

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 and large language models 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 K. 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. <https://link.aps.org/doi/10.1103/PhysRevE.99.013305>
2. **Mohit K. Tekriwal**, Karthik Duraisamy, Jean-Baptiste Jeannin. “**A formal proof of the Lax equivalence theorem in finite difference schemes**” [NFM 2021]. https://doi.org/10.1007/978-3-030-76384-8_20
3. Heiko Becker, **Mohit K. Tekriwal**, Eva Darulova, Anastasia Volkova, Jean-Baptiste Jeannin. “**Certified approximation of transcendental functions**”. In *Interactive Theorem Proving conference (ITP)*, 2022. 10.4230/LIPIcs.ITP.2022.6
4. **Mohit K. Tekriwal**, Ariel Kellison, Jean-Baptiste Jeannin, Geoffrey Hulette. “**Towards Verified Rounding-Error Analysis for Stationary Iterative Methods**”. In *Correctness workshop*, 2022.
5. **Mohit K. 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 K. 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 K. Tekriwal**, Joshua Miller, Jean-Baptiste Jeannin. “**Formalization of asymptotic convergence in stationary iterative methods**”. to appear at *NFM*, 2024. <https://doi.org/10.48550/arXiv.2202.05587>.
8. **Mohit K. 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*, 2024. https://link.springer.com/chapter/10.1007/978-3-031-57246-3_14.

9. Matthew Sottile and Mohit K. 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, 2024*.

<https://dl.acm.org/doi/10.1145/3677998.3678221>

UNDER REVIEW

1. Mohit K. Tekriwal and Matthew Sottile. “Mechanized semantics for correctness of the RS274 additive manufacturing command language”

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. |
| Reviewing | Artifact Evaluation committee : CAV’ 21, ASPLOS’ 22, ICFP’ 24, POPL’ 25.
External reviewer : PLDI’ 24, EMSOFT’ 24
Program Committee : Correctness@SC’ 24, NFM’ 25 |

RESEARCH EXPERIENCE

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|----------------------|---|
| Sept.2018– Aug. 2023 | Formal Verification of Numerical Programs
Advisor: Prof. Jean-Baptiste Jeannin, Dept. of Aerospace Engineering, 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 |
| 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, Dept. of Aerospace and Mechanical Engineering, University of Southern California, Los Angeles <ul style="list-style-type: none"> • 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, Dept. of Aerospace Engineering, 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 the formal methods conference.
- Summer 2024 **Mentor**
 I co-mentored a visiting summer student at LLNL, Yihan Yang, on applied formal methods. We are writing 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”. *Under review.*

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**