

Yue Li

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Education

Ph.D. student in Computer Science, Texas A&M University, 2008-Present.

Thesis topic: *Coding Theory and its Applications in Nonvolatile Memories*

Advisor: Anxiao (Andrew) Jiang

B.E. in Information Security, Huazhong University of Science and Technology, China, 2008.

Bachelor Thesis: *Realistic Coherent One Way Quantum Key Distribution*

Thesis Advisor: Yu Liu

Exchange Student in Computer Science, National University of Singapore, Singapore, 2007.

Research Interests

Data representation, compression and error correction in data storage.

Programming language design, compilers, computer algebra systems, parallel computing.

Research Experience

Research Assistant, Information Innovation Lab, Department of Computer Science and Engineering, Texas A&M University, 2011.6 - present.

Content-assisted File Decoding for Nonvolatile Memories

Working on a file recovery framework for correcting the accumulated errors introduced after long term storage. The framework uses a dictionary to find the most possible corrections for the noisy bit strings that cannot be recovered with ECC. Preliminary results show that the framework significantly improves the error correction capability of the systems which only use ECC.

Bit Fixing Codes for Multi-level Nonvolatile Memories

Working on error correcting codes which takes advantage of the unique features of errors in MLC nonvolatile memories. The rate of our code compared favorably with that of Gray code and are always better than the rate of binary code.

Memory Scrubbing Techniques for Phase Change Memories

Proposed new memory scrubbing schemes for phase-change memories. The purpose is to reduce the bit errors introduced by the effects of resistance drifting in phase-change materials. The scrubbing schemes utilize error correcting codes to discover faulty bits and refresh them periodically with the correct bits. The performance of the scrubbing schemes are evaluated with extensive simulations.

Visiting Student, PARADISE Laboratory, California Institute of Technology, 2013.1.

Collaborative research on designing error-correcting write-once-memory (WOM) codes using polar codes.

Research Assistant, Institute for Scientific Computation, Texas A&M University, 2011.9 - 2012.8.

GPU Accelerated Hausdorff Distance Computation

Working on accelerating the sequential Hausdorff distance algorithm using GPU. The algorithm is implemented with OpenCL for processing large 3D data sets.

3D Point Cloud Editor

Developed a GUI (QT) application for interactively visualizing and editing large 3D point clouds. The software is used by several research institutes as well as defense companies.

Visiting Student, The Gallium Research Team, INRIA-Rocquencourt, France, 2011.1.
Collaborative research on verified C++ compiler.

Research Assistant, Parasol Lab, Texas A&M University, 2008.9 - 2011.5.

Retargeting OpenAxiom to Poly/ML

Worked on the integration of Poly/ML's run time system into OpenAxiom. The objective is to provide computer algebra systems with the reasoning capability of proof assistants such as Isabelle/ML, and to provide proof assistants with the computation power of computer algebra systems. The code tree data structure of Poly/ML compiler is generated for the Spad language used by OpenAxiom. Run time codes are generated by Poly/ML's RTS from the code trees.

Generating high level internal representation of C++

Developed an internal program representation generator for C++ by converting the syntax tree obtained from GCC's front end to a well-defined, human readable high level representation (see Pivot's website in Parasol Lab). The objective is to utilize the high level representation to enable high level compiler optimization and static analysis for C++.

An Automatic Parallelization Framework for OpenAxiom

- Built a source-to-source program transformation framework which rewrites sequential reductions to their parallel version. The framework has been evaluated with a set of OpenAxiom algebra library functions and a user application.
- Developed a static analysis framework to extract parallelizable reductions and accumulation loops from program written in Spad, which is OpenAxiom's library extension language, supporting categorial programming. The framework was tested over the whole OpenAxiom algebra library, and experimental data has been collected.
- Developed a new language struct of the Spad computer algebra language to enable user to attach algebraic properties to functions and utilize the properties of functions.

Research Assistant, Department of Mathematics, Texas A&M University, 2009.6 - 2009.8.

Surface Reconstruction of 3D Urban Terrain using Wavelets

Worked on ARO MURI funded project that is developing a surface reconstruction software to reconstruct 3D models from scanned terrain data using Haar and Daubechies wavelets. Implemented the Locally Optimal Projection algorithm as a preprocessing software to project noisy points and adjust the point distribution of the scanned data set.

Visiting Student, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences, China. 2008.2 - 2008.5.

Security Analysis for Practical Quantum Key Distribution Systems

Improved the security of a practical long distance quantum key distribution system (coherent-one-way system) against a new practical "zero-error" attack.

Undergraduate Research Scholar, Department of Electronics and Information Engineering, Huazhong University of Science and Technology, China. 2005.10 - 2008.6.

Quantum Secure Direct Communication with Low Complexity

Designed three quantum secure direct communication protocols with low implementation complexity, theoretically proved the security of the protocols against some famous quantum attacks.

Patent

Anxiao (Andrew) Jiang, Yue Li, Eyal En Gad, Michael Langberg, and Jehoshua Bruck. Joint Rewriting and Error Correction in Write-Once Memories, 2013 (US Patent Pending).

Recent Publications

Papers

- [1] Anxiao (Andrew) Jiang, Yue Li, and Jehoshua Bruck. Correcting errors in mlcs with bit-fixing coding. In *NVMW '13: Nonvolatile Memory Workshop*, 2013.
- [2] Yue Li, Yue Wang, Anxiao (Andrew) Jiang, and Jehoshua Bruck. Content-assisted file decoding for nonvolatile memories. In *Proc. 46th Asilomar Conference on Signals, Systems and Computers*, 2012. (Invited).
- [3] Anxiao (Andrew) Jiang, Yue Li, and Jehoshua Bruck. Bit-fixing codes for multi-level cells. In *ITW '12: Information Theory Workshop*, 2012.
- [4] Yue Li, Gabriel Dos Reis, and David Matthews. Retargeting openaxiom to poly/ml: Towards an integrated proof assistant and computer algebra system. In *Calcuemus '11: 18th Symposium on the Integration of Symbolic Computation and Mechanised Reasoning (part of CICM 2011)*, 2011.
- [5] Yue Li and Gabriel Dos Reis. An automatic parallelization framework for algebraic computation systems. In *ISSAC '11: Proceedings of the 36th International Symposium on Symbolic and Algebraic Computation*, 2011.
- [6] Yue Li and Gabriel Dos Reis. A quantitative study of reductions in algebraic libraries. In *PASCO '10: Proceedings of the 4th International Workshop on Parallel and Symbolic Computation*, pages 98–104, New York, NY, USA, 2010. ACM.

Refereed posters

- [7] Yue Li, Yue Wang, Anxiao (Andrew) Jiang, and Jehoshua Bruck. Verification-based file recovery for nonvolatile memories. In *NVMW '13: Nonvolatile Memory Workshop*, 2013.
- [8] Yue Li and Gabriel Dos Reis. An automatic parallelization framework for openaxiom. In *ISSAC '11: the 36th International Symposium on Symbolic and Algebraic Computation*, 2011.

Undergraduate Research Publications

- [9] Jun Ye, Yue Li, Yu Liu, and Sha Hua. A general scheme for multiparty controlled quantum teleportation of an arbitrary n-particle state. 2008. <http://arxiv.org/abs/0803.3903>.
- [10] Yue Li and Yu Liu. Quantum secure direct communication based on supervised teleportation. In *Quantum Optics, Optical Data Storage, and Advanced Microlithography*, volume 6827, page 682707. SPIE, 2007. <http://arxiv.org/abs/0711.2827>.
- [11] Shanshan Huang, Jun Li, Yue Li, and Yu Liu. Quantum identity authentication based on secret transmitting order of particles. In *Quantum Optics, Optical Data Storage, and Advanced Microlithography*, volume 6827, page 68270L. SPIE, 2007.
- [12] Yue Li and Yu Liu. Supervised secure entanglement sharing for faithful quantum teleportation via tripartite w states. 2007. <http://arxiv.org/abs/0709.1449>.
- [13] Yu Liu, Sha Hua, Xiaoxin Wang, Yue Li, Jun Ye, and Jun Li. A flexible improvement for ping-pong protocol. *Chinese Physics Letters*, 23(12):3152–3154, 2006.

Software

Point Cloud Editor A BSD licensed simple open-source 3D editor for the Point Cloud Library. The editor was written with Matthew Hielsberg, it supports point selection by mouse picking and 2D rubber band, as well as inversion. Points may be deleted, cut, copied and pasted. Also, the basic set of translation, rotation and scale operators are supported. Currently the editor supports only the PCD format but will eventually include others. The source for the editor can be found in the apps directory of the latest PCL release (starting with 1.7).

- SVN repository: http://svn.pointclouds.org/pcl/trunk/apps/point_cloud_editor/

OpenAxiom Reduction Parallelizer A BSD licensed compiler static analysis tool for automatically parallelizing reductions in the Spad programs running on the OpenAxiom computer algebra system. The software serves as the demo for my research project. Also see Publication [5, 6, 8].

- SVN repository: <http://open-axiom.svn.sourceforge.net/viewvc/open-axiom/yli-sandbox/>

Teaching Experience

Teaching Assistant, Department of Computer Science and Engineering, Texas A&M University.

CSCE 629: Analysis of Algorithms (with Andrew Jiang). 2011 Spring

CSCE 629: Analysis of Algorithms (with Don Friesen). 2010 Fall

CSCE 629: Analysis of Algorithms (with Andrew Jiang). 2010 Spring

CSCE 629: Analysis of Algorithms (with Don Friesen). 2009 Fall

CPSC 411: Design and Analysis of Algorithms (with Andreas Klappenecker). 2009 Spring

CPSC 289: Special Topic on Discrete Mathematics (with Sing-hoi Sze). 2009 Spring

CPSC 411: Design and Analysis of Algorithms (with Jennifer Welch). 2008 Fall

Student Research Mentoring

Mr. Erik Katzen, undergraduate in CE at Texas A&M University, NSF REU Summer 2010.

Implemented a solver for system of differential equations in OpenAxiom computer algebra system.

Mr. Patrick Smith, undergraduate in CS at Texas A&M University, NSF REU Summer 2010.

Implemented an internal program representation (IPR) generator for evaluating s-expressions.

Professional Service and Activities

Judge, Mathematics and Computer Science, Student Research Week, Texas A&M University. 2012.3

Judge, Poster session in computational science, Student Research Week, Texas A&M University. 2010.3

Student Team, TOOTS: The OOPSLA Trivia Show, ACM Object-Oriented Programming, Systems, Languages and Applications(OOPSLA), Orlando. 2009.10

Student Volunteer, ACM Object-Oriented Programming, Systems, Languages and Applications(OOPSLA), Orlando. 2009.10

Graduate Student Panel, NSF REU (Research Experiences for Undergraduates) summer program, Department of Computer Science and Engineering, Texas A&M University. 2009.7

External Reviewer International Journal of Communication Systems, Chinese Journal of Quantum Electronics, Chinese Journal of Computers.

Member of ACM since 2008, ACM SIGSAM since 2011, IEEE student member since 2006.

Honors and Awards

Scholarships

“China Computerworld” Scholarship for talented undergraduate student in computer science,

“China Computerworld” Publishing Group, China. 2005-2006

Awards

Invited to join The Honor Society of Upsilon Pi Epsilon. 2011.

Inducted to The Honor Society of Phi Kappa Phi. 2010.

First place prize (computational science), Student Research Week, Texas A&M University. 2009

Wakonse fellow, Center for Teaching Excellence, Texas A&M University. 2009

First place prize, Outstanding Technological Innovation Award for Undergraduate Students, Government of Hubei province, China. 2008

Best Bachelor Thesis Award, Huazhong University of Science and Technology. 2008
Excellent Graduate, Huazhong University of Science and Technology. 2008
Second place prize, Outstanding Technological Innovation Award for Undergraduate Students,
Government of Hubei province,
Pacemaker of Undergraduate Research, Huazhong University of Science and Technology. 2007
Award for Outstanding Undergraduate Research, Huazhong University of Science and Technology.
2007

Travel Grants

Travel grant, Non-Volatile Memory Workshop (NVMW), San Diego, 2013.
SIGPLAN PAC travel grant, ACM Symposium on Principles of Programming Languages (POPL),
Austin, 2011.
Silver plan of student volunteer program, ACM Object-Oriented Programming, Systems, Languages
and Applications (OOPSLA). Orlando, 2009.
Wakonse South Conference Travel Grant, Center for Teaching Excellence, Texas A&M University,
2009.

Professional Skills

Programming Languages: C++, C, Java, Python, Standard ML, Haskell, Fortress (Oracle Lab),
Maple, Spad (computer algebra language).
Parallel Programming: MPI, OpenMP, OpenCL.
Mathematical Software: OpenAxiom, Maple, Matlab.
Operating Systems: MacOS, Windows, Linux(CentOS/Fedora/Ubuntu), DOS.
Tools: Doxygen, L^AT_EX, Beamer.

Miscellaneous Information

Work Authorization: International student authorized for curricular practical training (F1).
Spoken Languages: English-fluent, Chinese-native speaker.
Extracurricular: President of the Association of Abroad Alumni of Dian Group(A well-known under-
graduate research team in China at Huazhong University of Science and Technology).

References

Available upon request.

February 8, 2013