

Pengfei Su

Assistant Professor

Department of Electrical Engineering and Computer Science

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Education

- **College of William & Mary** Williamsburg, VA
Ph.D. in Computer Science
Advisor: Xu Liu
Aug 2016 - Aug 2020
- **Institute of Computing Technology, Chinese Academy of Sciences** Beijing, China
M.S. in Computer Science
Aug 2013 - Jul 2016
- **Yunnan University** Yunnan, China
B.S. in Computer Science
Aug 2009 - Jul 2013

Research Interests

- Programming Languages
- Static and Dynamic Program Analysis
- High-Performance/Parallel Computing
- Software Engineering

Publications

- [SC'19] "Pinpointing Performance Inefficiencies via Lightweight Variance Profiling", **Pengfei Su**, Shuyin Jiao, Milind Chabbi, Xu Liu, The International Conference for High Performance Computing, Networking, Storage and Analysis, Nov 17-22, 2019, Denver, CO, USA.
- [ESEC/FSE'19] "Pinpointing Performance Inefficiencies in Java", **Pengfei Su**, Qingsen Wang, Milind Chabbi, Xu Liu, The 27th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering, Aug 26 - 30, 2019, Tallinn, Estonia.
- [ICSE'19] "Redundant Loads: A Software Inefficiency Indicator", **Pengfei Su**, Shasha Wen, Hailong Yang, Milind Chabbi, Xu Liu, The 41st IEEE/ACM International Conference on Software Engineering, May 25 - Jun 1, 2019, Montreal, Canada. **ACM SIGSOFT Distinguished Paper Award**
- [PPoPP'19] "Lightweight Hardware Transactional Memory Profiling", Qingsen Wang, **Pengfei Su**, Milind Chabbi, Xu Liu, The 24th ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming, Feb 16-20, 2019, Washington, D.C.. **Best Paper Award**
- [Under Review] "An Object-centric Profiler for Java", Bolun Li, **Pengfei Su**, Milind Chabbi, Xu Liu.

Honors and Awards

- Stephen K.Park Graduate Research Award 2020
- ACM SIGSOFT Travel Grant, ESEC/FSE'19 2019
- Distinguished Paper Award, ICSE'19 2019
- Best Paper Award, PPoPP'19 2019
- ACM SIGPLAN Travel Grant, PPoPP'19 2019

- NSF Travel Grant, PPOPP'19 2019
- Outstanding Student Award (Top 5%), Chinese Academy of Sciences 2014&2015
- Outstanding Student Award (Top 3%), Yunnan University 2010&2011&2012

Professional Services

- Program Committee HIPS'21
- Artifact Evaluation Committee ASPLOS'20, CGO'18&19&20, PPOPP'18&19&21
- Conference Sub-reviewer HPCA'20, CGO'20, IPDPS'20, ICPP'17&19&20, BIGCOM'19
- Conference Volunteer ASPLOS'18

Teaching Experiences

- **College of William & Mary** Williamsburg, VA
Teaching Assistant for Principles of Programming Languages (CSCI312) Spring 2018, Fall 2017
- **College of William & Mary** Williamsburg, VA
Teaching Assistant for Algorithms (CSCI303) Spring 2017, Fall 2016

Industry Experiences

- **Uber** Palo Alto, CA
Software Engineering Intern May 2019 - Aug 2019
- **Facebook** Menlo Park, CA
Research Engineer (Short-term) May 2020- Nov 2020

Research Highlights

- **LoadSpy — a fine-grained performance tool for pinpointing redundant memory loads**
 - Shows that redundant memory loads are a common indicator of various forms of software inefficiencies.
 - Proposes new strategies for analyzing profiling data by attributing redundancies to runtime contexts, objects, and scopes.
 - Pinpoints large quantities of temporal and spatial redundant memory loads in well-known real-world applications that are the subjects of optimization for years.
 - Available at <https://github.com/CCTLib/cctlib>.
- **FVSampler — a lightweight performance tool for pinpointing function-level execution variance**
 - Quantifies execution variance across different invocations of the same function.
 - Uses performance monitoring units (PMU) to sample function call and uses debug registers to intercept the return from the same function invocation to monitor whole function instances.
 - Overcomes a critical missing piece in existing sampling-based tools — synchronize samples with function boundaries to monitor whole function instances.
 - Available at <https://github.com/WitchTools/FVSampler>.
- **TXSampler — a lightweight performance tool for hardware transactional memory (HTM) profiling**
 - Quantifies the time spent in different components (e.g., transaction path, fallback path) of an HTM-based critical section.

- Exploits call stack unwinding to construct the calling contexts outside transactions and exploits last branch records (LBR) to deduce the calling contexts inside transactions.
- Available at <https://github.com/ScalableMachinesResearch/TXSampler>.
- **JXPerf — a lightweight performance tool for pinpointing redundant memory operations in Java**
 - Pinpoints three kinds of redundant memory operations (i.e., dead stores, silent stores, silent loads) by combining PMU and debug registers.
 - Works at the machine code level with no bytecode instrumentation.
 - Requires no modifications to hardware, OS, JVM, or monitored applications.
 - Available at <https://github.com/ScalableMachinesResearch/JXPerf>.
- **DJXPerf — a lightweight object-centric performance tool for pinpointing locality issues in Java**
 - Develops a novel object-centric profiling technique.
 - Combines PMU and lightweight bytecode instrumentation to reduce runtime and memory overheads.
 - Addresses the distinct challenges caused by just-in-time compilation and garbage collection.