

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, Performance 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 realistic distributed systems (TrainTicket and 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