Michael B. James, Ph.D.

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Research Mission

Building the next generation of Human-AI programming environments requires a deep understanding both of how AI-assistants operate and of how programmers use them. My work spans both, through my experience with *AI-agents*, *Programming Languages* techniques, and *Human-Computer Interactions* methodologies. I identify developer-centric challenges and overcome them with a novel combination of stochastic and formal techniques.

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

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

Senior AI Research Scientist. Sailplane PBC. New York City. Jul 2024 - *current*
· Designed and implemented new highly-parallel AI agent for programming
· Built and managed large VSCode extension empowering AI engineers
· Compared agent against SOTA with new dataset and novel evaluation using LLM judges
· Conducted contextual inquiry studies for UX development of tools.

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.
· Gathered changing product goals from several internal customers in concrete action plan

Software Engineer II. Jana Mobile. Boston, Massachusetts. Feb 2017 - Jun 2018
· Redesigned revenue reporting pipeline for live business metrics
· Designed & implemented user profile data collection, from Cassandra DB to Android+Chromium frontend
· Productionized data scientist analyses for metrics and alert generation on business status
· Managed data scientists' APIs for product metrics, including Kafka pipelines

Software Engineer I. Uber Technologies. San Francisco. Jul 2015 - Dec 2016
· Owned `business.uber.com`. Led service migration to React.
· Lead team migration to golang, with a new anti-fraud microservice.
· Managed and contributed to 12 microservices.
· Gathered requirements from designers and backend for feature implementation
· Conducted technical interviews to hire for team

*Equal Work

Research Projects

Human-AI Collaborative Programming 2021-2024
Our groundbreaking study identified how programmers use 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].

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: ICFP 2020, ICFP 2021

Skills

Python, Typescript, Haskell, Elixir, Program Synthesis, Artificial Intelligence, AI Agents, Distributed Systems, User Research, Quantitative Research, Qualitative Research, Evaluation, Data Science, Compilers, Type Systems, Web development, git, jira, react