

Curriculum Vitae
Ashwin Lall
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Objective

To get a Ph.D. in Computer Science so as to do research in academia or industry.

Personal

Indian; born August 21, 1980 in Kerala, India; visa status: F1 student visa.

Education

Ph.D., 2003-present, University of Rochester, advised by Mitsunori Ogihara.

M.S., 2003-2005, University of Rochester.

B.A., 1999-2003, summa cum laude from Colgate University.

Awards and Honors

Edward Peck Curtis Award for Excellence in Teaching by a Graduate Student, 2005

Sproull Fellowship, University of Rochester, 2003

High honors in Computer Science, Colgate University, 2003

Honors in Mathematics, Colgate University, 2003

Award for Academic Excellence (Computer Science), Colgate University, 2003

Award for Excellence in Research (Computer Science), Colgate University, 2003

Edwin J. Downie '33 Award for Mathematics, Colgate University, 2003

Phi Beta Kappa, National Honor Society, Colgate University, 2003

Upsilon Pi Epsilon, Computer Science Honor Society, Colgate University, 2002

Dean's List, Colgate University, Fall 1999 - Spring 2003

Research Interests

My research is focused on the field of Streaming Algorithms. A streaming algorithm is one that processes an enormous amount of data in one pass. The challenge is to design algorithms that can answer meaningful queries about the data being streamed by maintaining a sketch that is both small and fast to update. This class of algorithms is motivated by applications in networking and databases, where the sheer volume of data makes it infeasible for all of it to be stored or processed more than once. My interests lie specifically in the intersection of the theory and practice of this class of algorithms.

Publications

Conferences

1. Ashwin Lall, Vyas Sekar, Mitsunori Ogihara, Jun Xu and Hui Zhang, “Data Streaming Algorithms for Estimating Entropy of Network Traffic”, In Proceedings of ACM SIGMETRICS 2006/IFIP Performance 2006, Saint Malo, France, June 2006.
2. Haiquan (Chuck) Zhao, Ashwin Lall, Mitsunori Ogihara, Olivier Spatscheck, Jia Wang, and Jun Xu, “A Data Streaming Algorithm for estimating entropies of OD flows”, In ACM Internet Measurement Conference 2007, San Diego, CA, October 2007.
3. Ashwin Lall, Anca Sailer, Mark Brodie, “SPIRIT: Service for Providing Infrastructure Recommendations for IT”, To appear in IEEE/IFIP Network Operations and Management Symposium 2008 (short paper), Salvador da Bahia, Brazil, April 2008.

Technical Reports

1. Ashwin Lall, Vyas Sekar, Mitsunori Ogihara, Jun Xu and Hui Zhang, “Data Streaming Algorithms for Estimating Entropy of Network Traffic”, Technical Report TR-2005-886, Department of Computer Science, University of Rochester, Rochester, NY, November 2005.
2. Ashwin Lall and Mitsunori Ogihara, “The Bitwise Bloom Filter”, Technical Report TR-2007-927, Department of Computer Science, University of Rochester, Rochester, NY, November 2007.

Research Experience

SPIRIT: Service for Providing Infrastructure Recommendations for IT, Summer 2007, with Anca Sailer and Mark Brodie, IBM T.J. Watson Research Labs.

We designed SPIRIT, a service that allows maintenance support providers for Small-to-Medium Businesses (SMBs) to recommend solutions which are standardized, flexible, and cost-effective. SPIRIT works by first aligning the customer's IT infrastructure with a "template" describing the best practices recommended by the maintenance support provider. This step is done using an efficient graph algorithm that finds the most cost-effective transformations of the customer's environment that are consistent with the template. Then, the aligned environment can be upgraded by choosing from a standard set of well understood, highly automated (and therefore economical) options. We show that the algorithm performs well on both real and synthetic data. A short paper on this work has been accepted to NOMS 2008 and two patents related to it have been filed.

A Data Streaming Algorithm for Estimating Entropies of OD Flows, Spring 2007, with Mitsunori Ogihara, University of Rochester; Chuck Zhao and Jim Xu, GeorgiaTech; Jia Wang and Oliver Spatscheck, AT&T Research.

We designed an algorithm for computing the entropy of the flows between every ingress and egress node in a network. We had previously studied the problem of computing the entropy at a single point (or between a given pair of nodes), but the challenge with this problem was to design an efficient data structure to retain sufficient information at each ingress (egress) point to compute the entropy to every other egress (ingress) point. We were able to design an efficient algorithm for solving this distributed problem by adapting the stable distribution sketch data structure of Indyk. We show how the problem of computing entropy can be reduced to computing some L_p norms and improve Indyk's algorithm for computing these norms. A paper on this work appeared in the Internet Measurement Conference (IMC) 2007.

An efficient algorithm for identifying medium to large flows in network traffic, Fall 2006, with Mitsunori Ogihara, University of Rochester, and Jim Xu, GeorgiaTech.

We developed an algorithm to maximally utilize fast/limited SRAM and slow/abundant DRAM to maintain the counts of medium to large flows with provably bounded relative error. By using the properties of SRAM and DRAM to complement one another, we were able to maintain an order of magnitude more flows (i.e., not just the largest flows, but the medium-sized ones as well) than previous methods. Underlying our scheme is the sketch-guided methodology (for which we give analytical bounds) and a counter-array architecture that supports exact writes

and approximate reads.

Streaming Algorithms for Estimating Entropy, Summer/Fall 2005, with Mitsunori Ogihara, University of Rochester; Vyas Sekar and Hui Zhang, Carnegie Mellon University; Jim Xu, GeorgiaTech.

Entropy has recently been suggested as a metric to monitor features of network traffic or detect anomalies. We presented algorithms based on the celebrated Alon–Matias–Szegedy algorithm for computing the frequency moments over a stream. We also empirically demonstrated that sieving out the high-frequency items from the stream increased the performance considerably. A paper on this work was published in SIGMETRICS/Performance 2006.

Bitwise Bloom Filter, Fall 2004, with Mitsunori Ogihara, University of Rochester.

We developed and analyzed the performance of a novel data structure for keeping approximate counts of a large number of items succinctly. The data structure was based on the counting Bloom filter, a data structure for succinctly maintaining set membership.

Streaming Algorithms, Summer 2004, with Mitsunori Ogihara, University of Rochester.

A streaming algorithm is one that can work with huge streams of data (presented as items) and compute functions of this data (probably, approximately) using minimal space and time per item. Since there is typically an enormous amount of data, even linear storage is infeasible. We looked at the progress made in the field and designed algorithms for so-called iceberg queries.

Teaching Experience

Teaching assistant to Daniel Gildea, CS284: Advanced Algorithms, Fall 2004

Teaching assistant to Lane Hemaspaandra, CS280: Computer Models and Limitations, Spring 2004

Calculus tutor, Colgate University, Spring 2000–Spring 2003

Service

Admissions Committee: I have served twice on the admissions committee for the URCS Ph.D. program. As a member of this committee, I had the same responsibilities as the professors on it in hand-picking qualified students for our program.

Recruitment Committee: I served two years on the recruitment committee for the URCS Ph.D. program. As part of my service, I helped design a webpage to attract graduate applicants to our department and maintained a webpage detailing the department's accomplishments.

Rochester Graduate Student Theory Seminar: Piotr Faliszewski and I founded the Rochester Graduate Student Theory Seminar. We have been meeting weekly since the Spring of 2005 to discuss topics in theory that are of interest to us. I have also presented at this seminar many times. The webpage for this seminar can be found here: <http://www.cs.rochester.edu/~pfali/theory-meet/>.

References

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