RYAN TSANG

PhD Candidate

Davis, California, USA

rchtsang@proton.me ◆ +1 (310) 663-6476 ◆ linkedin.com/in/r-tsang/ ◆ rctsang.github.io ◆ github.com/rchtsang

EDUCATION

Doctor of Philosophy in Electrical and Computer Engineering **Expected: Jun 2025**

University of California, Davis GPA: 3.95/4.0

- **Honors**: Smita Bakshi Digital Learning and Teaching Award 2024
- **Research Areas**: Embedded Systems, Firmware Security, Engineering Education
- *Advanced to Candidacy on September 1, 2023*

Master of Science in Electrical and Computer Engineering **Sep 2023**

University of California, Davis GPA: 3.95/4.0

- **Courses**: Design and Optimization of Embedded Computing Systems, Computer Architecture, Parallel Programming, Operating Systems, Computer & Information Security

Bachelor or Science in Electrical Engineering and Computer Science & Engineering Physics **Dec 2019**

University of California, Berkeley GPA: 3.79/4.0

- **Honors**: UC Berkeley Regent's and Chancellor's Scholar

RESEARCH EXPERIENCE

Graduate Student Researcher - *UC Davis, Department of Electical and Computer Engineering* **Sep 2020 – Present**

ASEEC Lab - Supervisor: Houman Homayoun

- Lead research projects on reverse engineering and dynamic analysis of bare-metal embedded firmware.
- Designed and prototyped a novel dynamic control flow graph recovery algorithm targeting registered interrupt handler functions in firmware binaries.
- Demonstrated a firmware reverse-engineering attack targeting deeply embedded systems with power management ICs.
- Designed and supervised a quantitative research experiment in engineering education exploring the effects of LLMs on self-regulated learning in a classroom environment.
- Wrote and presented grant proposals for an NSF-funded research center successfully.

TEACHING EXPERIENCE

Teaching Assistant | University of California, Davis **Jan 2021 – Jun 2024**

EEC172 - Embedded Systems *WQ21 (Remote), SQ22, WQ24, SQ24*

Topics: Memory-Mapped I/O, Wired Communication Protocols, Interrupts, Cortex-M Architecture

- Coordinated with instructor and managed other teaching assistents to structure the course of 50-80+ students
- Supervised student lab sections (2x/wk, 20+ students) and debugged lab hardware and software
- Communicated with students to answer lab questions, provide guidance, and manage interpersonal conflict among groups
- Created pre-lab assignment and exam material and updated lab manuals and documentation
- Implemented lab software support for MacOS to expand course accessibility.

EEC170 - Computer Architecture *FQ21 (Hybrid)*

Topics: RISC-V, Processor Pipeline, Memory and Caching

- Developed new labs, homework assignments, and notes for hybrid-remote teaching (60+ students).
- Supported students in-person through weekly office hours and aynchronously via assignment review videos.

EEC7 - Intro to Microcontrollers *WQ23, FQ24*

Topics: C Programming, Input/Output, Basic Microcontrollers

- Supervised student lab sections (25+ students) and debugged lab hardware and software.
- Coordinated with facilities to manage lab equipment and with equipment suppliers to address software bugs.

ENG17 - Circuits I *FQ23*

Topics: Resistive Circuits, Nodal and Mesh Analysis, Ideal Op-Amps, Non-periodic Waveforms, First and Second-Order RLC Circuits, AC and Phasor Analysis

- Host weekly 2-hour discussion sections (10-20 students)
- Host full-class exam review sessions (280+ students online)

EEC1 - Intro to Electrical and Computer Engineering *FQ22*

Topics: Miscellaneous

- Supervised student lab sections (40+ students) and debugged lab hardware and software.
- Explained foundational concepts of electical engineering to first-year students during hands-on labs.

Undergraduate Student Instructor | University of California, Berkeley **Aug 2018 – Dec 2019**

EECS16A - Designing Information Devices and Systems I *Fa18, Sp19, Fa19*

Topics: Introductory Linear Algebra, Introductroy Circuit Analysis, Introductory Machine Learning

- Supervised student lab sections (50+ students)
- Debugged lab hardware and software
- Held biweekly discussion sections (40+ students) and office hours covering all course topics
- Held end-of-semester review sessions (100+ students)
- Designed scaffolded midterm and final exam problems every semester

PUBLICATIONS

R. Tsang et al., "FANDEMIC: Firmware Attack Construction and Deployment on Power Management Integrated Circuit and Impacts on IoT Applications," in *Proceedings 2022 Network and Distributed System Security Symposium*, San Diego, CA, USA: Internet Society, 2022. doi: 10.14722/ndss.2022.24349.

R. Tsang, Asmita, D. Joseph, S. Salehi, P. Mohapatra, and H. Homayoun, "FFXE: Dynamic Control Flow Graph Recovery for Embedded Firmware Binaries," in *33rd USENIX Security Symposium (USENIX Security 24)*, Philadelphia, PA, USA: USENIX Association, Aug. 2024. [Online]. Available: https://www.usenix.org/conference/usenixsecurity24/presentation/tsang

Asmita, Y. Oliinyk, M. Scott, **R. Tsang**, C. Fang, and H. Homayoun, "Fuzzing BusyBox: Leveraging LLM and Crash Reuse for Embedded Bug Unearthing," in *33rd USENIX Security Symposium (USENIX Security 24)*, Philadelphia, PA: USENIX Association, Aug. 2024, pp. 883–900. [Online]. Available: https://www.usenix.org/conference/usenixsecurity24/presentation/asmita

INDUSTRY EXPERIENCE

Apple - Display and Touch Silicon **Cupertino, CA**

Firmware Engineering Intern Jun 2022 – Jun 2022

- Implemented firmware patch build scripts for custom Apple SoC firmware with GNU linker scripts and Python
- Automated tests via Python interface to FPGA soft core instance
- Identified, triaged, and resolved bugs caught through regression testing
- Created metadata scripts to report firmware image and function sizes

SERVICE

Program Committee Member | *SIGCSE Technical Symposium 2025* **Jul 2024 – Present**

- Paper Reviewer for Computing Education Research Track

HONORS AND AWARDS

2024 Smita Bakshi Online Digital Learning Teaching Award

Issued by *UC Davis Department of Electrical and Computer Engineering*

- Awarded annually to teaching assistants who have made exceptional innovations in the use of technology or develop digital material to improve the curriculum and the learning outcomes for our students.

SKILLS

- **Soft Skills**: Communication, Mentorship, Teaching, Teamwork
- **Programming Languages**: Python, C, Rust
- **Software**: Bash, Git, Docker, Ghidra, Renode, Conda
- **Hardware**: Soldering, Standard Bench Tools, Basic PCB Design