

# Dinghao Wu

## 1. Contact Information

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<http://faculty.ist.psu.edu/wu/>

## 2. Research Interests

I do research on software systems, including software design and development, software security, software and information assurance, software testing, software analysis and verification, programming languages and tools, and software engineering. I also work on a project on cloud computing for energy and environmental sustainability.

## 3. Education

Princeton University, Ph.D., Computer Science, 2005.

Thesis: *Interfacing Compilers, Proof Checkers, and Proofs for Foundational Proof-Carrying Code*. (Advisor: Andrew W. Appel)

Princeton University, M.A., Computer Science, 2002.

Nanjing University, M.E., Computer Science, 1999.

Thesis: *A State-Space Based Approach to the Specification and Verification of Hybrid Systems and Its Axiomatic Basis*. (Advisor: Jian Lü)

Nanjing Institute of Chemical Technology, B.E., Chemical Engineering, with Honors, 1996.

Thesis: *Numerical Simulation of Free Turbulent Jets*. (Advisor: Daiqing Zhao)

## 4. Professional Appointments

College of Information Sciences and Technology, The Pennsylvania State University, University Park.  
Senior Lecturer and Research Scientist, September 2009–present.

Center for Software Excellence & Windows Azure Division, Microsoft Corporation. Redmond, WA.  
Research engineer, 2005–2009.

Princeton University, Princeton, NJ. Research and teaching assistant, 2000–2005.

Microsoft Research, Redmond, WA. Summer research intern, Summer 2003 & 2004.

Nanjing University, Nanjing, China. Research and teaching assistant, 1996–1999.

## 5. Research Grants

- Cloud Computing for Energy Efficient Building. **PI: Dinghao Wu**. Co-PI: John Yen. Integrated Modeling and Design (Task 2) of the DOE Greater Philadelphia Innovation Cluster for Energy Efficient Buildings (GPIC/HUB) project. \$87,111 (\$44,742 from DOE plus \$42,369 matching from PSU), 2010–2011.
- Building Information Modeling (BIM) Data Hub (in the Cloud for Energy Efficient Building). **PI: Dinghao Wu**. Co-PI: John Messner (Architectural Engineering, PSU), Robert Leicht (Architectural Engineering, PSU), Prasenjit Mitra (IST, PSU), John Yen (IST, PSU); Sambit Sahu (IBM), Jeaha Yang (IBM), Younghun Lee (IBM), Tian Chao (IBM), Jane Snowdon (IBM), Milind Naphade (IBM). Task 2 project of the DOE GPIC/HUB project. \$828,086 (PSU: \$298,299, IBM: \$529,787. **Wu is the Overall Lead PI.**), 2011–2012.

## 6. Awards and Honors

ACM SIGPLAN PAC professional activities grant for PLDI, 2003.  
Distinguished Graduate Student Award, Nanjing University, 1998.  
Distinguished Student Award, Nanjing Institute of Chemical Technology, 1995.  
Award for Excellence in Organizing Student Activities, Nanjing Institute of Chem. Tech., 1993, 94, 95.  
Honorable Mention, National Mathematical Contest in Modeling (MCM), Chinese Society for Industrial and Applied Mathematics, 1994. (with Miao Li and Ji Zhou, team advisor: Guoqing Liu)  
University Scholarship, Nanjing Institute of Chemical Technology, 1992–1996.  
Many awards on Chinese calligraphy, 1989–1992.

## 7. Current Research Projects

- **GPIC/HUB: Greater Philadelphia Innovation Cluster for Energy Efficient Buildings**  
Collaboration with John Messner (Architectural Engineering, PSU), Robert Leicht (Architectural Engineering, PSU), Prasenjit Mitra (IST, PSU), John Yen (IST, PSU); Sambit Sahu (IBM), Jeaha Yang (IBM), Younghun Lee (IBM), Tian Chao (IBM), Jane Snowdon (IBM), Milind Naphade (IBM). I have led two projects in GPIC/HUB: (1) Cloud computing for energy efficient building and (2) Building Information Modeling (BIM) Data Hub (in the cloud for energy efficient building). See <http://gpichub.org/> for more information.
- **Cancer Informatics Initiative**  
Collaboration with John Yen, Prasenjit Mitra, Eugene J. Lengerich (Penn State Hershey Cancer Institute), Mohan J. Dutta (Purdue University), Greta E. Greer (American Cancer Society), Kenneth Portier (American Cancer Society). See <http://cani.ist.psu.edu/> for more information.
- **EMERSE: Enhanced Messaging for the Emergency Response Sector**  
Collaboration with John Yen, Prasenjit Mitra, Andrea Tapia, C. Lee Giles, Jim Jansen.
- **Software Plagiarism Detection**  
Collaboration with Sencun Zhu and Peng Liu.
- **Cruiser: Concurrent Buffer Overflow Monitoring Using Lock-free Data Structures**  
Collaboration with Peng Liu.
- **Kruiser: Semi-synchronized Non-blocking Concurrent Kernel Heap Buffer Overflow Monitoring**  
Collaboration with Peng Liu.
- **Malware attribution analysis and classification**  
Collaboration with Peng Liu.

## 8. Previous Research Projects

- **Static analysis and verification of web service code**  
Center for Software Excellence, Microsoft, March 2008–2009.
- **Static analysis of concurrency on the Windows source Code**  
Center for Software Excellence, Microsoft, March 2007–March 2008. (with Jason Yang)
- **Testing and verification research on the Windows binary code**  
Center for Software Excellence, Microsoft, August 2005–March 2007.
- **Foundational Proof-Carrying Code (FPCC)**  
Princeton University, June 2000–June 2005. (with Andrew Appel, et al.)
- **Heap abstraction and refinement using separation and dynamic program slicing**  
Microsoft Research, Summer 2004. (with Shaz Qadeer)
- **KISS: Keep It Simple and Sequential**  
Microsoft Research, Summer 2003. (with Shaz Qadeer)  
The KISS project was started with Shaz Qadeer in Summer 2003, and reviewed by Bill Gates in

Summer 2004. The KISS technology has been implemented in the Static Driver Verifier (SDV, the product version of SLAM), which is being released as part of Windows Vista and Windows 7, and is now routinely used to check Windows Device Drivers. This is the first work on analyzing concurrent software with sequential analysis, and has been followed by many other researchers. There are 118 citations as of November 5, 2011 by Google Scholar.

- **Specification and verification of hybrid systems**  
Nanjing University, 1998–1999. (with Jian Lü)
- **DD-VDM++**, Nanjing University, 1996–1999.  
(with Jian Lü, Dajun Yang, and Ming Zhang)
- **Radar data processing system**  
Nanjing Institute of Chemical Technology, 1993. (with Guoqing Liu and Ji Zhou)
- **Numerical simulation of free turbulent jets**  
Nanjing Institute of Chemical Technology, 1996. (with Daiqing Zhao)

## 9. Teaching

- Instructor, College of Information Sciences & Technology, The Pennsylvania State University.
  - SRA 221: Information Security (39 students, Fall 2011)
  - IST 451: Network Security (68 students, Online MPS and resident sections, Fall 2011)
  - IST 220: Networking and Telecommunications (51 students, Spring 2011)
  - IST 451: Network Security (67 students, Spring 2011)
  - IST 230: Discrete Mathematics (54 students, Fall 2010)
  - SRA 221: Information Security (42 students, Fall 2010)
  - IST 451: Network Security (65 students, Spring 2010)
- Guest Lecturer, College of Information Sciences & Technology, The Pennsylvania State University.
  - CMPSC 443: Introduction to Computer Security (Spring 2011)
  - IST 451: Network Security (Spring 2010)
  - IST 110S: Information, People and Technology (Fall 2010)
- Assistant in Instruction, Department of Computer Science, Princeton University.
  - COS 111: Computers and Computing (Spring 2002)
  - COS 109: Computers in Our World (Fall 2001)
- Volunteer Teacher, Princeton Chinese Language School.
  - Teaching children the game of Go (Wei-Qi) (Fall 2002)
- Teaching Assistant, Department of Computer Science, Nanjing University.
  - UNIX and C (Spring 1997)

## 10. Service

- Lions Center Lunch Seminar Organizer (Spring 2010, Fall 2010, Spring 2011, Fall 2011)
- IST PhD student Candidacy Examination Committee: Chu Huang (August 2010), Ryan Kaulakis (August 2010), Sushama Karumanchi (August 2011), Bin Zhao (August 2011), Changkun Zhao (August 2011).
- Master's Thesis Committee: Chu Huang (May 2011. Co-advised with Sencun Zhu), Ke Dang (August 2011), Jung-woo Sohn (2011).
- Program Committee: SocialCom 2012: IEEE International Conference on Social Computing; SocInfo 2012: ASE/IEEE International Conference on Social Informatics.

- Reviewer for Conferences and Journals: The 28th International Conference on Software Engineering (ICSE 2006), IEEE Symposium on Security and Privacy (Oakland 2010), iConference 2010, The 6th International Conference on Security and Privacy in Communication Networks (SecureComm 2010), ACM Transactions on Programming Languages and Systems (TOPLAS), International Conference on Information Systems 2011 (ICIS), IEEE Transactions on Parallel and Distributed Systems (TPDS), Journal of Information Processing Systems (JIPS).
- Course Development Committee: IST 140/240/311 programming course design committee, IST 451 Network Security
- Advisor for the Summer Programming Experience (SPE) program, (Summer 2001, Princeton University).
- Class President, Nanjing Institute of Chemical Technology, 1993–1996.
- Editor in Chief, Bulletin of Nanjing Institute of Chemical Technology, 1992–1993.

## 11. PhD Students

- Chu Huang (co-advised with Sencun Zhu)
- Yufei Jiang (co-advised with John Yen)
- Weiling Li (co-advised with John Yen)
- Jiang Ming (co-advised with John Yen)
- Mo Yu (co-advised with John Yen)

## 12. Invited Talks

- “Cloud Computing Security and Privacy.” PSU-PKU Joint Workshop on Smart Health and Wellbeing. Beijing, China, May 18–19, 2011.
- “Concurrent Security Monitoring Using Semi-synchronized and Lock-free Algorithms.” Penn State-Peking University Joint Workshop on Energy Efficient Computing and Applications. Beijing, China, May 18–19, 2011.
- “EMERSE in Cloud.” Microsoft Campus Visit to Penn State (Research Track). March 22–23, 2011.
- “Software Correctness, Verification, and Proofs in the Real World,” Department of Computer Science, University of Houston, April 12, 2007. (Host: Barbara Chapman)
- “Software Correctness, Verification, and Mathematical Proofs in the Real World,” Department of Computer Science, Drexel University, April 9, 2007. (Host: Spiros Mancoridis)
- “Software Correctness, Verification, and Mathematical Proofs,” Department of Electrical Engineering & Computer Science, University of Kansas, March 12, 2007. (Host: Perry Alexander)
- “Software Correctness, Verification, and Mathematical Proofs,” Department of Software and Information Systems, University of North Carolina, Charlotte, March 1, 2007. (Host: Bill Chu)
- “Verification via Proof-Carrying Code and Model Checking,” Center for Software Excellence, Microsoft Corporation. May 19, 2005. (Host: Thirumalesh Bhat)
- “Verification via Proof-Carrying Code and Model Checking,” NEC Labs, Princeton, NJ. April 22, 2005. (Host: Aarti Gupta)
- “Interfacing Compilers, Proof Checkers, and Proofs for Foundational Proof-Carrying Code,” Department of Computer Science and Engineering, Texas A&M University. May 9, 2005. (Host: Bjarne Stroustrup)
- “Interfacing Compilers, Proof Checkers, and Proofs for Foundational Proof-Carrying Code,” Department of Computer Science, University of Massachusetts Amherst (UMASS). February 22, 2005. (Host: Lori A. Clarke)

- “Interfacing Compilers, Proof Checkers, and Proofs for Foundational Proof-Carrying Code,” Department of Computer Science, Northwestern University. February 14, 2005. (Host: Ming-Yang Kao, Peter Dinda)
- “KISS: Keep It Simple and Sequential,” Presentation to Bill Gates (Microsoft BillG Review—highest level technical review at Microsoft), Shaz Qadeer (presenter) and Dinghao Wu (intern). Summer 2004.

### 13. Other Talks

- “Cruiser: Concurrent Buffer Overflow Monitoring Using Lock-free Data Structures,” *DOD MURI Project Meeting on Cyber Situation Awareness*, UC Santa Barbara, August 23–24, 2010.
- “Developing Advanced Computational Techniques for Complex Multiphase and Multicomponent Reactive Transport Simulations at Large Spatial and Time Scales,” (Poster) Dinghao Wu and Li Li. PSIEE-NETL (National Energy Technology Laboratory, Department of Energy) Joined Workshop at the University Park Campus on April 2, 2010.
- Guest lecture for CMPSC 443: Introduction to Computer Security (Spring 2011, Sencun Zhu).
- Guest lecture for IST 451 Network Security (Spring 2010, Sencun Zhu) on *Buffer overflow detection*.
- “A glimpse of programming languages.” Guest lecture for *IST 110S Information, People and Technology (Fall 2010, James Wang)*.
- “Lightweight Concurrent Heap Buffer Overflow Detection,” Lions Center Seminar, College of Information Sciences and Technology, The Pennsylvania State University, February 9, 2010.
- “Data Center Energy Optimization: Opportunities and Challenges,” Smart Building Meeting, IST, PSU, November 11, 2009.
- “Foundational Proof Checkers with Small Witnesses,” *in the Fifth ACM-SIGPLAN International Conference on Principles and Practice of Declarative Programming (PPDP 2003)*, Uppsala, Sweden, August 2003.
- “Precise Race Detection Using Sequential Program Analysis and Model Checking,” Tool and Algorithms for Compilers and Languages (TACL) Seminar of the Computer Science department at Princeton University, October 3, 2003.

## 14. Publications (Total citations: 246 as of November 5, 2011 by Google Scholar)

### Manuscripts Submitted

- [1] “Finding influential users of an online health community: a new metric based on sentiment influence,” (Kang Zhao, Greta Greer, Baojun Qiu, Cornelia Caragea, Prasenjit Mitra, Dinghao Wu, Kenneth Portier, and John Yen). Submitted to *Science*.
- [2] “Semantic Aware Attribution Analysis of Remote Exploits,” (Deguang Kong, Donghai Tian, Peng Liu, and Dinghao Wu), Submitted to Wiley Journal of *Security and Communication Networks*.
- [3] “Reactive Transport Modeling of Permeability Profile Modification with *Leuconostoc Mesenteroides* to Enhanced Oil Recovery,” (Javier Vilcáez, Li Li, Dinghao Wu, and Susan Hubbard) Submitted to Springer Journal of *Transport in Porous Media*.

### Peer-reviewed Conference and Journal Publications

- [4] “A First Step Towards Algorithm Plagiarism Detection,” (Fangfang Zhang, Yoon-Chan Jhi, Dinghao Wu, Peng Liu, and Sencun Zhu), In *Proceedings of the 2012 ACM International Symposium on Software Testing and Analysis (ISSTA 2012)*, Minneapolis, MN, July 15–20, 2012. *Accepted*. (Acceptance ratio:  $31/108 = 28.7\%$ . ISSTA is the leading research symposium in software testing and analysis.)
- [5] “Towards Trusted Services: Result Verification Schemes for MapReduce,” (Chu Huang, Sencun Zhu, and Dinghao Wu), In *Proceedings of the 12th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing (CCGrid 2012)*, Ottawa, Canada, May 13–16, 2012. *To appear*. (Acceptance ratio:  $83/302 = 27.5\%$ . CCGrid is a major conference in the field of Cluster, Cloud and Grid computing.)
- [6] “BIM Server Requirements to Support the Energy Efficient Building Lifecycle,” (Yufei Jiang, Jiang Ming, Dinghao Wu, John Yen, Prasenjit Mitra, John I. Messner, and Robert Leicht), In *Proceedings of the 2012 ASCE International Conference on Computing in Civil Engineering (ASCE 2012)*, Special Session on *BIM Computer Science Fundamentals*, Clearwater Beach, FL, June 17–20, 2012. *To appear*.
- [7] “Kruiser: Semi-synchronized Non-blocking Concurrent Kernel Heap Buffer Overflow Monitoring,” (Donghai Tian, Qiang Zeng, Dinghao Wu, Peng Liu, and Changzhen Hu), In *Proceedings of the 19th Network and Distributed System Security Symposium (NDSS 2012)*, San Diego, California, February 5–8, 2012. (Acceptance ratio:  $46/258 = 17.8\%$ . NDSS is one of the top 3–5 conferences in security.)
- [8] “Identifying Leaders in an Online Cancer Survivor Community,” (Kang Zhao, Baojun Qiu, Cornelia Caragea, Dinghao Wu, Prasenjit Mitra, John Yen, Greta E. Greer, and Kenneth Portier), In *Proceedings of the 21st Annual Workshop on Information Technologies and Systems (WITS 2011)*, Shanghai, China, December 3–4, 2011.
- [9] “Get Online Support, Feel Better—Sentiment Analysis and Dynamics in an Online Cancer Survivor Community,” (Baojun Qiu, Kang Zhao, Prasenjit Mitra, Dinghao Wu, Cornelia Caragea, John Yen, Greta E. Greer, and Kenneth Portier), In *Proceedings of the Third IEEE International Conference on Social Computing (SocialCom 2011)*, Boston, USA, October 9–11, 2011. (Acceptance ratio: 9.8%. SocialCom is a top conference in social computing.)
- [10] “SA<sup>3</sup>: Automatic Semantic Aware Attribution Analysis of Remote Exploits,” (Deguang Kong, Donghai Tian, Peng Liu, and Dinghao Wu), In *Proceedings of the 7th International ICST Conference on Security and Privacy in Communication Networks (SecureComm 2011)*, London, UK,

September 7–9, 2011.

(Acceptance ratio:  $23/92 = 24.2\%$ )

- [11] “Cruiser: Concurrent Buffer Overflow Monitoring Using Lock-free Data Structures,” (Qiang Zeng, Dinghao Wu, and Peng Liu), In *Proceedings of the 2011 ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI 2011)*, pages 367–377, San Jose, CA, USA, June 4–8, 2011.  
(Acceptance ratio:  $55/236 = 23.0\%$ . PLDI is one of the top 2 conferences in programming languages.)
- [12] “Value-Based Program Characterization and Its Application to Software Plagiarism Detection,” (Yoon-Chan Jhi, Xinran Wang, Xiaoqi Jia, Sencun Zhu, Peng Liu, and Dinghao Wu), In *Proceedings of the ACM/IEEE 33rd International Conference on Software Engineering (ICSE 2011)*, Software Engineering in Practice Track, pages 756–765, Honolulu, Hawaii, USA, May 21–28, 2011.  
(Acceptance ratio:  $18/100 = 18.0\%$ . ICSE is one of the top 2 conferences in software engineering.)
- [13] “Classifying Text Messages for the Haiti Earthquake,” (Cornelia Caragea, Nathan McNeese, Anuj Jaiswal, Greg Traylor, Hyun-Woo Kim, Prasenjit Mitra, Dinghao Wu, Andrea Tapia, C. Lee Giles, Jim Jansen, and John Yen), In *Proceedings of the 8th International Conference on Information Systems for Crisis Response & Management (ISCRAM 2011)*, Lisbon, Portugal, May 8–11, 2011.  
(ISCRAM is a top conference in crisis management.)

#### **Publications before joined PSU**

**(2005–2009 in industry; see the patents section)**

- [14] “KISS: Keep It Simple and Sequential,” (Shaz Qadeer and Dinghao Wu), In *Proceedings of the 2004 ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI 2004)*, Washington DC, June 9–11, 2004, 14–24.  
(*The KISS project was started with Shaz Qadeer in Summer 2003, and reviewed by Bill Gates in Summer 2004. The KISS technology has been implemented in the Static Driver Verifier (SDV, the product version of SLAM), which is being released as part of Windows Vista and Windows 7, and is now routinely used to check Windows Device Drivers. This is the first work on analyzing concurrent software with sequential analysis, and has been followed by many other researchers. There are 118 citations as of November 5, 2011 by Google Scholar. PLDI is one of the top 2 conferences in programming languages.*)
- [15] “Construction of a Semantic Model for a Typed Assembly Language,” (Gang Tan, Andrew W. Appel, Kedar N. Swadi, and Dinghao Wu), In *Proceedings of the Fifth International Conference on Verification, Model Checking, and Abstract Interpretation (VMCAI 2004)*, Springer-Verlag Lecture Notes in Computer Science (LNCS 2937), Venice, Italy, January 2004, 30–43.  
(*22 citations as of November 5, 2011 by Google Scholar. VMCAI is a top conference in software verification and analysis.*)
- [16] “Foundational Proof Checkers with Small Witnesses,” (Dinghao Wu, Andrew W. Appel, and Aaron Stump), In *Proceedings of the Fifth ACM-SIGPLAN International Conference on Principles and Practice of Declarative Programming (PPDP 2003)*, Uppsala, Sweden, August 27–29, 2003, 264–274.  
(*40 citations as of November 5, 2011 by Google Scholar. PPDP is a top conference on declarative programming.*)
- [17] “A Provably Sound TAL for Back-end Optimization,” (Juan Chen, Dinghao Wu, Andrew W. Appel, and Hai Fang), In *Proceedings of the 2003 ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI 2003)*, San Diego, CA., June 8–11, 2003, 208–219.  
(*46 citations as of November 5, 2011 by Google Scholar. PLDI is one of the top 2 conferences in programming languages.*)

- [18] (in Chinese) “On Theoretical Basis of a State-Space Based Approach to the Design of Hybrid Systems,” (Dinghao Wu and Jian Lü), *Journal of Nanjing University (Natural Sciences)*, **35**(5):564–572, 1999.
- [19] (in Chinese) “Researches on Software Interoperability,” (Junhua Ding, Huan Dong, Dinghao Wu, and Jian Lü), *Computer Research and Development*, **35**(7):577–583, 1998.
- [20] (in Chinese) “A State-Space Based Approach to the Design of Hybrid Systems,” (Dinghao Wu and Jian Lü), In *Proceedings of the Seventh CCF National Conference of Young Computer Scientists (NCYCS 1998)*, China Computer Federation (CCF), Shanghai Sci-Tech Press. Shanghai, China, October 1998, 48–53.
- [21] “Two-Dimensional Dealiasing of Doppler Velocities,” (Guoqing Liu, Wenzhong Ge, Xueru Zhang, Dinghao Wu, and Ji Zhou), In *Proceedings of the Twenty-seventh International Conference on Radar Meteorology*, American Meteorological Society. Vail, Colorado, October 9–13, 1995.

### Technical Reports

- [22] “Detecting Data Race and Atomicity Violation via Typestate-Guided Static Analysis,” (Yue Yang, Anna Gringauze, Dinghao Wu, and Henning Rohde), Technical Report MSR-TR-2008-108, Microsoft Research, August 2008.

### Conference Abstract

- [23] “Leadership and Sentiment Analysis of An Online Cancer Support Community Using Computational Text Mining,” (Kenneth Portier, Greta Greer, John Yen, Prasenjit Mitra, Kang Zhao, Baojun Qiu, Dinghao Wu, and Cornelia Caragea). Abstract for presentation at *The 6th Biennial Cancer Survivorship Research Conference: Translating Science to Care*. Arlington, VA, June 14–16, 2012.
- [24] “Analyzing regional advantage by means of patent co-inventor network: A case study,” (Weiling Li, John Yen, Zhen Lei, and Dinghao Wu). Abstract for presentation at *Sunbelt 2012: 32st annual conference of the International Network for Social Network Analysis (INSNA)*. Redondo Beach, CA, March 13–18, 2012.
- [25] “Who are the influential users?—A new metric based on sentimental influence,” (Kang Zhao, Baojun Qiu, Cornelia Caragea, Dinghao Wu, Prasenjit Mitra, John Yen, Greta E. Greer, and Kenneth Portier). Abstract for presentation at *Sunbelt 2012: 32st Annual conference of the International Network for Social Network Analysis (INSNA)*. Redondo Beach, CA, March 13–18, 2012.

### Theses

- [26] “Interfacing Compilers, Proof Checkers, and Proofs for Foundational Proof-Carrying Code,” Ph.D. thesis, Department of Computer Science, Princeton University, 2005.
- [27] “A State-Space Based Approach to the Specification and Verification of Hybrid Systems and Its Axiomatic Basis,” Master’s thesis, Department of Computer Science, Nanjing University, 1999.
- [28] (in Chinese) “Computer Simulation of Free Turbulent Jets,” Bachelor thesis, Department of Chemical Engineering, Nanjing Institute of Chemical Technology, 1996.

### Patents

- [29] “Data Race Detection Using Sequential Program Analysis,” (Shaz Qadeer and Dinghao Wu), US Patent US7316005. Issued on January 01, 2008.  
*(8 citations as of November 5, 2011 by Google Scholar)*
- [30] “Detecting Data Race and Atomicity Violation via Typestate-Guided Static Analysis,” (Yue Yang, Anna Gringauze, Dinghao Wu, and Henning Rohde), US Patent Application 327545.01. Filed in July 2009.  
*(5 citations as of November 5, 2011 by Google Scholar)*