MOHIT KUMAR TEKRIWAL

PhD Candidate, University of Michigan, Ann Arbor

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RESEARCH EXPERIENCE

Formal Verification of Numerical schemes
Advisor: Prof. Jean Baptiste Jeannin, Dept. of Aerospace Engineering, University of Michigan

📅 September 2018 – Ongoing

- Learnt functionalities of Coq proof assistant
- Formally verified consistency of a 2nd order central finite difference scheme in Coq proof assistant
- Formalized the Lax–equivalence theorem (statement of convergence of finite difference schemes) in Coq proof assistant
- Formally verified stability of Forward in time and Central in Space (FTCS) scheme for 1D-heat diffusion equation
- Exploring light weight verification techniques like Frama-C/VST for verification at code level
- Formalized the convergence of classical iterative methods in the Coq proof assistant

Certified approximation of Transcendental functions
Mentor: Prof. Eva Darulova, formerly at MPI-SWS, currently at the University of Uppsala

📅 June 2021–August 2021

- 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

Instability and receptivity studies in Lid Driven Cavity Problem
Mentor: Prof. Tapan K Sengupta, Dept. of Aerospace Engineering, Indian Institute of Technology, Kanpur, India

📅 Aug 2017– May 2018

- 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 using TecPlot
- Redrew bifurcation curve using vorticity time series data with respect to specific numerical method to obtain reported critical Reynolds number by other researchers
- Extended the exercise for 257 x 257 grid to finer grids: 513 x 513 and 1025 x 1025, and obtained similar results

MY LIFE PHILOSOPHY

"Change is the only constant in life. Ones ability to adapt to those changes will determine your success in life." – Benjamin Franklin

EDUCATION

Ph.D. in Aerospace Engineering
University of Michigan, Ann Arbor

📅 Sept 2018 – Present

MSE in Aerospace engineering
University of Michigan, Ann Arbor

📅 September 2018–April 2020

B.Tech in Aerospace engineering
Indian Institute of Technology (IIT), Kanpur, India

📅 August 2014 – May 2018

STRENGTHS

Hard-working | Fast learner | Leader | Focused | Adaptability | Statistical Analysis | Interactive Theorem Proving

TECHNICAL SKILLS

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

RELEVANT COURSE PROJECTS

Bayesian Games
AEROSP 740: Inference Estimation and Learning

- Carried literature survey on Bayesian games for adversarial machine learning
- Studied the relevance of Game theoretic approach in cybersecurity applications

Verification with Frama-C
EECS 590: Advanced Programming Languages

- Carried static analysis of C code using the Hoare Logic
- Motivation is to formally verify CFD solvers directly at the code level

TEACHING EXPERIENCE

Graduate Student Instructor
AEROSP 495: Introduction to Aerospace computing

📅 Fall–2019, Fall–2020   📍 Rating: 4.6/5.0

- Responsible for grading homework, take home examinations and conducting office hours
- In-charge of weekly labs for the course
- Delivered a couple of lectures in the class

PUBLICATIONS

Journal Articles:

- 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: *Physical Review E 99.1, p. 013305, 2019.*
- **Tekriwal, Mohit**, Karthik Duraisamy, and Jean-Baptiste Jeannin. "A formal proof of the Lax equivalence theorem for finite difference schemes." NASA Formal Methods Symposium. Springer, Cham, 2021.

In Review:

- **Mohit K. Tekriwal**, Joshua Miller, Jean-Baptiste Jeannin. "Formal verification of iterative convergence for numerical solutions of differential equations". (Submitted)
- "Certified approximation of transcendental functions." Investigators: Heiko Becker, **Mohit K. Tekriwal**, Eva Darulova, Anastasia Volkova, Jean-Baptiste Jeannin. (Submitted)

CONSULTING EXPERIENCE

Worked as a marketing consultant for Every2minutes, as part of the project management and consulting course at the University of Michigan in Winter 2020. Our team delivered a go to market strategy for launching the app. We designed a digit marketing campaign to help Every2minutes reach out to the college students with the aim of providing resources for the victims of sexual harassment.

ACHIEVEMENTS AND AWARDS

🏆 **Max Plank Research fellowship (2021)**
Awarded fellowship for summer research internship at the Max Plank Institute for Software systems(MPI-SWS), Germany

PhD candidacy (2020)
Advanced to PhD candidacy in Aerospace engineering

🏆 **General Proficiency Medal (2018)**
Awarded for the best academic performance in the graduating batch of Aerospace engineering

🏆 **Proficiency Medal (2018)**
Awarded for the best undergraduate Project in the graduating batch of Aerospace engineering department

🏆 **SN Bose Scholarship (2017)**
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.

🏆 **Academic Excellence award (2016–2017)**

🏆 **Kishore Vaigyanik Protsahan Yojna (KVPY) Fellowship (2014)**

Qualified the Joint Entrance Examination (IIT-JEE)
Only 0.1% of the applied candidates are selected in the premier engineering college of India, Indian Institute of Technology (IIT)

COURSEWORK

- **Inference, Estimation and Learning**
- **Data driven modeling of Complex systems**
- **Advanced Programming Languages**
- **Formal Verification of Software and Hardware systems**
- **Compiler Construction**
- Linear Systems theory
- Non-linear Systems theory
- Computational Fluid Dynamics
- Differential equations
- Optimization methods in engineering applications
- Applied numerical methods