JINGYUAN CHEN

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EDUCATION

Princeton University 2022 - 2027 (expected)
Master & PhD in Computer Science *Princeton, US*
· Advisor: Amit Levy
· Research Interest: Program Analysis, Verification, Debugging, Neural-Symbolic AI

University of North Carolina at Chapel Hill 2018 - 2022
Bachelor of Science in Computer Science, Bachelor of Science in Mathematics *Chapel Hill, US*
· Graduated with highest honor, GPA: 3.99/4.0

RESEARCH EXPERIENCE

Princeton University Princeton, NJ
Research Assistant (advised by `Amit Levy`)

Provenance-Guided Automatic Runtime Debugging Sep 2022 - Present
Built an *online* debugger that automatically instruments tracepoints to record the data-flow provenances of cross-component bugs in deployed distributed systems upon debugging queries. Developed *dynamic-trace-assisted* static analysis algorithms to prune the number of activated instrumentation according to traces collected at the manifestation of bugs. Engineered a lightweight runtime that supports *sliced recording* where only bug-relevant program statements incurs recording overheads. Evaluated the tool against reported latent bugs in a realistic distributed system (HDFS) and demonstrated its capability to reduce the burden of root-cause debugging with practical runtime overheads.

Auditing Resource Interference-Freedom of Cloud Platforms Nov 2024 - Present
Identified a new type of threat in cloud platforms where providers break promises of resource-isolation. Designed a mechanism to detect side-channel interference over shared resources in cloud platforms with compiler-instrumented auditing operations. Proposed methods to defend against providers' cheating strategies where only temporary isolation is provided when auditing operations execute. Currently engineering an efficient runtime that incurs minimal overheads on victim applications.

Quantitative Performance Verification of Schedulers Apr 2025 - Present
Evaluated performance bugs in real-world schedulers. Designed language frameworks for specifying workload behaviors and performance requirements for workload-driven scheduler design. Formulated schedulers' performance models in probabilistic programming language assertions. Proposed quantitative verification frameworks through martingale synthesis.

University of North Carolina at Chapel Hill Chapel Hill, NC
Research Assistant (advised by `James H. Anderson` and `F. Don Smith`)

Making Powerful Enemies on NVIDIA GPUs Aug 2021 - Aug 2022
Empirically evaluated the sensitivity of common GPU workloads to a wide range of interference channels in NVIDIA GPUs. Engineered "enemy" GPU kernels that maximize contention over hardware resources for approximating the worst-case execution times of real-time GPU kernels. Evaluated the enemies against real-world kernels and showed the effectiveness of the enemies in maximizing resource contention.

PUBLICATIONS

Provenance-Guided Automatic Runtime Debugging In submission

Making Powerful Enemies on NVIDIA GPUs IEEE RTSS'22
Tyler Yandrofski, **Jingyuan Chen**, Nathan Otterness, James H. Anderson and F. Donelson Smith

Minimizing DAG Utilization by Exploiting SMT IEEE RTAS'22
Sims Hill Osborne, Joshua Bakita, **Jingyuan Chen**, Tyler Yandrofski, and James H. Anderson

Simultaneous Multithreading in Mixed-Criticality Real-Time Systems IEEE RTAS'21
Joshua Bakita, Shareef Ahmed, Sims Hill Osborne, Stephen Tang, **Jingyuan Chen**, F. Donelson Smith, and James H. Anderson

TECHNICAL SKILLS

Programming Languages | Proficient: Java, C, Python, Go, Javascript, Datalog; Prior Experience: C++, Rust, Haskell, CLisp, Ocaml, Prolog
Tools | Proficient: Linux, bash, Git, Vim, Spring, Docker, Distributed Tracing (Jaeger, OpenTelemetry), Soot, Doop, Tensorflow, PyTorch, CUDA; Prior Experience: Coq, Dafny