# 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 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

**Founding Research Scientist**. Sailplane PBC. New York City. Jul 2024 - *current*
· Designed and implemented new highly-parallel AI agent
· Compared agent against SOTA with new dataset and novel evaluation
· Conducted contextual inquiry studies for UX development of tool.

**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

*Equal Work

**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.

## 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: ICFP 2020, ICFP 2021

## Skills

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