Will Crichton

Email: wcrichto@brown.edu
Website: https://willcrichton.net
GitHub: https://github.com/willcrichton
Twitter: https://twitter.com/tonofcrates

Abstract

I design principled, practical systems to amplify the intelligence of programmers. My research spans programming languages and human-computer interaction, and I also draw ideas from system design, cognitive psychology, and learning science. My current research is about making advanced programming languages like Rust easier to learn. My dissertation work is about using static analysis to build tools for program comprehension, such as information flow in the IDE. I have also developed systems for improving auto-generated documentation and authoring richly-structured documents.

Education

2016-22 **Stanford University**, Ph.D. in Computer Science.
Advised by Pat Hanrahan and Maneesh Agrawala.

2012-16 **Carnegie Mellon University**, B.S. in Computer Science.
Advised by Kayvon Fatahalian.

Employment

Academic employment

2022-now **Brown University**, Postdoctoral researcher.
Advised by Shriram Krishnamurthi.

Industry employment

summer 2017 **Snap, Inc.** Research intern. Designed an elastic and fault-tolerant distributed system for video analytics using Kubernetes, reducing operational costs up to $10\times$.

summer 2015 **Jane Street Capital**. Software intern. Reduced GC overhead in OCaml language runtime. Designed new parallelization strategy for incremental computation library.

2015 **Expii**. Web developer. Architected web front-end for education startup, managed hiring pipeline for new developers.

summer 2014 **Palantir Technologies**. Software intern. Developed logic engine for case management system.

summer 2013 **Tunessence**. Web developer. Built interactive guitar tab learning tool for guitar learning startup.

summer 2012 **Pioneer Hi-Bred**. Software engineer. Built BI app for analysis of laboratory efficiency in Pioneer agricultural technology labs.

2010-12 **Webspec Design**. Web developer. Created 30+ websites for clients across the country.

Research

Legend: 📝 = paper, 🎥 = talk recording, GitHub = GitHub repository, 🔗 = project website

Conference publications

OOPSLA '23 📝 GitHub
A Grounded Conceptual Model for Ownership Types in Rust.
Will Crichton, Gavin Gray, Shriram Krishnamurthi.

PLDI '22 📝 🎥 GitHub
Modular Information Flow through Ownership.
Will Crichton, Marco Patrignani, Maneesh Agrawala, Pat Hanrahan.

CHI '21 📝 🎥
The Role of Working Memory in Program Tracing.
Will Crichton, Maneesh Agrawala, Pat Hanrahan.
Featured in the MIT Programming Languages Review.

SIGCSE '21 📝 🎥 GitHub
Automating Program Structure Classification.
Will Crichton, Georgia Gabriela Sampaio, Pat Hanrahan.

KDD '21 📝 🔗
Analysis of Faces in a Decade of US Cable TV News.
James Hong, Will Crichton, Haotian Zhang, Daniel Y. Fu, Jacob Ritchie, Jeremy Barenholtz, Ben Hannel, Xinwei Yao, Michaela Murray, Geraldine Moriba, Maneesh Agrawala, Kayvon Fatahalian.

SIGGRAPH '18 📝 🎥 GitHub
Scanner: Efficient Video Analysis at Scale.
Fait Poms, Will Crichton, Pat Hanrahan, and Kayvon Fatahalian.

Workshop publications

FUNARCH '23 📝
Typed Design Patterns for the Functional Era.
Will Crichton.

HATRA '21 📝 GitHub
A New Medium for Communicating Research on Programming Languages.
Will Crichton.

HATRA '20 📝
The Usability of Ownership.
Will Crichton.

PLATEAU '20 📝 🎥
Documentation Generation as Information Visualization.
Will Crichton.

AI Systems @ SOSP '19 📝 GitHub
Rekall: Specifying Video Events using Compositions of Spatiotemporal Labels.
Daniel Y. Fu, Will Crichton, James Hong, Xinwei Yao, Haotian Zhang, Anh Truong, Avanika Narayan, Maneesh Agrawala, Christopher Ré, and Kayvon Fatahalian.

SNAPL '19 📝 🔗
From Theory to Systems: A Grounded Approach to Programming Language Education.
Will Crichton.

Theses

2022 📝 🎥
Revisiting Program Slicing with Ownership-based Information Flow.
Ph.D. thesis at Stanford.

2016 📝
Lantern: A Query Language for Visual Concept Retrieval.
Bachelor's thesis at CMU.
Received Alumni Award for Undergraduate Excellence.

Invited Talks

2023 **The Art and Science of Teaching Rust.**
Presented at RustConf.

2022-23 **Cognitive Design Principles for Programming Tools.**
- MIT HCI Seminar
- Northeastern PL Seminar
- Tufts PL Seminar
- Georgia Tech PL/SE Seminar
- Barnard CS Seminar

2022-23 **Modular Information Flow through Ownership.**
- UC Santa Cruz LSD Seminar
- Amazon Web Services
- Rust Formal Methods Interest Group

2022 **The Design of Nota.**
Guest lecture in Jeff Heer's course CSE 599D: "The Future of Scholarly Communication".

2021 **Type-Driven API Design in Rust.**
Presented at Strange Loop.

2019 **Video Analysis at Scale in the Era of Deep Learning.**
Presented at the Monterey Bay Aquarium Research Institute Research Seminar.

2018 **Data Mining 70,000 Hours of TV News.**
Presented at the "Audiovisual Collections" conference at the National Library of Sweden.

Teaching

Instructor

fall 2017-19 **Programming Languages** (CS 242). Stanford (3x).

fall 2013-14 **Game Development on the Web** (1-unit mini course). CMU (2x).

Teaching Assistant

spring 2017 **Computer Systems from the Ground Up** (CS 107e). Stanford.

fall 2015 **Compiler Design** (15-411). CMU.

spring 2015 **Parallel Computer Architecture and Programming** (15-418). CMU.

fall 2014 **Parallel and Sequential Data Structures and Algorithms** (15-210). CMU (Head TA).

spring 2014 **Parallel and Sequential Data Structures and Algorithms** (15-210). CMU.

fall 2013 **Functional Programming** (15-150). CMU.

Grants

2023 **NSF grant #2227863** under Formal Methods in the Field Track II for the Rust Book Experiment.

2018 **Magic Grant** from the Brown Institute for Media Innovation for the TV News project.

2017 **Magic Grant** from the Brown Institute for Media Innovation for the Esper project.

Professional Service

Academic Community Service

Organizing Committee

· 2023: HATRA

Program Committee

· 2022: HATRA
· 2021: HATRA

External Review Committee

· 2023: OOPSLA

Reviewer

· 2023: OOPSLA, CHI, UIST
· 2022: CHI, UIST
· 2021: SIGGRAPH, SIGGRAPH Asia
· 2020: UIST
· 2019: SIGGRAPH Asia

University Service

2016-2022 **Ph.D. Admit Weekend Organizer**
Ran events, comms, Q&A panels, and social activities for admitted students.
Awarded the Stanford CS Department Student Service Award all six years for volunteering in this role.

2019 **Undergraduate Summer Research Program Organizer**
Managed the CURIS program by running weekly events and facilitating student/faculty relations.

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