time algorithm for STCON and the only sublinear ($n/2^{\Theta(\sqrt{n})}$) space polynomial time known till date is due to Barnes *et al.* We proposed an $O(n^\epsilon)$ space $O(m+n)^{\frac{1}{\epsilon}}$ time algorithm for a subclass of directed graphs, which we call *unique path graphs*. A directed graph has unique path property if there exists at most one simple path between any two vertices and any vertex is contained in at most one directed (non trivial) cycle. We give an alternate implementation of DFS to solve STCON on unique path graphs which takes $O(n^\epsilon)$ space and polynomial time when ϵ is a constant between 0 and 1.

Optimizimg User Views for Workflows 2007
University of Pennsylvania, Philadelphia, PA.
Undertaken as an Independent Study, under the guidance of Prof. Sanjeev Khanna.
Construction of 'user views' for a workflow specification is a recent technique to focus user's attention to 'relevant' information in response to provenance queries. Given which modules are relevant in the specification, a user view concisely clusters together modules in the specification such that each composite module in the user view contains at most one relevant module from the specification, and no control or data dependencies are introduced or removed between modules. The problem we looked at is construction of user view with minimum size for a specification. We have proposed a linear time algorithm to construct optimum user views for 'series-parallel' workflow graphs and have given a tight upper bound on the size of the user view constructed in terms of number of relevant modules in the specification. We have also studied the same problem for general workflow graphs.

On "Go With The Winners" Algorithm 2005 - 2006
Indian Institute of Technology, Kanpur, India.
Undertaken as M.Tech Thesis Work, under the guidance of Prof. Manindra Agrawal and Prof. Somenath Biswas.
We proposed a simple condition that is expected to characterize the search-trees for which the *Go With The Winners* algorithm proposed by Aldous and Vazirani will work. We proved that our condition is both necessary and sufficient for a special class of trees.

Projects

Optimal Parallel 2D String Matching on Mesh Connected Computers 2005 - 2006
Indian Institute of Technology, Kanpur & Google India Pvt Ltd, Bangalore, India.
Under the guidance of Prof. Phalguni Gupta.
We extended an existing exact two dimensional string matching algorithm for PRAM model to an optimal algorithm in mesh connected network model.

Verification of Authentication Protocols 2003 - 2004
Jadavpur University, Kolkata, India.
Undertaken as B.E. Final Year Project Work, under the guidance of Prof. Chandan Mazumdar.
This work involved design and implementation of a technique for the verification of authentication protocols using a model-theoretic approach.

Achievements

1. Obtained certificate of appreciation from Indian Institute of Technology Kanpur for Academic Excellence in Computer Science and Engineering in the year 2004-05.
2. Obtained 99.90 percentile (AIR 35) in GATE (CSE) 2004 among 35,019 candidates.
3. Ranked 46th in WBJEE 2000 among around 46,000 candidates.

References

Prof. Sanjeev Khanna, Department of Computer & Information Science, University of Pennsylvania, Philadelphia, PA - 19104, email - `sanjeev@cis.upenn.edu`

Prof. Somenath Biswas, Department of Computer Science & Engineering, Indian Institute of Technology Kanpur, Kanpur - 208016, India, email - `sb@cse.iitk.ac.in`

Prof. Manindra Agrawal, Department of Computer Science & Engineering, Indian Institute of Technology Kanpur, Kanpur - 208016, India, email - `manindra@cse.iitk.ac.in`