Kuan-Yen Chou

University of Illinois Urbana-Champaign

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Summary

I am a PhD candidate in CS at UIUC, advised by Prof. Matthew Caesar. My research interests include network verification, network architecture, formal methods, software engineering, programmable networks, and networked systems in general. Before UIUC, I obtained my Bachelor's in EECS at the National Chiao Tung University in Taiwan.

Education

University of Illinois Urbana-Champaign *Urbana, Illinois*

Ph.D. in Computer Science *Aug. 2019 - (Expected Fall 2024)*

National Chiao Tung University *Hsinchu, Taiwan*

B.S. in Electrical Engineering and Computer Science *Sep. 2014 - Jun. 2018*

Experience

Graduate Research Assistant *Urbana, Illinois*

University of Illinois Urbana-Champaign *Aug. 2019 - now*

- Implement Plankton, a highly scalable network configuration verification system based on model checking (SPIN).
- Design and implement Neo, a concolic network testing tool that combines emulation with model checking (SPIN).
- Extend Neo to efficiently model concurrent connections and explore all interleaving behavior.
- Design and implement Scylla, a distributed data plane verification system that enables efficient scale-out.
- Improve the scalability of Scylla further with fine-grained and intent-based model slicing.
- Design and implement a distributed algorithm for detecting forwarding loops in Scylla.
- Apply full-system symbolic execution with S2E and KLEE to auto-extract formal models from network functions.

Intern (P4-Based Automated Reasoning) *(remote) Urbana, Illinois*

Google LLC *May 2023 - Aug. 2023*

- Implement symbolic execution for parsers in P4 programs, used for automated test generation for software switches.
- Implement a generic packet deparser for any input P4 program to serialize packets from solved SMT formulas.
- Design and implement the symbolic execution of P4 programs with symbolic table entries to synthesize the control plane output with criteria involving data plane semantics.

Teaching Assistant *Urbana, Illinois*

University of Illinois Urbana-Champaign *Jan. 2022 - Aug. 2022*

- CS 128: Introduction to Computer Science II (Summer 2022)
- CS 437: Internet of Things (Spring 2022)

Intern (vRealize Network Insight) *(remote) Urbana, Illinois*

VMware Inc. *May - Aug. 2020/2021*

- Enable network verification with incomplete network models, which greatly improves time and memory usage.
- Design and implement intent-based slicing for network verification, where the network intents are distributed and verified across a cluster without needing a monolithic network model.
- Implement algorithms to incrementally verify common types of network intents.
- Evaluate performance differences caused by the intent-based slicing and incremental verification.

Visiting Scholar

Urbana, Illinois

University of Illinois Urbana-Champaign

Jun. 2018 - May 2019

- Improve the scalability of network configuration verification with the combination of equivalence partitioning and explicit-state model checking.
- Present a workshop paper for Plankton-neo, a high-coverage network testing framework in 2018 SecSoN SIGCOMM.
- Implement Bazang, a kernel-level tracing tool for distributed applications, utilizing gRPC, kernel timestamping, and out-of-band trace collection.

Teaching Assistant, System/Network Administrator

Hsinchu, Taiwan

Computer Center of Computer Science Dept. in NCTU

Jun. 2016 - Jan. 2018

- Manage Linux workstations for the CS department and some CS courses.
- Manage the Postfix/Dovecot mail servers and proxy servers.
- Manage Cisco switches for the CS department campus network.

Open Source Contributor

Individual Contributor

- `leagueoflegends`, `wine-lol`: Make playing League of Legends on Linux through Wine easier.
- `wideriver`: A window manager (layout generator) for river, a wayland compositor.
- `aur`: Maintain several packages in the Arch User Repository (AUR).

Technical Skills

Programming	C, C++, Bash, Python, System/Network prog., Lua, Java, Assembly (in order of proficiency)
Networking	Linux networking, P4, Mininet
OS/Distro	Arch Linux, Ubuntu/Debian, CentOS, FreeBSD
Virtualization	Docker, QEMU/KVM, Mininet, GNS3
Formal method tools	SPIN, S2E, KLEE, Z3, Angr
Other tools	Vim/Neovim, Git, tmux

Publications/Patents

- Santhosh Prabhu, **Kuan-Yen Chou**, Aanand Nayyar, Giri Prashanth Subramanian, Wenxuan Zhou, Philip Brighten Godfrey. "Handling device configuration changes in distributed network verification application" US Patent 2024/0086221A1, 2024.
- Santhosh Prabhu, **Kuan-Yen Chou**, Aanand Nayyar, Giri Prashanth Subramanian, Wenxuan Zhou, Philip Brighten Godfrey. "Evaluation of Network Correctness Requirement." US Patent 2024/0089257A1, 2024.
- Santhosh Prabhu, **Kuan-Yen Chou**, Aanand Nayyar, Giri Prashanth Subramanian, Wenxuan Zhou, Philip Brighten Godfrey. "Distributed Network Verification." US Patent 2024/0089184A1, 2024.
- Bingzhe Liu, **Kuan-Yen Chou**, Pramod Jamkhedkar, B. Anwer, Rakesh Sinha, K. Oikonomou, Matthew Caesar, Brighten Godfrey. "Practical Automation for Management Planes of Service Provider Infrastructure." FlexNets @ SIGCOMM 2021.
- Santhosh Prabhu, **Kuan-Yen Chou**, Ali Kheradmand, P. Brighten Godfrey, Matthew Caesar. "Plankton: Scalable network configuration verification through model checking." NSDI 2020.
- Sayed Hadi Hashemi, Paul Rausch, Benjamin Rabe, **Kuan-Yen Chou**, Simeng Liu, Volodymyr V. Kindratenko, Roy H. Campbell. "tensorflow-tracing: A Performance Tuning Framework for Production." OpML 2019.
- **Kuan-Yen Chou**, Chin-Fan Chiang, Ching-Hsiang Hsu, Zheng-Yu Chen, Jin-Cheng Zhu. "Implementation of Containerized TensorFlow in Heterogeneous CPU/GPU Clusters." TANET 2017.

Presentations

- Santhosh Prabhu, **Kuan-Yen Chou**, Ali Kheradmand, P. Brighten Godfrey, Matthew Caesar. "Plankton: Scalable network configuration verification through model checking." NSDI 2020.
- Santhosh Prabhu, Gohar Irfan Chaudhry, Brighten Godfrey, Matthew Caesar. "High-coverage Testing of Softwarized Networks." SecSoN @ SIGCOMM 2018.
- **Kuan-Yen Chou**, Chin-Fan Chiang, Ching-Hsiang Hsu, Zheng-Yu Chen, Jin-Cheng Zhu. "Implementation of Containerized TensorFlow in Heterogeneous CPU/GPU Clusters." TANET 2017.