

# 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.

## 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<sup>[GCP]</sup>. Our findings identified difficulty in validating AI-generated code, but our technique with live programming eases this difficulty<sup>[LEAP]</sup>. 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<sup>[TYGAR]</sup>. A user-study proves that our multi-modal search with examples and tests aids program comprehension, allowing a user to complete more tasks<sup>[H+]</sup>. A followup study reinforces the need for tool-assisted code validation<sup>[PRS]</sup>.

## 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.
- 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

**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.

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## 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

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## 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

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## Service

Reviewer: CHI 2024, PLATEAU 2024

Student Volunteer Co-Chair: PLDI 2023, 2024

Artifact Evaluation: ICFP 2020, ICFP 2021

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## Skills

Python, Haskell, Typescript, Program Synthesis, User Research, Quantitative Research, Qualitative Research, Data Science, Artificial Intelligence, Compilers, Type Systems, git, jira, react