Pengfei Su

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Education

- **College of William & Mary** — Williamsburg, VA
  Ph.D. in Computer Science — *Aug 2016 - Jan 2021*
  Advisor: Xu Liu
- **Institute of Computing Technology, Chinese Academy of Sciences** — Beijing, China
  M.S. in Computer Science — *Aug 2013 - Jul 2016*
- **Yunnan University** — Yunnan, China
  B.E. in Network Engineering — *Aug 2009 - Jul 2013*

Work Experiences

- **UC Merced** — Merced, CA
  Assistant Professor — *Jan 2021- Present*
- **Facebook** — Menlo Park, CA
  Research Engineer — *May 2020- Nov 2020*
- **Uber** — Palo Alto, CA
  Software Engineering Intern — *May 2019 - Aug 2019*

Research Interests

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

Publications

- **[arXiv'21]** "DJXPerf: Identifying Memory Inefficiencies via Object-centric Profiling for Java", Bolun Li, **Pengfei Su**, Milind Chabbi, Shuyin Jiao, Xu Liu.
- **[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

Honors and Awards

- Stephen K.Park Graduate Research Award, William & Mary — 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, China — 2010&2011&2012

Grants

- [**NSF'21**] "Collaborative Research: CNS Core: SMALL: DrGPU: Optimizing GPU Programs via Novel Profiling Techniques", Lead PI, $249,985

Professional Service

- Program Committee — HIPS'21, LCTES'21
- Artifact Evaluation Committee — ASPLOS'20, CGO'18&19&20, PPoPP'18&19&21
- Conference Reviewer — CLUSTER'21 HPCA'20, CGO'20, IPDPS'20, BIGCOM'19, ICPP'17&19&20, HIPS'17
- Conference Volunteer — ASPLOS'18

University Service

- CSE Undergraduate Committee — May 2021 - Present

Teaching

- **UC Merced** — Merced, CA
  Instructor for Introduction to Object-orientated Programming (CSE165) — *Fall 2021*
- **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*

Students

- Yuanzhou Yang (Ph.D. candidate) — *Fall 2021 - Present*
- Mao Lin (Ph.D. candidate) — *Fall 2021 - Present*
- Tahea Hossain (Undergraduate) — *Summer 2021*

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.
- **Pprof++ — a Go Profiler with Hardware Performance Monitoring**
  - Provides more accurate and precise go program profiles.
  - Monitors various CPU performance events, e.g., cache misses, inter-socket (NUMA) traffic, CPU branch. mispredictions.
  - Works smoothly at an extremely high frequency.
  - Available at https://github.com/uber-research/go/tree/release-branch.go1.16_pmu_pprof
- **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.