Michael B. James, Ph.D.

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Research Mission

Improving Human-AI programming environments require a deep understanding both of how these tools work and of how programmers use them. My work spans these two through a combination of *Programming Languages* techniques, *Human-Computer Interactions* methods, and *Artificial Intelligence* approaches. These skills allow me to identify user-focused challenges and overcome them, especially those encountered in a developer's environment.

Education

University of California, San Diego
· Ph.D., Computer Science 2018-2024
· M.S. Computer Science 2021
Adivsor: Nadia Polikarpova

Tufts University
· B.S. Computer Science 2015

Research Projects

Human-AI Collaborative Programming
Our groundbreaking study identified how programmers use tools like Copilot: they either *accelerate* through a task, or use the tool to *explore* their problem space[GCP]. Our findings identified difficulty in validating AI-generated code, but our technique with live programming eases this difficulty[LEAP]. Current work-in-progress highlights the "wisdom of the crowds" of an LLM to assist in design space exploration.

Type Directed Synthesis in Haskell
Our novel synthesis technique generates Haskell programs that are guaranteed to satisfy the user's intent quickly by using abstract refinements[TYGAR]. A user-study proves that our multi-modal search with examples and tests aids program comprehension, allowing a user to complete more tasks[H+]. A followup study reinforces the need for tool-assisted code validation[PRS].

Publications

[THESIS]: **Exploratory Phenomena in Program Synthesis**. Michael B. James. 2024.

[LEAP]: **Validating AI-Generated Code with Live Programming**. Kasra Ferdowsi*, Ruanqianqian (Lisa) Huang*, *Michael B. James*, Nadia Polikarpova, Sorin Lerner. *CHI*. May 2024.

[GCP]: **Grounded Copilot: How Programmers Interact with Code-Generating Models**. Shraddha Barke*, *Michael B. James**, Nadia Polikarpova. *OOPSLA*. October 2023. *Distinguished Paper Award*

[PRS]: **Program Recognition in Synthesis**. *Michael B. James*, Nadia Polikarpova. *PLATEAU*. November 2021.

[H+]: **Digging for Fold: Synthesis-aided API Discovery for Haskell**. *Michael B. James*, Zheng Guo, Ziteng Wang, Shivani Dosh, Hila Peleg, Ranjit Jhala, Nadia Polikarpova. *OOPSLA*. November 2020.

[TYGAR]: **Program Synthesis by Type-Guided Abstraction Refinement**. Zheng Guo, *Michael B. James*, David Justo, Jiaxiao Zhou, Ziteng Wang, Ranjit Jhala, Nadia Polikarpova *47th ACM SIGPLAN Symposium on Principles of Programming Languages* (POPL 2020). January 2020.

Work Experience

Research Intern. Microsoft, Remote, Summer 2022
Mentors: Arjun Radhakrishna, Gustavo Soares
Gathered changing project goals from internal customers into solid requirements for API refactoring tool
Built prototype novel interactive generative AI tool for API migrations.

Software Engineer II. Jana Mobile, Boston, Massachusetts, Feb 2017 - Jun 2018
2018 Created mobile anti-fraud mechanisms and data collection streams
2017 Managed data scientists' data collection APIs

*Equal Work

Software Engineer I. Uber Technologies, San Francisco, Jul 2015 - Dec 2016
2016 Lead team migration to golang, with a new anti-fraud microservice.
2015 Owned `business.uber.com`. Led service migration to React.

Elm Intern. Prezi, Budapest, Hungary, Summer 2014
Mentor: Evan Czaplicki
Built first interactive, time-traveling debugger for Elm-lang.
This was the first such production tool for any language.

Invited Talks

Grounded Copilot: How Programmers Interact with Code-Generating Models. 2023 - OOPSLA (Cascais, Portugal)

Program Recognition in Synthesis. 2021 - PLATEAU (Carnegie Mellon University)

Digging for Fold: Synthesis-aided API Discovery for Haskell. 2021 - OOPSLA (Chicago), 2020 - OOPSLA 2020 (virtual)

Component-based Type Driven Synthesis. 2019 - University of California, San Diego

Teaching

Graduate Teaching Assistant (UC San Diego)
Courses: undergraduate and graduate programming languages.
Fall 2023, Spring 2022, Spring 2021, Fall 2019.
Supervisor: Nadia Polikarpova

Undergraduate Teaching Assistant (Tufts University)
Course: undergraduate programming languages
Fall 2014.
Supervisor: Kathleen Fisher

Service

Reviewer: CHI 2024, PLATEAU 2024
Student Volunteer Co-Chair: PLDI 2023, 2024
Artifact Evaluation Committee: ICFP 2020, ICFP 2021