# Jingmei Hu

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## Education

Ph.D. Candidate in Computer Science — Aug 2016 - May 2022 (expected)
**Harvard University** — Cambridge, MA
Co-Advisors: Margo Seltzer (University of British Columbia), Stephen Chong (Harvard)

M.Sc. in Computer Science — Aug 2016 - May 2018
**Harvard University** — Cambridge, MA
Advisor: Margo Seltzer (University of British Columbia)

B.Sc in Computer Science — Sep 2012 - Jun 2016
**Shanghai Jiao Tong University (SJTU)** — Shanghai, China

## Publications

**Towards Porting Operating Systems with Program Synthesis** — TOPLAS
ACM Transactions on Programming Languages and Systems (Under Review)
**Hu, J.**, Lu, E., Holland, D.A., Kawaguchi, M., Chong, S. and Seltzer, M.I.

**Assuage: Assembly Synthesis Using A Guided Exploration** — UIST'21
ACM Symposium on User Interface Software and Technology
**Hu, J.**, Vaithilingam, P., Chong, S., Seltzer, M.I., Glassman, E.L.

**Improving Data Scientist Efficiency with Provenance** — ICSE'20
ACM/IEEE International Conference on Software Engineering
**Hu, J.**, Joung, J., Jacobs, M., Seltzer, M.I., Gajos, K.

**ProvBuild: Improving Data Scientist Efficiency with Provenance (An Extended Abstract)** — ICSE'20
ACM/IEEE International Conference on Software Engineering: Companion Proceedings
**Hu, J.**, Joung, J., Jacobs, M., Seltzer, M.I., Gajos, K.

**Trials and Tribulations in Synthesizing Operating Systems** — PLOS'19
Workshop on Programming Languages and Operating Systems
**Hu, J.**, Lu, E., Holland, D.A., Kawaguchi, M., Chong, S. and Seltzer, M.I.

**Shakein: Secure user authentication of smartphones with single-handed shakes** — TMC
IEEE transactions on mobile computing (2017)
Zhu, H., **Hu, J.**, Chang, S. and Lu, L.

**Aquarium: Cassiopea and Alewife Languages**
Technical Report (2019)
Holland, D.A., **Hu, J.**, Kawaguchi, M., Lu, E., Chong, S. and Seltzer, M.I.

## Research Experience

### Assembly Synthesis with Parallelism — 2021 - 2022
Graduate Research Assistant — Harvard University
Advised by Prof. Stephen Chong, Prof. Margo Seltzer

- Designed a framework for automated parallel synthesis via search space reductions.
- Designed a parallel assembly synthesis system and evaluated with various general assembly programming problems, showing its scalability improvement on assembly synthesis.

### Assembly Synthesis Using A Guided Exploration — 2020 - 2021
Graduate Research Assistant — Harvard University
Advised by Prof. Stephen Chong, Prof. Margo Seltzer and Prof. Elena Glassman

- Developed an interactive assembly synthesizer, *Assuage*, that allows the user and the synthesizer to collaboratively search a large space of assembly programs and generate the correct specification-satisfying program.

- Conducted a controlled laboratory study with 21 participants with a wide range of expertise to evaluate the usefulness and usability of *Assuage*.

### Porting Operating Systems with Code Synthesis
2018 - 2020

Graduate Research Assistant — Harvard University

Advised by Prof. Stephen Chong and Prof. Margo Seltzer, cooperated with Eric Lu, David Holland and Ming Kawaguchi

- Designed two domain specific languages: *Alewife*, a language for specification of Operating Systems functionality, and *Cassiopea*, a register transfer language style machine description language.
- Implemented a compiler in OCaml and a synthesis engine that takes a machine description and a specification instance, and produces an assembly program using satisfiability-modulo-theories (SMT) solvers.
- Developed usecases from preexisting operating systems to demonstrate the expressivity and usability.

### Improving Data Scientist Efficiency with Provenance
2017 - 2018

Graduate Research Assistant — Harvard University

Advised by Prof. Margo Seltzer and Prof. Krzysztof Gajos

- Developed a data analysis environment called *ProvBuild* that leverages language-level provenance to track dependencies in a script and uses change impact analysis to reduce the iterative editing process time in script-based workflow pipelines.
- Conducted a quantitative experiment, a controlled laboratory study and a real-world deployment study to evaluate *ProvBuild*'s performance, effectiveness, and usability.

### Smartphone User Authentication Scheme Based on Customized Shakes
2014 - 2015

Undergraduate Research Assistant — Shanghai Jiao Tong University

Advised by Prof. Hongzi Zhu

- Characterized single-handed shaking behavior based on sensory data with biometrical features and devised a training-authentication machine learning methodology for Android-based smartphones.
- Reduced equal error rate to $1.2\%$ and achieved resilience under shoulder-surfing attacks in various working conditions.

## Industry Experience

### Applied Scientist Intern
May 2021 — Aug 2021

AWS Automated Reasoning Group, Amazon — (Remote) Boston, MA

- Utilized the mutation testing information to analyze the behaviors of test cases with JUnit framework.
- Developed a toolchain to automatically generate test assertions to increase mutation coverage and improve test suite quality.

### Applied Scientist Intern
Sep 2020 — Dec 2020

AWS Automated Reasoning Group, Amazon — (Remote) Boston, MA

- Proposed an SMT-native lookahead-based approach for parallel SMT solving on program verification with string theories.
- Deployed the divide-and-conquer methodology, built a distributed solver with AWS cloud services and achieved orders-of-magnitude performance improvement on string-theory verification.

### Research Intern
Jun 2020 — Aug 2020

Systems Research Group, Microsoft Research — (Remote) Redmond, WA

- Explored and compared different approaches to integer reasoning for SMT-based verification.

## Skills

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| **Programming Languages** | (advanced) Python, Objective Caml (OCaml), HTML/CSS/JavaScript, C/C++<br>(intermediate) Assembly Languages, SQL, MATLAB, Java |
| **Research skills** | familiar with cloud services (AWS) and common testing techniques<br>familiar with human interaction related research |

## Honors, Awards, and Services

**ACM-W Scholarship** 2020

**National Scholarship (China)** (Top 1% in SJTU) 2013

Secretary, Harvard Chinese Student and Scholar Association Jun. 2019 - Apr. 2020

Teaching Fellow, COMPSCI 61 Systems Programming and Machine Organization Fall 2017