

curriculum vitæ of
Mohit Kumar Tekriwal
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RESEARCH INTERESTS

I am interested in programming languages, type theory, formal verification, numerical analysis, approximate computing, correctness/robustness in AI/ML, and AI for proof engineering. My current research work is on applying formal methods to the field of scientific computing, robotics and additive manufacturing.

EDUCATION

2018 – 2023	Ph.D. in Aerospace engineering	University of Michigan, Ann Arbor
2018 – 2020	M.Sc. in Aerospace engineering (GPA: 3.85/4)	University of Michigan, Ann Arbor
2014 – 2018	B.Tech in Aerospace engineering (GPA: 9.0/10)	Indian Institute of Technology, Kanpur

PUBLICATIONS

CONFERENCE AND JOURNAL PUBLICATIONS

1. V. K. Suman, Siva Viknesh S., **Mohit Tekriwal**, Swagata Bhaumik, Tapan K. Sengupta. “**Grid sensitivity and role of error in computing a lid-driven cavity problem**”. In *Phys. Rev. E* 99, 013305. (2019)
2. **Mohit Tekriwal**, Karthik Duraisamy, Jean-Baptiste Jeannin. “**A formal proof of the Lax equivalence theorem in finite difference schemes**”. In *NASA Formal Methods Symposium (NFM)*, 2021.
3. Heiko Becker, **Mohit Tekriwal**, Eva Darulova, Anastasia Volkova, Jean-Baptiste Jeannin. “**Certified approximation of transcendental functions**”. In *Interactive Theorem Proving conference (ITP)*, 2022.
4. **Mohit Tekriwal**, Ariel Kellison, Jean-Baptiste Jeannin, Geoffrey Hulette. “**Towards Verified Rounding-Error Analysis for Stationary Iterative Methods**”. In *Correctness workshop*, 2022.
5. **Mohit Tekriwal**, Andrew W. Appel, Ariel E. Kellison, David Bindel, Jean-Baptiste Jeannin. “**Verified Correctness, Accuracy, and Convergence of a Stationary Iterative Linear Solver: Jacobi Method**”. In *16th Conference on Intelligent Computer Mathematics*, 2023.
6. Ariel E. Kellison, Andrew W. Appel, **Mohit Tekriwal**, David Bindel. “**LAProof: a library of formal accuracy and correctness proofs for sparse linear algebra programs**”. In *30th IEEE International Symposium on Computer Arithmetic*, 2023.
7. **Mohit Tekriwal**, Joshua Miller, Jean-Baptiste Jeannin. “**Formalization of asymptotic convergence in stationary iterative methods**”. In *the NASA Formal Methods Symposium (NFM)*, 2024.
8. **Mohit Tekriwal**, Avi Tachna-Fram, Jean-Baptiste Jeannin, Manos Kapritsos, Dimitra Panagou. “**Formally verified asymptotic consensus in robust networks**”. In *30th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS)*, 2024.
9. Matthew Sottile and **Mohit Tekriwal**. “**Design and implementation of a verified interpreter for additive manufacturing programs**”. In *The Second ACM SIGPLAN Workshop on Functional Software Architecture - FP in the Large (FUNARCH)*, 2024.

10. **Mohit Tekriwal** and Matthew Sottile. “**Mechanized semantics for correctness of the RS274 additive manufacturing command language**”. *To appear in the 17th NASA Formal Methods Symposium (NFM), 2025.*
11. Yihan Yang, **Mohit Tekriwal**, John Sarracino, Matthew Sottile, Ignacio Laguna “**Towards Verified Linear Algebra Programs through Equivalence**”. *In The Eleventh International Workshop on Coq for Programming Languages (CoqPL), 2025 (co-located with POPL, 2025)*
12. Matthew Sottile, **Mohit Tekriwal**, John Sarracino. “**Towards Richer Challenge Problems for Scientific Computing Correctness**”. *Invited paper to the International Workshop on Verification of Scientific Software (VSS), 2025*

SKILLS

- Programming Languages: C, C++, OCaml, Rust
- Software and Utilities: MATLAB, TecPlot, Coq Proof Assistant, HOL4 theorem prover, Frama-C, Microsoft office suite, AutoCad, SolidWorks, LabVIEW
- Operating System: Linux, Windows, Mac

SERVICE TO THE SCIENTIFIC COMMUNITY

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|-------------------|---|
| Student Volunteer | Verification Mentoring Workshop , CAV’ 20.
Artifact Evaluation committee : CAV’ 21, ASPLOS’ 22, ICFP’ 24, POPL’ 25, PLDI’25, OOPSLA’25, SPIN’25. |
| Reviewing | External reviewer : PLDI’ 24, EMSOFT’ 24, ITP’25
Program Committee : Correctness@SC’ 24, NFM’ 25, SAS’25 |

RESEARCH EXPERIENCE

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|----------------------|---|
| Oct. 2023 – Present | Verified interpreter for 3D printing
Advisor: Matthew Sottile, Lawrence Livermore National Laboratory <ul style="list-style-type: none"> • Verified the semantics set of G and M codes (machine instructions to the 3D printing firmware) in Coq and extracted executables in OCaml to obtain a verified interpreter • Currently working on modeling uncertainties in the 3D print cycle for an accurate analysis during the print process |
| Sept.2018– Aug. 2023 | Formal Verification of Numerical Programs
Advisor: Prof. Jean-Baptiste Jeannin, University of Michigan <ul style="list-style-type: none"> • Formally verified the convergence properties of classical iterative methods in Coq • Explored light weight verification techniques like Frama-C/VST to carry verification at the code level • Developed a mechanized error analysis framework for end-to-end verification of numerical programs in presence of floating-point errors |
| Jun. 2022–Aug. 2022 | Verified QR factorization algorithm
Manager: Randy Lober, Sandia National Laboratories <ul style="list-style-type: none"> • Worked on formalization of the QR factorization algorithm • Formalized properties of Givens rotation algorithm for QR factorization |
| Jun. 2021–Aug. 2021 | Certified approximation of Transcendental functions
Advisor: Prof. Eva Darulova, formerly at MPI-SWS, currently at the University of Uppsala <ul style="list-style-type: none"> • Worked on formalization of the Remez algorithm for approximation of transcendental functions in HOL4 theorem prover • Implemented a first version of the certificate checker in a static analysis tool, Daisy • Formalized the McLaurin series approximation of transcendental functions and root finding methods in HOL4 theorem prover |

- May 2017–Jul. 2017 **Active Flow Control for Drag Reduction in wall bounded Turbulent Flows**
Mentor: Prof. Mitul Luhar, University of Southern California, Los Angeles
- Addressed challenges associated with feedback flow control that include development of a robust control law, and development of small and reliable actuators
 - Implemented Genetic Algorithm (GA) based techniques to find optimal values of PID control law constants
 - Fabricated a prototype of a piston-based actuator using 3-D printing
- Aug. 2017–May 2018 **Instability and receptivity studies in Lid Driven Cavity Problem**
Mentor: Prof. Tapan K Sengupta, Indian Institute of Technology, Kanpur, India
- Simulated and analyzed flow in a 2D Lid Driven Cavity
 - Successfully obtained a narrow range of optimal excitation amplitude responsible for onset of temporal instabilities in the system for Reynolds number in the range: 8000 - 8660
 - Carried Flow visualization studies and post processing using TecPlot

TEACHING AND MENTORING EXPERIENCE

- Fall–2019, Fall–2020 **Graduate Student Instructor** AEROSP 495: Introduction to Aerospace computing
I was responsible for grading homework, take home examinations and conducting office hours. I was also in-charge of weekly labs for the course, and delivered a couple of lectures in the class.
Student feedback rating: 4.6/5.0
- Summer 2020, 2021 **Mentor**
I mentored undergraduate students: Joshua Miller and Avi-Tachna Fram during their summer internship at the University of Michigan, Ann Arbor, on projects related to applied formal methods. Each of them wrote a paper with me, which got published in formal methods conferences.
- Summer 2024 **Mentor**
I co-mentored a visiting summer student at LLNL, Yihan Yang, on applied formal methods. We published a workshop paper together.

GRANT WRITING EXPERIENCE

1. LDRD Feasibility study 2024: “Formal framework for correctness of non-IEEE floating-point data formats”. *White paper endorsed.*
2. NSF 24-571: Correctness for Scientific Computing Systems: “A Comprehensive Pipeline for Formal Verification of Floating-Point Errors and Compilation for Scientific Computing”. *Recommended for funding.*

HONORS

- 2024 **Computing Research SLAM!**
2nd place winner.
- 2022 **Chateaubriand fellowship**
Awarded the fellowship to conduct a part of my PhD research in France.
- 2021 **Max Planck research fellowship**
Awarded the fellowship for summer research internship at MPI-SWS
- 2018 **General Proficiency Medal**
Awarded for the best academic performance in the graduating batch of Aerospace engineering
- 2018 **Proficiency Medal**
Awarded for the best undergraduate Project in the graduating batch of Aerospace engineering department
- 2017 **SN Bose Scholarship**
Selected for summer internship program in the United States of America. A total of 50 students from 78 reputed institutions in India, were selected for this award.
- 2016–2017 **Academic Excellence award**
- 2014 **Kishore Vaigyanik Protsahan Yojna (KVPY) Fellowship**