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
Advisor: Nadia Polikarpova

Tufts University
· B.S. Computer Science 2015

Research Projects

Human-AI Collaborative Programming   2021-2024
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   2018-2021
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
  Worked with the PROSE team on novel interactive program synthesis 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

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.

*Equal Work

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