Hanghang Tong

IBM T.J. Watson Research Center
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Research Interests Data mining, machine learning, social networks analysis, multimedia.

Education

9/2008-11/2009 Ph.D in Machine Learning Department, School of Computer Science, Carnegie Mellon University (Advisor: Prof. **Christos Faloutsos**)
Dissertation title: "Fast Algorithms for Querying and Mining Large Graphs"

9/2005-9/2008 M. Sci. in Machine Learning Department, School of Computer Science, Carnegie Mellon University (Advisor: Prof. **Christos Faloutsos**)
Thesis title: "Center-Piece Subgraphs: Problem Definition and Fast Solutions"

9/2002-7/2005 M. Eng. In Pattern Recognition and Intelligent System, Tsinghua University (Advisor: Prof. **Chongrong Li**)
Thesis title: "Machine Learning for Internet Traffic Prediction and Anomaly Detection"

9/1998-7/2002 B. Eng. In Automation Technology, Tsinghua University

Employment History

7/2010-present: Research Staff Member (full time),
IBM T.J. Watson Research Center
19 Skyline Drive,
Hawthorne, NY 10532
Lead the projects on large scale network infrastructure and anomaly detection at multiple scales.

12/2009-7/2010 Post-Doctoral Fellow (full time),
Carnegie Mellon University
5000 Forbes Avenue
Pittsburgh, 15213 PA
Do research on virus and influence propagation on real large networks.

8/2005-11/2009 Graduate Research Assistant (part time)
Carnegie Mellon University
5000 Forbes Avenue
Pittsburgh, 15213 PA
Do research on querying and mining large networks.

6/2008-8/2008 Summer Intern (full time)
IBM T.J. Watson Research Center
19 Skyline Drive,
Hawthorne, NY 10532
Do research on measuring graph proximity with side information

5/2006-7/2006 Summer Intern (full time)
AT&T Labs
180 Park Ave - Building 103
Florham Park, NJ 07932
Do research on directionality-aware proximity measure on large graphs

Hanghang Tong

Awards

2008 SDM 2008 Best Paper Award

2006 ICDM 2006 Best Research Paper Award

Patents

1. Yehuda Koren, Christos Faloutsos, ***Hanghang Tong***. Direction-aware proximity for graph mining. Publication number: US 2009/0204554 A1, US Pat. 12069500. Filed Feb. 11, 2008
2. ***Hanghang Tong***, Huiming Qu, Hani T. Jamjoom. System and method to measure node proximity on graphs with side information. Application Serial No.: 12/638531. Filed Dec. 15, 2009
3. ***Hanghang Tong***, Huiming Qu, Hani T. Jamjoom. An efficient method to compute node proximity with on line feedback on large graphs. Application Serial No.: 12/638514. Filed Dec. 15, 2009

Conference Presentations

1. "Non-Negative Residual Matrix Factorization with Application to Graph Anomaly Detection"

The 11th SIAM International Conference on Data Mining (SDM 2011), April 28-30, 2011, Mesa, AZ, USA

2. "Proximity Tracking on Time-Evolving Bipartite Graphs"

The 8th SIAM International Conference on Data Mining (SDM 2008), April 24-26, 2008, Atlanta, GA, USA

3. "Colibri: fast mining of large static and dynamic graphs"

The 14th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD 2008), August 24-27, 2008, Las Vegas, NV

4. "Fast mining of complex time-stamped events"

The 17th ACM Conference on Information and Knowledge Management (CIKM 2008), October 26-30, 2008, Napa Valley, CA

5. "Fast best-effort pattern matching in large attributed graphs"

The 13th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD 2007), August 12-15, 2007, San Jose, CA

6. "Fast direction-aware proximity for graph mining"

The 13th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD 2007), August 12-15, 2007, San Jose, CA

7. "Fast Random Walk with Restart and Its Applications"

The 6th IEEE International Conference on Data Mining (ICDM 2006), December 18-22, 2006, Hong Kong, China

8. "Center-piece subgraphs: problem definition and fast solutions"

The 12th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD 2006), August 20-23, 2006, Philadelphia, PA

Invited Talks

"Fast Algorithms for Querying and Mining Large Graphs"

- Department of Computer Science, University of Maryland, College Park, MD, 2009
- IBM T.J. Watson Research Center, Hawthorne, NY, 2009
- Department of Electric Engineering, Zhejiang Univeristy, Hongzhou, China, 2009
- Department of Computer Science, Peking Univeristy, Peking, China, 2009
- Department of Computer Science, Tsinghua Univeristy, Peking, China, 2009

- Microsoft Research Asia, Peking, China, 2009
- IBM T.J. Watson Research Center, Yorktown Heights, NY, 2010
- School of Computational Science and Engineering, Gatech, Atlanta, GA, 2010
- Yahoo! Labs, Sunnyvale, CA, 2010

Publications

Book Chapter

1. ***Hanghang Tong,*** Yehude Koren, and Christos Faloutsos. Direction-Aware Proximity on Graphs. Book chapter in Encyclopedia of Data Warehousing and Mining 2009: 646-653.
2. ***Hanghang Tong***, Spiros Papadimitriou, Philip S. Yu and Christos Faloutsos. Proximity Tracking on Dynamic Bipartite Graphs: Problem Definitions and Fast Solutions. LINK MINING: MODELS, ALGORITHMS, AND APPLICATIONS 2010, Part 2, 211-236, DOI: 10.1007/978-1-4419-6515-8_8.

Refereed Journal Publications

1. ***Hanghang Tong,*** Spiros Papadimitriou, Philip S. Yu and Christos Faloutsos. Fast Monitoring Proximity and Centrality on Time-Evolving Bipartite Graphs. SAM Special Issue on Best of SDM08
2. ***Hanghang Tong***, Christos Faloutsos, and Jia-Yu Pan. Random Walk with Restart: Fast Solutions and Applications. Knowledge and Information Systems: An International Journal (KAIS), Volume 14 Number 3/ March 2008, pp327-346.
3. ***Hanghang Tong***, Jingrui He, Mingjing Li, Wei-Ying Ma, Hong-Jiang Zhang, Changshui Zhang. Manifold-Ranking Based Keyword Propagation for Image Retrieval. EURASIP Journal on Applied Signal Processing, vol. 2006, Article ID 79412, 10 pages, 2006. doi:10.1155/ASP/2006/79412.
4. Jingrui He, Mingjing Li, Hong-Jiang Zhang, ***Hanghang Tong*** and Changshui zhang. Generalized Manifold-Ranking Based Image Retrieval. IEEE Transaction on Image Processing. volume 15, issue 10: pp.3170-3177, 2006

Refereed Conference Publications

1. ***Hanghang Tong***, Jingrui He, Zhen Wen, and Ching-Yung Lin. Diversified Ranking on Large Graphs: An Optimization Viewpoint. ACM SIGKDD conference on Knowledge Discovery and Data Mining (KDD-11) 2011
2. U Kang, ***Hanghang Tong***, Jimeng Sun, Ching-Yung Lin and Christos Faloutsos. GBASE: A Scalable and General Graph Management System. ACM SIGKDD conference on Knowledge Discovery and Data Mining (KDD-11) 2011
3. Keith Henderson, Brian Gallagher, Lei Li, Leman Akoglu, Tina Eliassi-Rad, ***Hanghang Tong*** and Christos Faloutsos. It's Who You Know: Graph Mining Using Recursive Structural Features. ACM SIGKDD conference on Knowledge Discovery and Data Mining (KDD-11) 2011
4. Fei Wang, ***Hanghang Tong*** and Ching-Yung Lin. Towards Evolutionary Nonnegative Matrix Factorization. Twenty-Fifth Conference on Artificial Intelligence (AAAI-11) 2011
5. ***Hanghang Tong*** and Ching-Yung Lin. Non-Negative Residual Matrix Factorization with Application to Graph Anomaly Detection. SIAM Data Mining Coference (SDM) 2011
6. U Kang, Spiros Papadimitriou, Jimeng Sun, and ***Hanghang Tong***. Centralities in Large Networks: Algorithms and Observations. SIAM Data Mining Coference (SDM) 2011
7. Dashun Wang, Zhen Wen, ***Hanghang Tong***, Ching-Yung Lin, Chaoming Song,

Albert-László Barabási. Information Spreading in Context. International World Wide Web Conference (WWW) 2011

8. Nicholas C. Valler, B. Aditya Prakash, ***Hanghang Tong***, Michalis Faloutsos, and Christos Faloutsos. Epidemic Spread in Mobile Ad Hoc Networks: Determining the Tipping Point. IFIP/TC6 NETWORKING 2011
9. B. Aditya Prakash, ***Hanghang Tong***, Nicholas Valler, Michalis Faloutsos, Christos Faloutsos: Virus Propagation on Time-Varying Networks: Theory and Immunization Algorithms. ECML/PKDD (3) 2010: 99-114
10. ***Hanghang Tong***, B. Aditya Prakash, Charalampos E. Tsourakakis, Tina Eliassi-Rad, Christos Faloutsos, Duen Horng Chau: On the Vulnerability of Large Graphs. ICDM 2010: 1091-1096
11. Jingrui He, ***Hanghang Tong***, Jaime G. Carbonell: Rare Category Characterization. ICDM 2010: 226-235
12. Keith Henderson, Tina Eliassi-Rad, Christos Faloutsos, Leman Akoglu, Lei Li, Koji Maruhashi, B. Aditya Prakash, ***Hanghang Tong***: Metric forensics: a multi-level approach for mining volatile graphs. KDD 2010: 163-172
13. ***Hanghang Tong***, Spiros Papadimitriou, Christos Faloutsos, Philip S. Yu, Tina Eliassi-Rad: BASSET: Scalable Gateway Finder in Large Graphs. PAKDD (2) 2010: 449-463
14. ***Hanghang Tong,*** Huiming Qu, Hani Jamjoom, and Christos Faloutsos. iPoG: Fast Interactive Querying on Graphs. CIKM 2009
15. Kensuke Onuma, ***Hanghang Tong***, Christos Faloutsos: TANGENT: a novel, 'Surprise me', recommendation algorithm. KDD 2009: 657-666 *(research track, short paper, Acceptance Rate: 20%)*
16. ***Hanghang Tong,*** Huiming Qu, and Hani Jamjoom. Measuring Proximity on Graphs with Side Information. ICDM 2008 (*full paper, Acceptance Rate: 10%)*
17. ***Hanghang Tong***, Yasushi Sakurai, Tina Eliassi-Rad, Christos Faloutsos. Fast Mining of Complex Time-Stamped Events. CIKM 2008 *(full paper, Acceptance Rate: 17%)*
18. ***Hanghang Tong***, Spiros Papadimitriou, Jimeng Sun, Philip Yu, and Christos Faloutsos.Colibri: Fast Mining of Large Static and Dynamic Graphs. KDD 2008 *(research track, short presentation)*
19. Brian Gallagher, ***Hanghang Tong***, Tina Eliassi-Rad, Christos Faloutsos. Using Ghost Edges for Classification in Sparsely Labeled Networks. KDD 2008 *(research track, full presentation, Acceptance Rate: 10%)*
20. ***Hanghang Tong***, Spiros Papadimitriou, Philip S. Yu and Christos Faloutsos. Proximity Tracking on Time-Evolving Bipartite Graphs. SDM 2008 *(full paper, Acceptance Rate: 14%)* **[Best Paper Award]**
21. ***Hanghang Tong*** Yehude Koren, and Christos Faloutsos. Fast Direction-Aware Proximity for Graph Mining. KDD2007 *(research track, full paper, Acceptance Rate: <8%)*
22. ***Hanghang Tong*** Brian Gallagher, Christos Faloutsos, and Tina Eliassi-Rad. Fast Best-Effort Pattern Match in Large Attributed Graphs. KDD2007 *(research track, short paper, Acceptance Rate: 19%)*
23. ***Hanghang Tong*** and Christos Faloutsos. Center-Piece Subgraphs: Problem Definition and Fast Solutions. KDD 2006 *(Full paper, Acceptance Rate: 11%)*

24. ***Hanghang Tong,*** Christos Faloutsos and Jia-Yu Pan. Fast Random Walk with Restarts and Its Applications. ICDM 2006 *(Full paper, Acceptance Rate: 10%)* **[Best Research Paper Award]**

25. ***Hanghang Tong***, Jingrui He, Mingjing Li, Changshui Zhang, Wei-Ying Ma. Graph based multi-modality learning. ACM Multimedia 2005: 862-871 *(Full paper, Acceptance Rate: 16%)*

26. ***Hanghang Tong***, Jingrui He, Mingjing Li, Hong-Jiang Zhang, Changshui Zhang. A Unified Optimization Based Learning Method for Image Retrieval, CVPR2005 *(Acceptance Rate: 22%)*

27. ***Hanghang Tong***, Mingjing Li, Hong-Jiang Zhang, Changshui Zhang, Jingrui He. Learning No-Reference Quality Metric by Examples. The 11th International Multi-Media Modelling Conferene (MMM 2005).

28. Jingrui He, Changshui Zhang, Nanyuan Zhao and ***Hanghang Tong***. Boosting Web Image Search by Co-Ranking. International Conference on Acoustics, Speech, and Signal Processing 2005 (ICASSP 2005)

29. ***Hanghang Tong***, Chongrong Li, Jingrui He. Internet Traffic Prediction by W-Boost: Classification and Regression Proc. ISNN (3) 2005: 397-402

30. ***Hanghang Tong***, Chongrong Li, Jingrui He, Jiajian Chen, Quang-Anh Tran, Hai-Xin Duan, Xing Li: Anomaly Internet Network Traffic Detection by Kernel Principle Component Classifier. ISNN (3) 2005: 476-481

31. ***Hanghang Tong***, Mingjing Li, Hong-Jiang Zhang, Jingrui He and Changshui Zhang. Classification of Digital Photos Taken by Photographers or Home Users. 2004 Pacific-Rim Conference on Multimedia (PCM2004).

32. ***Hanghang Tong***, Mingjing Li, Hong-Jiang Zhang, Changshui Zhang. No Reference Quality Assessment for JPEG2000 Compressed Images. International Conference on Image Processing 2004 (ICIP 2004).

33. ***Hanghang Tong***, Mingjing Li, Hong-Jiang Zhang, Changshui Zhang. Blur Detection for Digital Images Using Wavelet Transform. International Conference on Multimedia and Expo 2004 (ICME 2004).

34. ***Hanghang Tong***, Chongrong Li, Jingrui He. Boosting Feed-Forward Neural Network for Internet Traffic Prediction. The Third International Conference on Machine Learning and Cybernetics (ICMLC 2004).

35. ***Hanghang Tong***, Chongrong Li, Jingrui He. A Boosting-based Framework for Self-similar and Non-linear Internet Traffic Prediction. International Symposium on Neural Network 2004 (ISNN2004).

36. Jingrui He, Mingjing Li, Hong-Jiang Zhang, ***Hanghang Tong***, Changshui Zhang. Manifold-Ranking Based Image Retrieval. ACM Int. Conf. on Multimedia 2004 *(Full paper, Acceptance Rate: 17%)*

37. Jingrui He, Mingjing Li, Hong-Jiang Zhang, ***Hanghang Tong***, and Changshui Zhang. Pseudo Relevance Feedback Based on Iterative Probabilistic One-Class SVMs in Web Image Retrieval. Proc. Pacific-Rim Conference on Multimedia (PCM), 2004.

38. Jingrui He, Mingjing Li, Hong-Jiang Zhang, ***Hanghang Tong***, and Changshui Zhang. Automatic Peak Number Detection in Image Symmetry Analysis. Proc. Pacific-Rim Conference on Multimedia (PCM), 2004

Tutorials

1. Christos Faloutsos, ***Hanghang Tong***. Large Graph Mining: Patterns, Tools, and Case Studies. CIKM 2008, full day tutorial.
2. Christos Faloutsos, ***Hanghang Tong***. Large Graph Mining: Patterns, Tools, and Case Studies. ICDE 2008.

Demos in Conferences

1. Duen Horng Chau, Aniket Kittur, ***Hanghang Tong***, Christos Faloutsos, and Jason I. Hong. SHIFTR: A Fast and Scalable System for Ad Hoc Sensemaking of Large Graphs. KDD 2009
2. Duen Horng Chau, Christos Faloutsos, ***Hanghang Tong***, Jason Hong, Brian Gallagher, and Tina Eliassi-Rad. GRAPHITE: A Visual Query System for Large Graphs. ICDM 2008
3. José Fernando Rodrigues Jr., ***Hanghang Tong,*** Agma J. M. Traina, Christos Faloutsos, Jure Leskovec: Gmine: A System for Scalable, Interactive Graph Visualization and Mining. VLDB 2006: 1195-1198

Tech Reports

1. ***Hanghang Tong,*** B. Aditya Prakash, Charalampos Tsourakakis, Tina Eliassi-Rad, Christos Faloutsos, and Duen Horng Chau. BridgeFind: Fast Detection of Top-k Bridges in Large Graphs. Lawrence Livermore Technical Report, LLNL-TR-414449, July 2009.
2. ***Hanghang Tong***, Christos Faloutsos, and Jia-Yu Pan. Fast Random Walk with Restart and Its Application. CMU-ML-06-109
3. ***Hanghang Tong*** and Christos Faloutsos. Center-Piece Subgraphs: Problem Definition and Fast Solutions. CMU-ML-06-102

Workshop Publications

1. Jingrui He, ***Hanghang Tong***, Spiros Papadimitriou, Tina Eliassi-Rad, Christos Faloutsos, and Jaime Carbonell. PaCK: Scalable Parameter-Free Clustering on K-Partite Graphs. SDM 2009 Workshop on Link Analysis, Counterterrorism and Security, Reno, NV, May 2009.
2. Jingrui He, ***Hanghang Tong***, Mingjing Li, Wei-Ying Ma and Changshui Zhang. Multiple random walk and its application in content-based image retrieval. ACM Multimedia 2005 workshop on Multimedia information retrieval: 151-158.

Publications in Chinese

1. Nan Zhu, Chongrong Li, Yalei Wang and ***Hanghang Tong***. Hierarchical Periodic Broadcasting Stratagem and Resource Allocation. Journal of Huangzhong University of Science and Technology (Nature Science), vol 31, 2003.10.
2. Rongrong Tong and ***Hanghang Tong***. Tele-Immersion and its Application to Distance Learning. Global Chinese Conference on Computer in Education (GCCCE2003).
3. ***Hanghang Tong***, Ling Wang, and Jingrui He. Reference Point-Based Near Insertion Approach and Its Improvement for Traveling Salesman Problem. Computers Engineering and Applications.

Funding Experience

5/2011-4/2013 Co-PI in a DARPA grant, DARPA-BAA-11-04. Multi-Aspect Abnormal Behavior Detection. $4,789,938. (PI: Ching-Yung Lin)

6/2010-5/2012 Co-PI in a NSF grant, Proposal No. 1017415: *III:Small: Influence and Virus*

	Propagation in Large Graphs - Theory and Algorithms, $499K. (PI: Christos Faloutsos)
2/2009-9/2009	Helped in a successful proposal for a Lawrence Livermore National Laboratory, Contract No. B580840: *Trend and Anomaly Detection in Network Traffic*, $100K.
2/2008-9/2009	Helped in a successful proposal Lawrence Livermore National Laboratory (LLNL) grant, Contract No. B579447: *Mining Large Time-Evolving Graphs*, $50K
3/2007-9/2008	Helped in a successful proposal for Lawrence Livermore National Laboratory (LLNL), Contract No. B573265: *Mining Large Time-Evolving Graphs*, $90K
2006-2007	Helped in a successful proposal for a Yahoo! Research Alliance gift: *Analysis and Mining of the Query and Answer System of Yahoo*, $75K

Teaching Experience (TA)

Fall, 2008	Machine Learning
Spring, 2008	Multimedia Databases and Data Mining

Service Experience

2011	PC Member of KDD 2011 (both Research track and Industry track)
2010	PC Member of KDD 2010; PC Member of WWW 2011
2009	PC Member of PKDD 2009; PC Member of CNIKM'09.
2009	Admission Committee, Machine Learning Department, CMU.
2008	Admission Committee, Machine Learning Department, CMU.