

# Hanghang Tong

MLD SCS CMU, 5000 Forbes Ave. Pittsburgh PA, 15213

htong@cs.cmu.edu; www.cs.cmu.edu/~htong

## Education

- 9/08-present Ph.D student in Machine Learning Department, School of Computer Science, Carnegie Mellon University (Advisor: Prof. **Christos Faloutsos**)  
GPA: 3.98/4.0
- 9/05-9/08 M. Sci. in Machine Learning Department, School of Computer Science, Carnegie Mellon University (Advisor: Prof. **Christos Faloutsos**)  
GPA: 3.98/4.0
- 9/02-7/05 M. Eng. in Pattern Recognition and Intelligent System, Tsinghua University (Advisor: Prof. **Chongrong Li**)  
GPA: 86/100
- 9/98-7/02 B. Eng. in Automation Technology, Tsinghua University  
GPA: 85/100

## Research Experience

- ◆ *Proximity tracking*  
Studied how to track proximity and centrality on time-evolving bipartite graphs. Proposed a fast solution which utilizes the smoothness between two consecutive time steps. **[Best Paper Award from SDM 2008]**
- ◆ *Center-Piece Subgraphs*  
Proposed a fast solution to center-piece subgraph: given Q queries nodes, we want to find the nodes and the resulting subgraph with some budget b that have strong connection to all or most of query nodes.
- ◆ *Fast Random Walk with Restart*  
Proposed a fast solution to do random walk with restart. It explores two important properties shared by many real graphs: block-wise and linear correlation. **[Best Research Paper Award from ICDM 2008]**
- ◆ *Direction-Aware Proximity on Graph*  
Focus on the role of edge direction on measuring proximity on graph. Proposed a random walk based methods; built a formal link with random walk with random walk with restart; and developed several fast algorithms.
- ◆ *Best Effort Pattern Match in Attributed Graphs*  
Focus on large graphs where nodes have attributes and want to find subgraphs that match a user query pattern. The proposed solution (Graph X-Ray) 1) allows inexact match when exact match does not exist; and 2) finds high-quality subgraphs in time linear on the size of data graph.
- ◆ *Learning and Mining from Graph*  
Mainly focus on transductive inference for multi-modality by graph model. Proposed optimization based method for graph based multi-modality learning.
- ◆ *Image Retrieval*  
Mainly focusing on 1) automatic keyword annotation for large image database; and 2) unified

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learning in image retrieval. Proposed 1) a manifold-ranking based keyword propagation method; 2) an optimization method based on graph model to unify low-level feature, on-line relevance feedback and off-line long term learning.

## ◆ *Blur Detection*

Proposed an effective and computing efficient algorithm to 1) judge whether or not a given digital image is blurred and 2) determine to what extent it is blurred.

## ◆ *Image Quality Assessment*

Proposed a unified learning-based framework for No-Reference image quality assessment. The proposed framework contributes to No-Reference image quality assessment mainly in three parts: 1) providing a general solution for distortion measurement; 2) making a first attempt for holistic quality evaluation; and 3) unifying the above two.

## ◆ *Anomaly Detection in Network & Web Classification*

Mainly focusing on applying fusion technology (such as boosting, multi-view learning, etc.) into these fields.

## ◆ *Internet Traffic Prediction*

Introduced and designed specific version of boosting algorithm for self-similar and non-linear Internet traffic prediction.

## ◆ *Simulated Annealing Algorithm*

Proposed two improved versions of simulated annealing algorithm for Travel Salesman Problem.

## **Publications (Till Jul., 2008)**

### *Journal*

- **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
- **Hanghang Tong**, Yehude Koren, and Christos Faloutsos. Direction-Aware Proximity on Graphs. Book chapter in Encyclopedia of Data Warehousing and Mining (2<sup>nd</sup> edition)
- **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.
- **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.
- 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

### *Conference*

- **Hanghang Tong**, Huiming Qu, and Hani Jamjoom. Measuring Proximity on Graphs with Side Information. ICDM 2008 (*full paper, Acceptance Rate: 10%*)
- **Hanghang Tong**, Yasushi Sakurai, Tina Eliassi-Rad, Christos Faloutsos. Fast Mining of

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Complex Time-Stamped Events. CIKM 2008 (*full paper, Acceptance Rate: 17%*)

- **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*)
- 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%*)
- **Hanghang Tong**, Spiros Papadimitriou, Philip S. Yu and Christos Faloutsos. Proximity Tracking on Time-Evolving Bipartite Graphs. SDM 2008 (*full paper, Acceptance Rate: 14%*) [**won Best Paper Award**]
- **Hanghang Tong** Yehude Koren, and Christos Faloutsos. Fast Direction-Aware Proximity for Graph Mining. KDD2007 (*research track, full paper, Acceptance Rate: <8%*)
- **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%*)
- **Hanghang Tong** and Christos Faloutsos. Center-Piece Subgraphs: Problem Definition and Fast Solutions. KDD 2006 (*Full paper, Acceptance Rate: 11%*)
- **Hanghang Tong**, Christos Faloutsos and Jia-Yu Pan. Fast Random Walk with Restarts and Its Applications. ICDM 2006 (*Full paper, Acceptance Rate: 10%*), [**won Best Research Paper Award**]
- **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%*)
- **Hanghang Tong**, Jingrui He, Mingjing Li, Hong-Jiang Zhang, Changshui Zhang. A Unified Optimization Based Learning Method for Image Retrieval, CVPR2005 (*Acceptance Rate: 22%*)
- **Hanghang Tong**, Mingjing Li, Hong-Jiang Zhang, Changshui Zhang, Jingrui He. Learning No-Reference Quality Metric by Examples. The 11<sup>th</sup> International Multi-Media Modelling Conferene (MMM 2005).
- 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)
- **Hanghang Tong**, Chongrong Li, Jingrui He. Internet Traffic Prediction by W-Boost: Classification and Regression Proc. ISNN (3) 2005: 397-402
- **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
- **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).
- **Hanghang Tong**, Mingjing Li, Hong-Jiang Zhang, Changshui Zhang. No Reference

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Quality Assessment for JPEG2000 Compressed Images. International Conference on Image Processing 2004 (ICIP 2004).

- **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).
- **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).
- **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).
- 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%*)
- 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.
- 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.
- 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

## Tutorial

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

## Tech Report

- **Hanghang Tong**, Christos Faloutsos, and Jia-Yu Pan. Fast Random Walk with Restart and Its Application. CMU-ML-06-109
- **Hanghang Tong** and Christos Faloutsos. Center-Piece Subgraphs: Problem Definition and Fast Solutions. CMU-ML-06-102

## Demo

- Jos é 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

## In Chinese

- Ling Wang, **Hanghang Tong**, and Da-Zhong Zheng. Reference Point Based Near Insertion Approach and Two-Stage Approach for TSP. Control and Decision, 2004, 19(7): 831-833, 837.
- 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.

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- Rongrong Tong and *Hanghang Tong*. Tele-Immersion and its Application to Distance Learning. Global Chinese Conference on Computer in Education (GCCCE2003).
- *Hanghang Tong*, Ling Wang, and Jingrui He. Reference Point-Based Near Insertion Approach and Its Improvement for Traveling Salesman Problem. Computers Engineering and Applications.

## Honors and Awards (Selected)

- 2008 SDM 2008 Best Paper Award
- 2006 ICDM 2006 Best Research Paper Award
- 2005 Nominated as ‘Rising Academic Star’ in Tsinghua Univeristy (1%, the only one who is a master candidate)
- 2005 Excellent thesis (2%)
- 2004 Tsinghua-Lianxin Fellowship for Excellent Student (top grade 1%)
- 2003 Tsinghua-Guanghua Fellowship for Excellent Student (second grade)
- 2000 Tsinghua Fellowship for Excellent Student (third grade)

## Miscellaneous

- Internship*
  - 5/06-7/06 Intern in Information Visualization Group, AT&T Shannon Labs  
Mentor: Yehuda Koren; Manager: Stephen C. North  
(Lead to 1 paper, 1 book chapter and 1 patent)
  - 7/04-7/05 Intern in Web Search and Mining Group, Microsoft Research Asia  
Mentor: Mingjing Li; Manager: Wei-Ying Ma  
(Lead to 5 papers)
  - 7/03-7/04 Intern in Media Computing Group, Microsoft Research Asia  
Mentor: Mingjing Li; Manager: Hong-Jiang Zhang  
(Lead to 2 papers)
- Grant Proposal*
  - 1. Helped in a successful proposal for a Yahoo! Research Alliance gift, “Analysis and Mining of the Query and Answer System of Yahoo”, 2006-2007, \$75K
  - 2. Helped in a successful proposal for a LLNL grant, “Mining Large Time-Evolving Graphs” (LLNS Grant No. B573265), Mar. 2008- Sep. 2008, \$90K
- Teaching* Spring, 2008: Multimedia Databases and Data Mining
- Service* 2008, Admission Committee, Machine Learning Department, CMU.