Ravi Mangal

CONTACT INFORMATION

CSB 372, CSU
Fort Collins, CO 80523 USA

ravi.mangal@colostate.edu
https://ravimangal.github.io/

RESEARCH INTERESTS

Trustworthy AI, Formal Methods, Machine Learning, Assured Autonomy, Program Verification

EDUCATION

Georgia Institute of Technology, Atlanta, Georgia, USA
Ph.D., Computer Science, Dec 2020
Advisor: Dr. Alessandro Orso

Georgia Institute of Technology, Atlanta, Georgia, USA
M.S., Computer Science, May 2012

Veermata Jijabai Technological Institute, Mumbai, India
B.Tech., Information Technology, May 2010

WORK EXPERIENCE

Colorado State University, Fort Collins, Colorado, USA
Assistant Professor, Department of Computer Science **Aug 2024 - Present**

CyLab, Carnegie Mellon University, Silicon Valley, California, USA
Postdoctoral Researcher with Dr. Corina Păsăreanu **Jan 2021 - June 2024**

Georgia Institute of Technology, Atlanta, Georgia, USA
Graduate Research Assistant **Jan 2012 - Dec 2020**

Microsoft Research, Redmond, Washington, USA
Research Intern **May 2016 - Aug 2016**

Google, Mountain View, California, USA
Research Intern **May 2014 - Aug 2014**

Nvidia, Santa Clara, California, USA
Software Intern **May 2011 - Aug 2011**

Microsoft, Hyderabad, India
Software Development Engineer in Test Intern **May 2009 - Jul 2009**

Indian Institute of Technology-Bombay, Mumbai, India
Undergraduate Researcher **May 2008 - Jul 2008**

RESEARCH ARTICLES

(* indicates equal contribution, (α) indicates alphabetical ordering)

Preprints

Christopher Watson, Rajeev Alur, Divya Gopinath, **Ravi Mangal***, and Corina Păsăreanu. Scenario-based compositional verification of autonomous systems with neural perception. *arXiv:2504.20942*, 2025

Ravi Mangal*, Klas Leino*, Zifan Wang*, Kai Hu*, Weicheng Yu, Corina Păsăreanu, Anupam Datta, and Matt Fredrikson. Is certifying ℓ_p robustness still worthwhile? *arXiv:2310.09361*, 2023

Journal Publications

(α) Radu Calinescu, Calum Imrie, **Ravi Mangal**, Genaína Nunes Rodrigues, Corina Păsăreanu, Misael Alpizar Santana, and Gricel Vázquez. Controller synthesis for autonomous systems with deep-learning perception components. *IEEE Transactions on Software Engineering*, 2024

Conference Publications

Nils Palumbo, **Ravi Mangal**, Zifan Wang, Saranya Vijayakumar, Corina Păsăreanu, and Somesh Jha. Validating mechanistic interpretations: An axiomatic approach. *Proceedings of the 42nd International Conference on Machine Learning (ICML)*, 2025

Felipe Toledo, Sebastian Elbaum, Divya Gopinath, Ramneet Kaur, **Ravi Mangal**, Corina S. Păsăreanu, Anirban Roy, and Susmit Jha. Monitoring safety properties for autonomous driving systems with vision-language models. In *Engineering Reliable Autonomous Systems*, 2025

Boyue Caroline Hu, Divya Gopinath, Corina Păsăreanu, Nina Narodytska, **Ravi Mangal**, and Susmit Jha. Debugging and runtime analysis of neural networks with vlms (a case study). In *4th International Conference on AI Engineering – Software Engineering for AI (CAIN)*, 2025

Sayan Mitra, Corina Păsăreanu, Pavithra Prabhakar, Sanjit A Seshia, **Ravi Mangal**, Yangge Li, Christopher Watson, Divya Gopinath, and Huafeng Yu. Formal verification techniques for vision-based autonomous systems–a survey. In *Principles of Verification: Cycling the Probabilistic Landscape: Essays Dedicated to Joost-Pieter Katoen on the Occasion of His 60th Birthday, Part III*, pages 89–108. Springer, 2024

Chi Zhang, Zifan Wang, Ruoshi Zhao, **Ravi Mangal**, Matt Fredrikson, Limin Jia, and Corina Pasareanu. Attacks and defenses for large language models on coding tasks. In *Proceedings of the 39th IEEE/ACM International Conference on Automated Software Engineering*, pages 2268–2272, 2024

Ravi Mangal, Nina Narodytska, Divya Gopinath, Boyue Caroline Hu, Anirban Roy, Susmit Jha, and Corina S. Păsăreanu. Concept-based analysis of neural networks via vision-language models. In *AI Verification*. Springer Nature Switzerland, 2024

Corina Păsăreanu, **Ravi Mangal**, Divya Gopinath, and Huafeng Yu. Assumption generation for the verification of learning-enabled autonomous systems. In *International Conference on Runtime Verification*. Springer, 2023

Corina S Păsăreanu, **Ravi Mangal**, Divya Gopinath, Sinem Getir Yaman, Calum Imrie, Radu Calinescu, and Huafeng Yu. Closed-loop analysis of vision-based autonomous systems: A case study. In *International Conference on Computer Aided Verification*, pages 289–303. Springer, 2023

Ravi Mangal*, Zifan Wang*, Chi Zhang*, Klas Leino, Corina Păsăreanu, and Matt Fredrikson. On the Perils of Cascading Robust Classifiers. In *International Conference on Learning Representations*, ICLR '23, 2023

(α) Divya Gopinath, Luca Lungeanu, **Ravi Mangal**, Corina Păsăreanu, Siqi Xie, and Huafeng Yu. Feature-guided Analysis of Neural Networks. In *Fundamental Approaches to Software Engineering*, FASE'23. Springer, 2023

Klas Leino*, Chi Zhang*, **Ravi Mangal***, Matt Fredrikson, Bryan Parno, and Corina Păsăreanu. Degradation Attacks on Certifiably Robust Neural Networks. *Transactions on Machine Learning Research*, 2022

Ravi Mangal, Kartik Sarangmath, Aditya V. Nori, and Alessandro Orso. Probabilistic Lipschitz Analysis of Neural Networks. In *International Static Analysis Symposium*, SAS '20. Springer, 2020

Ravi Mangal, Aditya V. Nori, and Alessandro Orso. Robustness of Neural Networks: A Probabilistic and Practical Approach. In *Proceedings of the 41st International Conference on Software Engineering: New Ideas and Emerging Results*, ICSE-NIER '19, 2019

Sulekha Kulkarni, **Ravi Mangal**, Xin Zhang, and Mayur Naik. Accelerating Program Analyses by Cross-program Training. In *Proceedings of the 2016 ACM SIGPLAN International Conference on Object-Oriented Programming, Systems, Languages, and Applications*, OOPSLA '16, 2016

Ravi Mangal, Xin Zhang, Aditya Kamath, Aditya V. Nori, and Mayur Naik. Scaling Relational Inference Using Proofs and Refutations. In *Thirtieth AAAI Conference on Artificial Intelligence*, AAAI '16, 2016

Xin Zhang, **Ravi Mangal**, Aditya V. Nori, and Mayur Naik. Query-guided Maximum Satisfiability. In *Proceedings of the 43rd Annual ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages*, POPL '16, 2016

Ravi Mangal, Xin Zhang, Aditya V. Nori, and Mayur Naik. Volt: A Lazy Grounding Framework for Solving Very Large MaxSAT Instances. In *International Conference on Theory and Applications of Satisfiability Testing*, SAT '15, 2015

Ravi Mangal, Xin Zhang, Aditya V. Nori, and Mayur Naik. A User-guided Approach to Program Analysis. In *Proceedings of the 10th Joint Meeting on Foundations of Software Engineering*, ESEC/FSE '15, 2015

Xin Zhang, **Ravi Mangal**, Mayur Naik, and Hongseok Yang. Hybrid Top-down and Bottom-up Interprocedural Analysis. In *Proceedings of the 35th ACM SIGPLAN Conference on Programming Language Design and Implementation*, PLDI '14, 2014

Xin Zhang, **Ravi Mangal**, Radu Grigore, Mayur Naik, and Hongseok Yang. On Abstraction Refinement for Program Analyses in Datalog. In *Proceedings of the 35th ACM SIGPLAN Conference on Programming Language Design and Implementation*, PLDI '14, 2014

Ravi Mangal, Mayur Naik, and Hongseok Yang. A Correspondence Between Two Approaches to Interprocedural Analysis in the Presence of Join. In *Proceedings of the 23rd European Symposium on Programming Languages and Systems - Volume 8410*, ESOP '14, 2014

Workshop Papers and Abstracts

Ravi Mangal and Corina Păsăreanu. A Cascade of Checkers for Run-time Certification of Local Robustness. In *5th Workshop on Formal Methods for ML-Enabled Autonomous Systems*, 2022

Klas Leino, Aymeric Fromherz, **Ravi Mangal**, Matt Fredrikson, Bryan Parno, and Corina Păsăreanu. Self-correcting Neural Networks for Safe Classification. In *5th Workshop on Formal Methods for ML-Enabled Autonomous Systems*, 2022

Ravi Mangal, Aditya V. Nori, and Alessandro Orso. Checking Probabilistic Properties of Neural Networks via Symbolic Methods and Sampling. In *First ICSE Workshop on Testing for Deep Learning and Deep Learning for Testing*, DeepTest '19, 2019

Ravi Mangal, David Devecsery, and Alessandro Orso. On Optimally Combining Static and Dynamic Analyses for Intensional Program Properties. In *The Southeast Regional Programming Languages Seminar*, SERPL '19, 2019

Technical Reports

Ravi Mangal, Xin Zhang, Mayur Naik, and Aditya V. Nori. Solving Weighted Constraints with Applications to Program Analysis. Technical report, Georgia Institute of Technology, 2015

Honors and Awards

Distinguished paper award nominee at CAIN **2025**

Invited to NII Shonan Meeting on Trusted Automatic Programming **2025**

Invited to Dagstuhl Seminar on Resilience and Antifragility of Autonomous Systems **2024**
Invited to attend the DARPA AI Forward workshop **2023**
Invited to Dagstuhl Seminar on Machine Learning and Logical Reasoning: The New Frontier **2022**
Distinguished paper award at ESEC/FSE **2015**
Distinguished paper award at PLDI **2014**
Best paper award nominee at ESOP **2014**
Amongst the top reviewers at NeurIPS **2022, 2023, 2024**

Grants

Adversarial Perturbations and Self-Defenses for LLMs on Coding Tasks
IARPA
PI: Corina Păsăreanu; Co-PIs: Beidi Chen, Matt Fredrikson, Limin Jia, Ravi Mangal
Total funds awarded: $3,726,055 (CSU share: $305,000) **2025-27**

LLM Self-Defense Against Adversarial Attacks for Coding Tasks
CyLab Future Enterprise Security Initiative
PIs: Corina Păsăreanu, Limin Jia, Ravi Mangal
Total funds awarded: $75,000 **2023**

Verifiable Personalization for Federated Learning
CyLab Future Enterprise Security Initiative
PIs: Corina Păsăreanu, Ravi Mangal
Total funds awarded: $60,000 **2022**

Research Talks

Invited Talks

Concept-based Semantic Analysis of DNNs
University of Wyoming **April 2025**

Analyzing Safety of Learning-enabled Systems: Bottom-up and Top-down Perspectives
University of Colorado, Boulder **November 2024**

Closed-loop Analysis of Vision-based Autonomous Systems: A Case Study
Cohere for AI **May 2024**

Safety Analysis of Vision-based Autonomous Systems
CMU CyLab Partners Conference **Oct 2023**

Feature-Guided Engineering of Neural Networks
CMU CyLab Partners Conference **Oct 2022**

The Necessity of Run-time Techniques for Safe ML
Dagstuhl Seminar on Machine Learning and Logical Reasoning: The New Frontier **July 2022**

Repairing Neural Classifiers at Run-time: Safety for Free
CMU CyLab Partners Conference **Oct 2021**

A User-Guided Approach to Program Analysis
Microsoft Research India **Aug 2015**

Conference and Workshop Presentations and Posters
SAIV'24, CAV'23, FoMLAS'22, SAS'20, ICSE-NIER'19, DeepTest'19, SERPL'19, AAAI'16, SAT'15, FSE'15, ESOP'14

Teaching Experience

Instructor
CS454 Principles of Programming Languages **Spring 2025**

	CS580B1 Trustworthy Machine Learning	**Fall 2024**
	Teaching Assistant	
	CS6340 Software Analysis and Testing (Online)	**Spring 2016**
	CS6340 Software Analysis and Testing	**Spring 2016**
	CS8803 Foundations of Programming Languages	**Fall 2013**
	CS8803 Foundations of Programming Languages	**Fall 2012**
	CS6340 Software Analysis and Testing	**Fall 2011**
Advising and Mentoring Experience	Md Abdul Hannan (MS at CSU)	**Jan 2025 - Present**
	Harshit Singh (MS at CSU)	**Jan 2025 - Present**
	Ronaldo Canizales (PhD at CSU)	**Sept 2024 - Present**
	Siqi Xi (MS at CMU)	**Aug 2022 - July 2023**
	Chi Zhang (PhD at CMU)	**Mar 2021 - Present**
	Kartik Sarangmath (BS/MS at Georgia Tech)	**Aug 2019 - Dec 2022**
	SIGPLAN-M	**Oct 2020 - Present**
PhD and Masters Committees	Rupasree Dey (PhD)	Colorado State University
	Eric Enos (PhD)	Colorado State University
	Bassem Ghorbel (PhD)	Colorado State University
	Md Nazmul Islam (PhD)	Colorado State University
	Soumyadip Roy (PhD)	Colorado State University
	William Scarbro (PhD)	Colorado State University
	Siqi Xi (MS)	Carnegie Mellon University
	Jonathon Yallop (MS)	Colorado State University
	Chi Zhang (PhD)	Carnegie Mellon University

Academic Service

Program Committee

OOPSLA'26, FASE'26, CAV'25, SAIV'25, ASQAP'25, RAIE'25, VMCAI'25, AAAI'25, ICSE'25, FM'24, FMCAD'24, SAIV'24, IJCAI'24, NFM'24, CAIN'24, CAV'24

Reviewer

NSF Panel, ACM Journal on Responsible Computing, International Journal of Information Security, TOSEM, Journal of AI Research, IEEE Transactions on Big Data, TMLR, ICML'25, ICML'24, ICLR'24, NeurIPS'25, NeurIPS'24 (Top Reviewers), NeurIPS'23 (Top Reviewers), NeurIPS'22 (Top Reviewers), ICLR'22

Sub-Reviewer

NFM'23, POPL'22, CAIN'22, Oakland'22, PLDI'21, ICSE'20, ISSTA'20, FSE'19, FSE'18, ISSTA'18, SPIN'17, RV'17, JCST'17, ESSOS'17, CAV'14, HVC'14, ICSE-SRC'14

Artifact Evaluation Committee Member

OOPSLA'24, POPL'23, POPL'20, ISSTA'18, OOPSLA'17, OOPSLA'16