Federico Mora

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Research Interests

I am interested in automated reasoning, programming language theory, and formal methods. Specifically, I am excited about useful languages that theoretically and empirically lend themselves to efficient reasoning.

Education

Ongoing	**Ph.D. in Computer Science** Advised by Sanjit A. Seshia University of California, Berkeley
2018	**M.Sc. in Computer Science** Advised by Marsha Chechik University of Toronto
2016	**B.Sc. in Computer Science and Mathematics** First Class Honours with Distinction Mount Allison University

Refereed Conference Papers

[1] Amar Shah*, **Federico Mora**, and Sanjit A. Seshia. "An Eager Satisfiability Modulo Theories Solver for Algebraic Datatypes". In: *38th AAAI Conference on Artificial Intelligence (AAAI)*. 2024.

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

[3] **Federico Mora**, Murphy Berzish, Mitja Kulczynski, Dirk Nowotka, and Vijay Ganesh. "Z3str4: A Multi-armed String Solver". In: *24th International Symposium on Formal Methods (FM)*. 2021.

[4] Murphy Berzish, Joel Day, Vijay Ganesh, Mitja Kulczynski, Florin Manea, **Federico Mora**, and Dirk Nowotka. "String Theories involving Regular Membership Predicates: From Practice to Theory and Back". In: *13th International Conference on Words (WORDS)*. 2021.

[5] Murad Akhundov*, **Federico Mora**, Nick Feng, Vincent Hui, and Marsha Chechik. "Verification by Gambling on Program Slices". In: *19th International Symposium on Automated Technology for Verification and Analysis (ATVA)*. 2021.

[6] Nikhil Pimpalkhare*, **Federico Mora**, Elizabeth Polgreen, and Sanjit A. Seshia. "MedleySolver: Online SMT Algorithm Selection". In: *24th International Conference on Theory and Applications of Satisfiability Testing (SAT)*. 2021.

[7] Murphy Berzish, Mitja Kulczynski, **Federico Mora**, Florin Manea, Joel Day, Dirk Nowotka, and Vijay Ganesh. "An SMT Solver for Regular Expressions and Linear Arithmetic over String Length". In: *33rd International Conference on Computer-Aided Verification (CAV)*. 2021.

[8] Nick Feng, **Federico Mora**, Vincent Hui, and Marsha Chechik. "Scaling Client-Specific Equivalence Checking via Impact Boundary Search". In: *35th IEEE/ACM International Conference on Automated Software Engineering (ASE)*. 2020.

[9] Joseph Scott, **Federico Mora**, and Vijay Ganesh. "BanditFuzz: A Reinforcement-Learning Based Performance Fuzzer for SMT Solvers". In: *12th Working Conference on Verified Software: Theories, Tools, and Experiments (VSTTE)*. 2020.

[10] **Federico Mora**, Yi Li, Julia Rubin, and Marsha Chechik. "Client-Specific Equivalence Checking". In: *33rd IEEE/ACM International Conference on Automated Software Engineering (ASE)*. 2018.

Refereed Journal Papers

[1] Murphy Berzish, Joel Day, Vijay Ganesh, Mitja Kulczynski, Florin Manea, **Federico Mora**, and Dirk Nowotka. "Towards more efficient methods for solving regular-expression heavy string constraints". In: *Theoretical Computer Science* (2023).

* denotes undergraduate research mentee

Refereed Short or Tool Papers

[1] Elizabeth Polgreen, Kevin Cheang, Pranav Gaddamadugu, Adwait Godbole, Kevin Laeufer, Shaokai Lin, Yatin Manerkar, **Federico Mora**, and Sanjit A. Seshia. "UCLID5: Multi-Modal Formal Modeling, Verification, and Synthesis". In: *34th International Conference on Computer-Aided Verification (CAV)*. 2022.

[2] Joseph Scott, Trishal Sudula, Hammad Rehman, **Federico Mora**, and Vijay Ganesh. "BanditFuzz: Fuzzing SMT Solvers with Multi-Agent Reinforcement Learning". In: *24th International Symposium on Formal Methods (FM)*. 2021.

[3] Dmitry Blotsky, **Federico Mora**, Murphy Berzish, Yunhui Zheng, Ifaz Kabir, and Vijay Ganesh. "StringFuzz: A Fuzzer for String Solvers". In: *31st International Conference on Computer-Aided Verification (CAV)*. 2018.

Refereed Workshop Papers or Presentations

[1] Yixuan Li, **Federico Mora**, Elizabeth Polgreen, and Sanjit A. Seshia. "Genetic Algorithms for Searching a Matrix of Metagrammars for Synthesis". In: *12th Workshop on Synthesis (SYNT)*. 2023.

[2] **Federico Mora**, Kevin Cheang, Elizabeth Polgreen, and Sanjit A. Seshia. "Synthesis in UCLID5". In: *9th Workshop on Synthesis (SYNT)*. 2020.

Industrial Research Positions

2020-21 **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

Teaching Experience

2022-23 **Guest Lectures, UC Berkeley**
EECS 219C: Formal Methods: Specification, Verification, and 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

Grant Writing Contributions

With Sanjit A. Seshia as PI/Co-PI

2021 **Amazon Research Award**
"Scalable Verification of Secure Distributed Services through Synthesis and Learning"

Professional Service

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

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

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

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)

Other Service
- UC Berkeley EECS Equal Access to Application Assistance Reviewer ('23)
- UC Berkeley EECS Visit Day Coordinator ('21)
- UC Berkeley CSGSA Social Chair ('20)

Awards and Distinctions

2023	Undergraduate Research Mentoring Award (UC Berkeley)
2022-23	EECS Outstanding Teaching Assistant Award (UC Berkeley)
2021-22	Outstanding Graduate Student Instructor Award (UC Berkeley)
2021	Qualcomm Innovation Fellowship
2020-21	EECS Chair's Graduate Award (UC Berkeley)
2019	EECS Department Fellowship (UC Berkeley)
2018	C. C. Gotlieb (Kelly) Graduate Fellowship (University of Toronto)
2017	Alfred B. Lehman Graduate Scholarship (University of Toronto)

Research Mentoring

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

Community Service

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.

Non-Academic

Languages	English (native), Spanish (native), and French (basic).
Certificates	Canadian Soccer Association community coaching: "Active Start" (ages 4-6), "Fundamentals" (ages 6-9), and "Learning to Train" (ages 8-12).
Awards	Canadian Interuniversity Sport Academic All-Canadian (4); Jack Drover Athletics Award (2); David MacArel MacAulay Award (2); Mount Allison men's varsity soccer team captain (2); Soccer New Brunswick Male Bursary Award (1); and New Brunswick provincial soccer team captain (1).