Yao Li

Ph.D. candidate,
Computer and Information Science,
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Research Summary

My research aims to (1) advance the state of the art of verification on real-world software and (2) make verification easier to use from a *programming languages* perspective.
My research has been published in premier conferences on programming languages and formal verification, such as ICFP, ITP, and CPP.

Education

University of Pennsylvania, Philadelphia, PA, USA
Ph.D. in Computer and Information Science, 2016 – 2022 (expected)
Advisor: Prof. Stephanie Weirich

Shanghai Jiao Tong University, Shanghai, China
Master of Science in Engineering (Software Engineering), 2013-2016
Bachelor of Engineering (Software Engineering), 2009 – 2013
Advisor: Prof. Zhengwei Qi

Research Experience

University of Pennsylvania, Philadelphia, PA, USA
Research Assistant, Aug. 2016 – present
Under supervision of Prof. Stephanie Weirich

Microsoft Research, Redmond, WA, USA
Research Intern, Jun. 2018 – Aug. 2018
Vale Project. Under supervision of Dr. Chris Hawblitzel

Shanghai Jiao Tong University, Shanghai, China
Research Assistant, Aug. 2013 – Mar. 2016
Under supervision of Prof. Zhengwei Qi

University of Lugano, Lugano, Ticino, Switzerland
Visiting Researcher, Mar. 2015 – Jun. 2015
Dynamic Analysis Group. Under supervision of Prof. Walter Binder

Industrial Experience

Microsoft, Shanghai, China
Software Development Engineer Intern, Jun. 2012 – Sep. 2012
Infrastructure team, under supervision of Zhiliang Xu

Publications

Reasoning about the Garden of Forking Paths
Yao Li, Li-yao Xia, Stephanie Weirich
(28 pages, single column)
Proceedings of the ACM on Programming Languages, Volume 5 (**ICFP**), 2021

Ready, Set, Verify! Applying hs-to-coq to Real-World Haskell Code
Joachim Breitner, Antal Spector-Zabusky, **Yao Li**, Christine Rizkallah, John Wiegley, Joshua Cohen, Stephanie Weirich
(43 pages, single column)
Journal of Functional Programming (**JFP**), Volume 31, 2021, e5

Verifying an HTTP Key-Value Server with Interaction Trees and VST
Hengchu Zhang, Wolf Honoré, Nicolas Koh, **Yao Li**, Yishuai Li, Li-yao Xia, Lennart Beringer, William Mansky, Benjamin C. Pierce, Steve Zdancewic
(19 pages, single column)
The 12th International Conference on Interactive Theorem Proving (**ITP**), 2021, Rome, Italy (virtual conference, co-located with LICS 2021)

Verified Transformations and Hoare Logic: Beautiful Proofs for Ugly Assembly Language
Jay Bosamiya, Sydney Gibson, **Yao Li**, Bryan Parno, Chris Hawblitzel
(18 pages, single column)
The 12th Working Conference on Verified Software: Theories, Tools, and Experiments (**VSTTE**), 2020, Los Angeles, USA (virtual conference, co-located with CAV 2020 and ISSTA 2020)

A Scala Based Framework for Developing Acceleration Systems with FPGAs
Yanqiang Liu, **Yao Li**, Zhengwei Qi, Haibing Guan,
(12 pages, double columns)
Journal of Systems Architecture (**JSA**), Volume 98, 2019

From C to Interaction Trees: Specifying, Verifying, and Testing a Networked Server
Nicolas Koh, **Yao Li**, Yishuai Li, Li-yao Xia, Lennart Beringer, Wolf Honoré, William Mansky, Benjamin C. Pierce, Steve Zdancewic
(15 pages, double columns)
The 8th ACM SIGPLAN International Conference on Certified Programs and Proofs (**CPP**), 2019, Cascais, Portugal (co-located with POPL 2019)

Ready, Set, Verify! Applying hs-to-coq to Real-World Haskell Code (Experience Report)
Joachim Breitner, Antal Spector-Zabusky, **Yao Li**, Christine Rizkallah, John Wiegley, Stephanie Weirich
(16 pages, single column)
Proceedings of the ACM on Programming Languages, Volume 2 (**ICFP**), 2018

AutoBench: Finding Workloads That You Need Using Pluggable Hybrid Analyses
Yudi Zheng, Andrea Rosà, Luca Salucci, **Yao Li**, Haiyang Sun, Omar Javed, Lubomír Bulej, Lydia Y. Chen, Zhengwei Qi, Walter Binder
(5 pages, double columns)
The 23rd IEEE International Conference on Software Analysis, Evolution, and Reengineering (**SANER**), 2016, Osaka, Japan

ScalaHDL: Express and Test Hardware Designs in a Scala DSL
Yao Li, Antonio Roldao Lopes, Zhouyun Xu, Zhengwei Qi, Haibing Guan
(4 pages, double columns)
The 32nd IEEE International Conference on Computer Design (**ICCD**), 2014, Seoul, Korea

Drafts

Program Adverbs: Structures for Embedding Effectful Programs
Yao Li, Stephanie Weirich
(31 pages, single column)

Embracing a Mechanized Formalization Gap: Pragmatic software system verification
Antal Spector-Zabusky, Joachim Breitner, **Yao Li**, Stephanie Weirich
(25 pages, double columns)

Talks

The Expression Problem and Theorem Proving (Submitted Talk)
Workshop on the Implementation of Type Systems (WITS), co-located with POPL, Philadelphia, PA, 2022

Effect-Oblivious Equivalence (Accepted Talk)
Workshop on Principles of Secure Compilation (PriSC), co-located with POPL, Philadelphia, PA, 2022

Reasoning about the Garden of Forking Paths
POPV seminar at Boston University (Longer Version, Invited Talk), 2021
The ACM SIGPLAN International Conference on Functional Programming (ICFP), virtual talk, 2021
The ACM SIGPLAN Conference on Systems, Programming, Languages, and Applications: Software for Humanity (SPLASH), Chicago, IL, 2021

Embracing a Mechanized Formalization Gap: Interactive reasoning for Haskell at scale
Haskell Implementors' Workshop (HIW), co-located with ICFP, virtual talk, 2020

The Science of Deep Specification
NSF Expeditions in Computing - 10 Years of Transforming Science and Society, Washington, DC, 2018

Dependent Types in Scala
Philly Area Scala Enthusiasts Meetup (PHASE), Philadelphia, PA, 2017

Scala-Forklift: Type-Safe Data Migration Tool for Slick, Git and Beyond
Comcast Scala By the Schuyllkill Conference, Philadelphia, PA, 2017

Teaching and Mentoring Experience

Teaching Assistant

- **Theory of Computation** (Graduate), Spring 2018
  - Taught by Prof. Sampath Kannan at University of Pennsylvania
- **Advanced Programming** (Graduate), Fall 2017
  - Taught by Prof. Stephanie Weirich at University of Pennsylvania
- **Programming and Data Structures**, Part 2, (Undergraduate), Fall 2013
  - Taught by Prof. Zhengwei Qi at Shanghai Jiao Tong University

Mentor

- DeepSpec Research Experience for Undergraduates (University of Pennsylvania), Summer 2021
  - Mentored (with Prof. Stephanie Weirich) two undergraduate students, Mohamed Abaker and Vikram Singh, on verifying the Patricia trie data structure used in Haskell's containers library.
- The DeepSpec web server project, Summer 2017 and Fall 2017
  - Mentored an undergraduate student, Azzam Althagafi, on writing a monadic parser combinator library in Coq.
- Google Summer of Code (Scala), Summer 2016
  - Mentored (with Jan Christopher Vogt) a student Trevor Sibanda on developing and maintaining Slick, a database query and access library for Scala. Sibanda later officially joined the Slick team as one of Slick's maintainers.
- The ScalaHDL project (Shanghai Jiao Tong University), 2016
  - Mentored two undergraduate students, Yanqiang Liu and Weilun Xiong, on designing a Scala domain-specific language for writing and testing hardware design. Liu later became a Ph.D. student at Shanghai Jiao Tong University. His work on the project was published in the Journal of Systems Architecture.

Service

Artifact Evaluation Committee: POPL'22, ICFP'21, POPL'21
Session Chair: SPLASH'21
Student Volunteer: CIS Doctoral Association at Penn (Spring 2021), Ph.D. Open House 2017 – 2020, ICFP'21, ICFP'20, DeepSpec Summer School'17

Honors and Awards

Google Open Source Peer Bonus (for creating and maintaining Scala Forklift), 2018
Outstanding Graduate of Shanghai Jiao Tong University, 2016
China National Scholarship, 2014
Outstanding Graduate of Shanghai Jiao Tong University, 2013
China National Scholarship, 2012
Most Popular Collegiate Innovation Projects of Shanghai Jiao Tong University, 2012
1st Prize in the 4th Intel Cup National Collegiate Software Innovation Contest in China, 2011
1st Prize in National Olympiad in Informatics in Provinces, Henan, China, 2008
1st Prize in National Olympiad in Informatics in Provinces, Henan, China, 2007

References

1. **Andrew Appel** (appel@princeton.edu)
Eugene Higgins Professor,
Department of Computer Science, Princeton University
2. **Benjamin C. Pierce** (bcpierce@cis.upenn.edu)
Henry Salvatori Professor,
Department of Computer and Information Science, University of Pennsylvania
3. **Stephanie Weirich** (sweirich@cis.upenn.edu)
ENIAC President's Distinguished Professor,
Department of Computer and Information Science, University of Pennsylvania
4. **Steve Zdancewic** (stevez@cis.upenn.edu)
Schlein Family President's Distinguished Professor,
Department of Computer and Information Science, University of Pennsylvania