

Bibudh Lahiri

Curriculum Vitae

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Personal Data

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Research Interests

- Data stream algorithms to monitor TCP/IP networks for intrusion detection and traffic behavior characterization
- Distributed algorithms for data aggregation and data mining in P2P and wireless sensor networks

Education

Ph.D. Candidate	Computer Engineering	Iowa State University	Fall 2006 - current
B.E.	Computer Science & Engineering	Jadavpur University	1998-2002

Experience

Research Assistant	ECE, ISU	Fall 2006 - current
Teaching Assistant	ECE, ISU	Fall 2008
Assistant Systems Engineer	Tata Consultancy Services Limited	2002 - 2006

Publications

Refereed Conference Publications

- Bibudh Lahiri and Srikanta Tirthapura, “**Computing Frequent Elements using Gossip**”, *Proc. 15th International Colloquium on Structural Information and Communication Complexity (SIROCCO) 2008*, pp. 119-130

This article proposes randomized algorithms with probabilistic guarantees for identifying the frequently occurring data elements and finding the number of distinct elements in a distributed database using uniform gossip as the communication primitive.

Invited Articles

- Bibudh Lahiri and Srikanta Tirthapura, “**Stream Sampling**”, to be published in the *Encyclopedia of Database Systems*, by Springer Verlag GmbH, Heidelberg, Germany

This article explains the application of random sampling techniques for computing aggregates on massive data streams in small space with probabilistic accuracy guarantees.

Talks

- “Computing Frequent Elements using Gossip”, The 15th International Colloquium on Structural Information and Communication Complexity (SIROCCO), Villars-sur-Ollon, Switzerland, 2008

Honors and Achievements

Hats-off award	Tata Consultancy Services Limited	2005
8th in class	Bachelor of Computer Science & Engineering	2002
54th among around 60,000 candidates	West Bengal Engineering Entrance Examination	1998
48th among around 300,000 candidates	West Bengal Higher Secondary Examination	1998
29th among around 500,000 candidates	West Bengal Secondary Examination	1996

Activities

- **Attended the Fifteenth International Colloquium on Structural Information and Communication Complexity (SIROCCO 2008) at Villars-sur-Ollon, Switzerland in June 2008.**
- Reviewed papers for ICDCN 2009, LCN 2008, DCOSS 2008 and ICDCN 2008
- **Attended the Twenty-Sixth Annual ACM SIGACT-SIGOPS Symposium on Principles of Distributed Computing (PODC 2007) in Portland, Oregon in August 2007.**
- Attended workshops LOCALITY and DialM-POMC in Portland, Oregon in August 2007.

Computer skills

Embedded Systems: MICA2 platform for sensor networks, nesC, TinyOS 1.1

Programming Languages: C, C++, Java, Unix Shell Script, Latex, PL/SQL

Operating Systems: Red Hat Enterprise Linux 4.0, Windows XP

Markup Languages: HTML, XML

Middleware: Java RMI

Database: Oracle 9i

IDE: Oracle 9i JDeveloper 9.0.2, Eclipse 3.1

J2EE frameworks: BC4J, Struts, Maverick

Statistical packages: R 2.7.2

Research and Development Projects

1. **Mining network flow data streams for detecting exploit behavior: ECE, ISU. Summer 2008 - current (with Srikanta Tirthapura):** The objective is to design and implement efficient algorithms that can work on massive volume of real network flow data, but require small space to detect the presence of patterns (if any) that characterize typical exploit behavior. The current work is to develop data stream algorithms that can identify (approximately) the frequently occurring source IP addresses; and for each source IP address reported as frequent, can identify the destination IP addresses (approximately) that occur frequently alongwith this source IP address in the network traffic data stream. **Roles played:**
 - Identified the problem
 - Working on the design and the analyses of the algorithms (with Srikanta Tirthapura)
2. **Design of Gossip-based protocols for data aggregation in P2P networks: ECE, ISU. Summer 2007 - Summer 2008 (with Srikanta Tirthapura):** The objective was to design distributed Gossip-based algorithms for computing various aggregates (e.g., identifying the frequently occurring

data elements, computing the number of distinct elements) in large-scale P2P networks, with probabilistic guarantees on accuracy. The nodes exchange small-sized “sketches” or synopses of their individual data sets through an underlying gossip mechanism. These scalable, fault-tolerant and self-stabilizing algorithms can be applied to identify the most popularly accessed resources and the degree of variation in the resources in large P2P networks.

Roles played:

- Identified the problem
- Worked on the design and the probabilistic analyses of the algorithms (with Srikanta Tirthapura)
- Simulated the algorithm on Java

3. **Design and implementation of a distributed, lightweight sensor network directory: ECE, ISU. Fall 2006 - Spring 2007 (with Srikanta Tirthapura and Bojian Xu):** The goal was to design and implement an efficient and scalable distributed sensor network directory to track mobile objects in a wireless sensor network. The algorithm adopted was the distributed Arrow protocol, in which local change in the object’s position does not usually result in a global change in the network. This was deployed in the first system demo with a fixed spanning-tree-based network of MICA2 motes.

Roles played:

- Designed the initial system demo (with Srikanta Tirthapura)
- Implemented the initial system demo with nesC on TinyOS and CrossBow motes (with Bojian Xu)
- Demonstrated the application in the Graduate Research Workshop organized by the Department of Electrical & Computer Engineering, ISU in April, 2007.

4. **A peer-to-peer file-sharing system: ECE, ISU. Fall 2007:** This application, developed using socket programming in Java, supported file sharing across multiple machines. The design was adopted from the Gnutella specification and the application was successfully tested on a platform involving multiple Linux machines.

Roles played:

- Worked on the object-oriented design of the protocol
- Implemented the protocol over a network of Linux machines

Industrial Projects

1. **Trailblazer (Acuity): TCS, Kolkata, Feb 2006 - July 2004:** Acuity is a web-based application developed for McGraw-Hill Digital Learning to enhance the functionality of an existing application named TrailBlazer. It is used to create test, exercise and assignments for students; score the students’ response and generate predictive, diagnostic and summary reports. The system also monitors the structure of state curriculum and tracks the progress of a student in class.

Roles played:

- Interacted with the customer for requirement collection
- Designed the class and sequence diagrams using UML tool Enterprise Architect 6.0
- Developed the application on Maverick framework using Eclipse 3.1

2. **DUoS and Associated Distribution Systems: TCS, Kolkata, Manchester (UK), Nov 2002 - Jan 2006:** The goal of the DADS program was to meet the regulatory requirement to separate electricity distribution and supply businesses of United Utilities. The application developed by TCS provided a common web-based interface across all the distribution functions and it replaced a number of different legacy applications that were used for distribution billing previously.

Roles played:

- Interacted with the customer for requirement collection
- Developed prototypes and specification documents for the middleware and database components
- Developed web components on BC4J (Business Component for Java) framework using Oracle 9i JDeveloper 9.0.2
- Developed and maintained programs for data migration from legacy applications
- Joined the project as a developer and later took the responsibility as a process owner of Payment Management and Revenue Protection Service modules

References

Prof. Srikanta Tirthapura (Major professor)
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