Federico Mora

federico.morarocha.ca
fmora@berkeley.edu

Education

202□ **Ph.D. Computer Science**
Advised by Sanjit A. Seshia
University of California, Berkeley

2018 **M.Sc. Computer Science**
Advised by Marsha Chechik
University of Toronto

2016 **B.Sc. Math and Computer Science**
First Class Honours with Distinction
Mount Allison University

Employment

2020, 2021, 2024 **Applied Scientist Intern, Amazon**
AWS Automated Reasoning Group
Supervised by Ankush Desai

2017 **Research Intern, General Motors**
Electronic Control Systems Lab
Supervised by Ramesh S

Research

I am interested in automated reasoning, programming language theory, and formal methods. Specifically, I am excited about useful formal languages that theoretically and empirically lend themselves to efficient reasoning. All of my publications—which are listed below—relate to this theme.

Awarded the Qualcomm Innovation Fellowship

Refereed Conference Papers

Research mentees denoted with *

[1] Shah*, **Mora**, and Seshia. "An Eager Satisfiability Modulo Theories Solver for Algebraic Datatypes". *AAAI Conference on Artificial Intelligence (AAAI)*. 2024.

[2] **Mora**, Desai, Polgreen, and Seshia. "Message Chains for Distributed System Verification". *Proceedings of the ACM on Programming Languages (OOPSLA)*. 2023.

[3] **Mora**, Berzish, Kulczynski, Nowotka, and Ganesh. "Z3str4: A Multi-armed String Solver". *International Symposium on Formal Methods (FM)*. 2021.

[4] Berzish, Day, Ganesh, Kulczynski, Manea, **Mora**, and Nowotka. "String Theories involving Regular Membership Predicates: From Practice to Theory and Back". *International Conference on Words*. 2021.

[5] Akhundov*, **Mora**, Feng, Hui, and Chechik. "Verification by Gambling on Program Slices". *International Symposium on Automated Technology for Verification and Analysis (ATVA)*. 2021.

[6] Pimpalkhare*, **Mora**, Polgreen, and Seshia. "MedleySolver: Online SMT Algorithm Selection". *International Conference on Theory and Applications of Satisfiability Testing (SAT)*. 2021.

[7] Berzish, Kulczynski, **Mora**, Manea, Day, Nowotka, and Ganesh. "An SMT Solver for Regular Expressions and Linear Arithmetic over String Length". *International Conference on Computer-Aided Verification (CAV)*. 2021.

[8] Feng, **Mora**, Hui, and Chechik. "Scaling Client-Specific Equivalence Checking via Impact Boundary Search". *IEEE/ACM International Conference on Automated Software Engineering (ASE)*. 2020.

[9] Scott, **Mora**, and Ganesh. "BanditFuzz: A Reinforcement-Learning Based Performance Fuzzer for SMT Solvers". *Working Conference on Verified Software: Theories, Tools, and Experiments (VSTTE)*. 2020.

[10] **Mora**, Li, Rubin, and Chechik. "Client-Specific Equivalence Checking". *IEEE/ACM International Conference on Automated Software Engineering (ASE)*. 2018.

Refereed Journal Papers

[11] Berzish, Day, Ganesh, Kulczynski, Manea, **Mora**, and Nowotka. "Towards more efficient methods for solving regular-expression heavy string constraints". *Theoretical Computer Science* (2023).

Refereed Short or Tool Papers

[12] Polgreen, Cheang, Gaddamadugu, Godbole, Laeufer, Lin, Manerkar, **Mora**, and Seshia. "UCLID5: Multi-Modal Formal Modeling, Verification, and Synthesis". *International Conference on Computer-Aided Verification (CAV)*. 2022.

[13] Scott, Sudula, Rehman, **Mora**, and Ganesh. "BanditFuzz: Fuzzing SMT Solvers with Multi-Agent Reinforcement Learning". *International Symposium on Formal Methods (FM)*. 2021.

[14] Blotsky, **Mora**, Berzish, Zheng, Kabir, and Ganesh. "StringFuzz: A Fuzzer for String Solvers". *International Conference on Computer-Aided Verification (CAV)*. 2018.

Refereed Workshop Papers or Presentations

[15] Li, **Mora**, Polgreen, and Seshia. "Genetic Algorithms for Searching a Matrix of Metagrammars for Synthesis". *Workshop on Synthesis (SYNT)*. 2023.

[16] **Mora**, Cheang, Polgreen, and Seshia. "Synthesis in UCLID5". *Workshop on Synthesis (SYNT)*. 2020.

Grant Writing Contributions

2021 **Amazon Research Award** (with Sanjit A. Seshia as PI)
"Scalable Verification of Secure Distributed Services through Synthesis and Learning"

Teaching and Mentoring

My teaching and mentoring is primarily influenced by universal design for learning (UDL) principles. I am particularly interested in how autograders can maximize student autonomy and encourage active learning. I have taught at the undergraduate and graduate levels and covered topics including programming languages, formal methods, software engineering, and artificial intelligence.

Received UC Berkeley's Outstanding Graduate Student Peer Mentor and Teaching Assistant Awards

Courses Taught

2022-24 **Guest Lectures, UC Berkeley**
EECS 219C: Formal Methods: Specification, Verification, and Synthesis
- Abstraction and Verification by Reduction to Synthesis
- Interpolation-Based Model Checking and IC3
- Satisfiability Modulo Theories - Part II: Theories and Theory Solvers
- Syntax-Guided Synthesis

CS 164: Programming Languages and Compilers

- Regular Expressions and Tokenization

2021-22 **Graduate Student Instructor, UC Berkeley**
CS 164: Programming Languages and Compilers (2)

2016-18 **Teaching Assistant, University of Toronto**
CSC 324: Principles of Programming Languages
CSC 384: Introduction to Artificial Intelligence (2)
CSC 410: Software Testing and Verification (2)

2015-16 **Teaching Assistant, Mount Allison University**
COMP 1631: Introduction to Computer Science

Students Mentored

2020- **UC Berkeley Undergraduate Students**
Amar Shah (PLDI '23 USRC Winner), Annamira O'Toole, Selina Kim, Nikhil Pimpalkhare

2023- **MiraCosta College Students**
Haley Lepe (NDiSTEM '23 Presentation Award Winner)

2022-23 **City College of San Francisco Students**
Isaac Chan

2018-20 **University of Toronto Undergraduate Students**
Murad Akhundov (POPL '20 USRC Winner), Lukas Finnbarr O'Callahan, Alex Tough

Service

I prioritize service that promotes diversity, equity, and inclusion in computer science. Whether directly, through application assistance programs, or indirectly, through outreach at local schools.

Received UC Berkeley's EECS Department Chair's Graduate Award

Professional Service

Organizer
- Berkeley Programming Systems Seminar Series (Summer '20)

Artifact Evaluation Committee Member
- Tools and Algorithms for the Construction and Analysis of Systems (TACAS '23)

Reviewer
- Formal Methods in System Design (FMSD '22)

External Reviewer or Subreviewer
- Automated Software Engineering (ASE '17, '18, '19)
- Computer Aided Verification (CAV '18, '21)
- Formal Methods in Computer-Aided Design (FMCAD '21, '22)
- Foundations of Software Engineering (FSE '17)
- International Joint Conference on Automated Reasoning (IJCAR '18)

- Programming Language Design and Implementation (PLDI '21)
- Tools and Algorithms for the Construction and Analysis of Systems (TACAS '21, '24)
- Verification, Model Checking, and Abstract Interpretation (VMCAI '24)

Conference or Workshop Student Volunteer
- Programming Language Design and Implementation (PLDI '22)
- **B**ryant **D**iscoveries **D**ay (FLoC '22)
- Waterloo Machine Learning, Verification, and Security Workshop ('19)

UC Berkeley EECS Departmental Service
- CS Faculty Hiring Committee ('24)
- Equal Access to Application Assistance Reviewer ('23)
- Visit Day Coordinator ('21)
- CSGSA Social Chair ('19, '20)

Community Outreach

2022 **Citizen Clinic**
Worked with indigenous land rights activists to help them defend themselves and their communities from cyber threats.

2022 **Be A Scientist**
Mentored a group of four seventh grade students in Spanish. Students designed and conducted their own scientific experiment over a six-week-long lab.

2020 **Bay Area Scientists in Schools (BASIS)**
Developed a new bilingual "You Belong" lesson on Ynés Mexía's research. Lesson delivered to schools serving low-income and historically marginalized communities.

Awards and Distinctions

Excluding awards from undergraduate studies or earlier

2024 Outstanding Graduate Student Peer Mentor Award (UC Berkeley)
2024 Demetri Angelakos Memorial Achievement Award (UC Berkeley EECS)
2023 Outstanding Teaching Assistant Award (UC Berkeley EECS)
2022 Outstanding Graduate Student Instructor Award (UC Berkeley)
2021 Qualcomm Innovation Fellowship
2021 Chair's Graduate Award (UC Berkeley EECS)
2019 Department Fellowship (UC Berkeley EECS)
2018 C. C. Gotlieb (Kelly) Graduate Fellowship (University of Toronto CS)
2017 Alfred B. Lehman Graduate Scholarship (University of Toronto CS)