John Hui

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EDUCATION

Columbia University, Graduate School of Arts and Sciences — New York, N.Y.
Ph.D. in Computer Science — September 2019—present
(Proposed) Thesis: *Temporal Abstractions for Sparse Synchronous Programming* — *expected defense: July 2024*
Advisor: Stephen A. Edwards

Columbia University, School of Engineering and Applied Sciences — New York, N.Y.
M.S. in Computer Science — September 2018—May 2019

Columbia University, Columbia College — New York, N.Y.
B.A. in Computer Science and Music — September 2014—May 2018
Honors: Phi Beta Kappa, *magna cum laude*

RESEARCH

Areas of interest: real-time reactive computing, language virtual machines, microcontrollers, functional programming, compilers, semantics, operating systems

Sparse Synchronous Model (SSM) *with Stephen A. Edwards* — Fall 2018—present

- Designed and formally specified a programming model for microcontroller-based reactive real-time systems, featuring logical execution time, precise timing prescriptions, and deterministic concurrency
- Implemented a standalone, compiled SSM language with constraints-based polymorphic type inference, higher-order functions, pattern-matching, and automatic memory management
- Built an SSM language runtime that uses hardware timestamping to achieve sub-100 ns timing precision
- Currently building combinator bytecode VM to explore non-strict evaluation strategies for SSM in Haskell

INDUSTRY

Roblox *Research Intern* — San Mateo, C.A.
Core Research — Summer 2023

- Implemented game engine prototype in Rust, with Luau bindings for DOM manipulation
- Worked on formal semantics for replicated scripting and speculative execution

Nuro *Software Intern* — Remote
Embedded Software Team — Summer 2020

- Designed state machine specification language for low-level transition systems
- Developed compiler with C and Promela (SPIN model checker) backends

TEACHING

COMS 6998: Types, Languages, and Compilers *Project Advisor and Guest Lecturer* — Spring 2023
Instructor: Stephen A. Edwards

- Advised student projects that explored definitional interpreters, session types, and Rust lifetimes
- Gave guest lecture discussing definitional interpreters and the expressive power of programming languages

COMS 3157: Advanced Programming *Instructor of Record* — Fall 2022

- Gave lectures to class of 400 students, for systems programming course covering C, UNIX, sockets, shell, and Git
- Led team of 22 teaching assistants, and administered multi-user Linux server used by students for coursework

COMS 4118: Operating Systems *Teaching Assistant* — Spring {2017,2018,2019}
Instructor: Jae Woo Lee

- Developed specification, solutions, and automated grading infrastructure for virtual memory assignment
- Migrated coursework from 32-bit Arch Linux to 64-bit Debian, and created guides for Linux kernel development

COMS 3157: Advanced Programming *Teaching Assistant* — Spring 2016, Fall {2016,2017,2018}
Instructor: Jae Woo Lee

SOFTWARE

Fidget *Author* — January 2019–present
`https://github.com/j-hui/fidget.nvim` — 1505 stars, 50 forks
Neovim plugin written in Lua, provides extensible UI system for animated notifications and LSP progress messages

SKILLS

Programming languages: C, Rust, Haskell, Lua, Bash, Python, Coq, Go, OCaml, VimL
Platforms and tools: Linux {kernel,userspace}, UNIX-like systems, Raspberry Pico, Zephyr RTOS, Neovim, Git