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

- [**ICSE'22**] "OJXPerf: Featherlight Object Replica Detection for Java Programs", Bolun Li, Hao Xu, Qidong Zhao, **Pengfei Su**, Milind Chabbi, Shuyin Jiao, Xu Liu.

- [**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

- **[UC Merced]** Academic Senate Faculty Grant, Sole PI, $5000

Professional Service

- Organization Committee   CLUSTER'21 (session), HPBD&IS'21 (session)
- 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
- Journal Reviewer   TECS
- 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.