

B. Aditya Prakash

5th Year Graduate Student,
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Academic Interests

- I am interested in solving **large real-world** problems by **understanding** and **managing** efficiently, dynamical mechanisms (like propagation) on **networks**, occurring across natural, social and technological systems. My research combines theoretical analysis of models, developing efficient algorithms and empirical studies on tera-byte scale data. I have also worked on time-series modeling and mining, privacy and anomaly detection.

Education

Carnegie Mellon University, Pittsburgh PA, USA

- PhD. Student, Computer Science Department August 2007 – 2012 (expected)
(MS in CS awarded 2011)
Thesis: *Propagation and Immunization on Large Networks: Theory and Tools*
Committee: Prof. Christos Faloutsos (Advisor, Chair), Prof. Roni Rosenfeld (CMU), Prof. David Andersen (CMU), Prof. Jon Kleinberg (Cornell University)

Indian Institute of Technology – Bombay, Mumbai, INDIA

- B.Tech, Computer Science and Engineering July 2003 – May 2007
Thesis: *On Query Optimization Issues in Fine-grained Access Control*
Thesis Advisor: Prof. S. Sudarshan

Selected Achievements

- Awarded the CMU SCS *Graduate Fellowship*. Received *perfect GRE and TOEFL* scores. (2007)
- Secured **All India Rank (AIR) 58** out of 1,72,000 candidates in the IIT - Joint Entrance Examination (IIT JEE) 2003
- Was placed in the **top 0.1%** of students in NSEP & NSEC and hence selected for Indian National *Physics and Chemistry Olympiads (InPhO & InChO)* (2003)
- Was awarded the prestigious *Kishore Vaigyanik Protsahan Yojana (KVPY) Fellowship (Young Scientist Encouragement Fellowship) 2001* by the Department of Science & Technology, Govt. of India and administered by Indian Institute of Science, Bangalore.
webpage - <http://www.iisc.ernet.in/kvpy/>
- Was awarded the prestigious *National Talent Search Examination (NTSE) Scholarship 2001* by NCERT (New Delhi).
- Was awarded the *Jawaharlal Nehru Science and Engg. Scholarship 2003* by Govt. of India.

Manuscripts in submission

- Fractional Immunization on Networks** (B. Aditya Prakash, Lada Adamic, Theodore Iwashyna, Hanghang Tong, Christos Faloutsos)
- How much of Twitter is Influence?** (B. Aditya Prakash, Deepayan Chakrabarti, Kunal Punera)
- Who is to blame? Finding Culprits in Epidemics** (B. Aditya Prakash, Jilles Vreeken, Christos Faloutsos)
- Got the Flu (or mumps)? Check the Eigenvalue!** (B. Aditya Prakash, Deepayan Chakrabarti, Michalis Faloutsos, Nicholas Valler and Christos Faloutsos)
- Competing Viruses on Composite Networks: Who wins?** (Xuetao Wei, Nicholas Valler, B. Aditya Prakash, Iulian Neamtii, Michalis Faloutsos and Christos Faloutsos)

6. **Gelling, and Melting, Large Graphs through Edge Manipulation** (Hanghang Tong, B. Aditya Prakash, Tina Eliassi-Rad, Michalis Faloutsos, Christos Faloutsos)
7. **Worst-case Footprints in the SIS model** (B. Aditya Prakash, Varun Gupta and Christos Faloutsos)

**Publications
(reverse
chronological)**

1. **Winner-takes-all: Competing Viruses or Ideas on fair-play networks** (B. Aditya Prakash, Alex Beutel, Roni Rosenfeld, Christos Faloutsos) – In WWW 2012, Lyon
2. **Threshold Conditions for Arbitrary Cascade Models on Arbitrary Networks** (B. Aditya Prakash, Deepayan Chakrabarti, Michalis Faloutsos, Nicholas Valler, Christos Faloutsos) - In IEEE ICDM 2011, Vancouver
3. **Times Series Clustering: Complex is Simpler!** (Lei Li, B. Aditya Prakash) - In ICML 2011, Bellevue
4. **Epidemic Spreading on Mobile Ad Hoc Networks: Determining the Tipping Point** (Nicholas Valler, B. Aditya Prakash, Hanghang Tong, Michalis Faloutsos and Christos Faloutsos) – In IEEE NETWORKING 2011, Valencia, Spain
5. **On the Vulnerability of Large Graphs** (Hanghang Tong, B. Aditya Prakash, Tina Eliassi-Rad and Christos Faloutsos) – In IEEE ICDM 2010, Sydney, Australia
6. **Virus Propagation on Time-Varying Networks: Theory and Immunization Algorithms** (B. Aditya Prakash, Hanghang Tong, Nicholas Valler, Michalis Faloutsos and Christos Faloutsos) – In ECML-PKDD 2010, Barcelona, Spain
7. **Parsimonious Linear Fingerprinting for Time Series** (Lei Li, B. Aditya Prakash and Christos Faloutsos) - In VLDB 2010, Singapore
8. **MetricForensics: A Multi-Level Approach for Mining Volatile Graphs** (Keith Henderson, Tina Eliassi-Rad, Christos Faloutsos, Leman Akoglu, Lei Li, Koji Maruhashi, B. Aditya Prakash and Hanghang Tong) - In SIGKDD 2010, Washington D.C.
9. **EigenSpokes: Surprising Patterns and Scalable Community Chipping in Large Graphs** (B. Aditya Prakash, Ashwin Sridharan, Mukund Seshadri, Sridhar Machiraju and Christos Faloutsos) – In PAKDD 2010, Hyderabad, India
10. **BGP-lens: Patterns and Anomalies in Internet-Routing Updates** (B. Aditya Prakash, Nicholas Valler, David Andersen, Michalis Faloutsos and Christos Faloutsos) – In ACM SIGKDD 2009, Paris, France.
11. **FRAPP: A Framework for high-Accuracy Privacy-Preserving Mining** (Shipra Agarwal, Jayant R. Haritsa and B. Aditya Prakash) – In Intl. Journal on Data Mining and Knowledge Discovery (DKMD), Springer, vol. 18, no. 1, February 2009, Ed: Johannes Gehrke.
12. **Complex Group-By Queries For XML** (C. Gokhale, N. Gupta, P. Kumar, L. V. S. Lakshmanan, R. Ng and B. Aditya Prakash) – In IEEE ICDE 2007, Istanbul, Turkey.

**Other
Publications**

1. **Formalizing the BGP stability problem: patterns and a chaotic model** (B. Aditya Prakash, Michalis Faloutsos and Christos Faloutsos) – CMU-Technical Report. Preliminary Version in IEEE INFOCOM NetSciCom Workshop, 2011.
2. **Surprising Patterns and Scalable Community Detection in Large Graphs** (B. Aditya Prakash, Ashwin Sridharan, Mukund Seshadri, Sridhar Machiraju and Christos Faloutsos) – In IEEE ICDM Large Scale Data Mining Workshop 2009, Miami
3. **On Query Optimization Issues in Fine-Grained Access Control** – Senior Thesis, IIT-Bombay, 2007

Patents

1. **Determining User Communities in Communication Networks** (pending, filed March 2010) Ashwin Sridharan, Mukund Seshadri, James Schneider, B. Aditya Prakash, Christos Faloutsos and Sridhar Machiraju
2. **Analysis of Computer Network Activity by Successively Removing Accepted Types of Access Events** (pending, filed April 2010) B. Aditya Prakash, Alice Zheng, Jack Stokes, Eric Fitzgerald, Theodore Hardy

Research Experience

- **Graduate Research: Epidemic Spreading, Time-Series, Network Data** Ongoing
Advisor: Prof. Christos Faloutsos (CSD, CMU)
Joint with: Prof. Roni Rosenfeld (CMU), Prof. Lada Adamic (UMich), Prof. Michalis Faloutsos (UCR), Prof. David Andersen (CMU), Prof. Theodore Iwashnya (M.D.) (UMich)

Ongoing research on data mining, virus propagation, immunization, marketing, time-series mining and modeling, modeling BGP routing and finding anomalies.
- **Summer Internship: Social Influence Propagation in context of Twitter** Summer 2011
Mentors: Dr. Ravi Kumar, Dr. Deepayan Chakrabarti and Dr. Kunal Punera (Yahoo! Research – Santa Clara)

Studied on the Hadoop+PIG system, more than 10 Tera-bytes of data over multiple months, and showed fundamental differences in the dynamics of hashtags (topics) on Twitter.
- **Summer Internship: Detecting Anomalous Network Connections** Summer 2009
Mentors: Dr. Jack Stokes and Dr. Alice Zheng (Microsoft Research – Redmond)

Developed and implemented a graph-based active learning algorithm to detect anomalies among millions of network connections.
- **Summer Internship: Clustering in Large Graphs** Summer 2008
Mentors: Dr. Sridhar Machiraju, Dr. Mukund Seshadri, Dr. Ashwin Sridharan (Sprint Research Labs, Burlingame, California)

Analyzed mobile call-graphs covering billions of calls and discovered the unusual 'Eigenspokes' pattern to extract communities like spammers and telemarketers.
- **Senior Thesis: Query Optimization in presence of Access Control** Aug 2006-Spring 2007
Advisor: Prof. S. Sudarshan (CSE, IIT Bombay)

We formally developed and implemented a substantially better method of combining redundancy removal and safe-plan generation in presence of unsafe user-defined functions.
- **Summer Internship: Complex Nested Aggregation in XML databases** Summer 2006
Mentors: Prof. Laks. V. S. Lakshmanan, Prof. Raymond Ng (CS, UBC, Vancouver)

Designed algorithms for complex group-by/aggregate queries over very large XML databases in memory.
- **Summer Internship: Privacy Preserving Data Mining** Summer 2005
Mentor: Prof. Jayant R. Haritsa (SERC, Indian Institute of Science, Bangalore)

Enhanced a matrix theoretic framework by relating dataset size and mining accuracy/privacy, optimizing & extending it to classification rule mining.

Selected Course Projects

- **Choices for Map-Reduce:** *ML algorithm to predict number of reducers for a map-reduce job.*
- **Parallelizing Cross-Associations:** *Parallelized cross-association mining for a Map-Reduce setting and implemented on Hadoop.*

Programming Skills

- **Programming Languages** : C/C++/C#, Java, Matlab, Scheme, BASIC, FORTRAN90
- **Other** : HTML, Latex, Awk, Ruby, Python, PIG, JDBC, SQL, DB2
- **Operating Systems** : GNU/Linux (SysAd Experience), Windows, MacOS

Relevant Courses

- **At CMU:** Analysis of Social Media, Machine Learning, Social Networks, Probabilistic Graphical Models, Multimedia Databases and Data Mining, Algorithms in the Real World, Advanced Computational Complexity, Advanced Operating and Distributed Systems, Programming Language Semantics, Computer Architecture.
- **At IITB:** Advances in Data Management, IR, Implementation Techniques in DBMS, Statistical Foundations of Machine Learning, Statistical Inference, Probability and Statistics, Linear Algebra, Analysis of Algorithms, Operating Systems, Networks.

Teaching Assistant

- **15-415 Database Applications by Prof. Christos Faloutsos** (Designed and graded assignments, held office hours etc.)
- **15-451 Undergraduate Algorithms by Prof. Avrim Blum and Prof. Manuel Blum** (was the senior TA, held weekly recitations, graded assignments, held office hours etc.)

Guest Lectures and Talks

- **Guest Lecture: Virus/Influence Propagation** 15-826 Multimedia Databases and Data Mining (Machine Learning Department, CMU) Instructor: Prof. Christos Faloutsos, 2011
- **Guest Lecture: Epidemic Thresholds** 47-867 Social Network Analysis (Tepper School of Business, CMU) Instructor: Prof. R. Ravi, 2010
- **Invited Talk** Massive Graphs: Big Compute meets Big Data, SIAM Annual Meeting, Minneapolis, July 2012
- **Invited Talk: Epidemic Thresholds, Immunization and BGP** University of Michigan Information Seminar, 2010
- **Invited Talk: Virus Propagation in Time-Varying Networks: Theory and Immunization Algorithms** BBN, Cambridge, INARC/NS-CTA Meeting, 2010
- **Invited Talk: Virus Propagation in Time-Varying Networks: Theory and Immunization Algorithms** CMU-Yahoo! Machine Learning Seminar, 2010
- **Invited Talk: BGP-lens: Patterns and Anomalies in Internet-Routing Updates** ECE Parallel Data Laboratory Retreat, 2009
- **Gave talks at various conferences** like KDD, PKDD, PAKDD, ICDM, VLDB

Grants

- **Helped create a successful NSF III Grant Proposal No. 1017415** (title: 'Influence and Virus Propagation in Large Graphs', amount: \$499,000).
- **Helped create an IARPA proposal** (title: 'Robust Automated Analysis for Early-warning of outbreaks, amount: \$650,000).
- **Helped create a DOE/ASCR proposal** (title: 'Scalable Human-centered management, Analysis, and visualization of Really Big Scientific Data', amount: \$1,000,000).

Academic Community Activities

- **Student Member** ACM
- **Program Committee** member for ICDM 2011 Workshop on Data Mining Technologies for Computational Creative Intelligence
- **Reviewer** for ACM Trans. on Knowledge Discovery from Data (ACM TKDD), IEEE Trans. on Knowledge and Data Engg. (IEEE TKDE), SIAM Journal on Applied Dynamical Systems, Data Mining and Knowledge Discovery Journal, Advances in Complex Systems Journal, Social Network Analysis Journal
- **External Reviewer (several times):** EDBT, VLDB, WWW, KDD, ICDM, SIGMOD, ICWSM
- **Organizer DB-Seminar** CMU (2010-): Organizing the DB-Seminar at CMU.
- **Dataset Manager**, CMU (2008-): Managing the data repository of the DB-group.
- **Student Contact**, CMU (2008-11): Contact for new students admitted to the Department.

- **Student Mentor**, IGSA@CMU (2010-11): Mentored newly admitted Indian students of various departments in CMU. Helped them with academic and cultural issues.
- **Student Mentor**, CSE, IIT Bombay (2006): Mentored sophomores of the CSE Dept. by guiding them on academic issues and helping them convey their difficulties to the faculty.
- **System Administrator**, Hostel Six, IIT Bombay (2004-2005): Maintained a network consisting of all the machines (Linux, Windows and Mac based) in the dorm. Work involved setting up NFS/NIS Servers, Proxy, FTP, DNS and handling user accounts.
- **Head Boy**, Delhi Public School, Bhilai.

Extracurricular Activities

- Am a **certified Tabla Visharad (Classical Tabla Scholar)** from the famous Indira Kala Sangeet Vishwavidyalaya, Khairagarh, C.G., India after successful completion of the 6-year theory+practical course (1995-2000). Secured **Distinction** in practical in 4th year. Performed solo in functions in school, college and outside. (Tabla is an Indian musical instrument)
- Was a regular member of school and house Cricket, Dramatics, Debating and Quizzing teams.

References

- Prof. Christos Faloutsos (advisor)
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