Monal Narasimhamurthy

Contact Information

Department of Computer Science
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Research Interests

Formal Methods, Cyber-Physical Systems, Machine Learning, Programming Languages.
I'm interested in data-driven modeling of autonomous systems for control and verification.

Education

University of Colorado Boulder, Boulder, Colorado, USA — GPA - 3.93/4
Ph.D. Student, Computer Science, since Fall 2016
- Advisor (since Fall 2019): Prof. Sriram Sankaranarayanan
- Previously advised by Prof. Matthew Hammer

University of Colorado Boulder, Boulder, Colorado, USA — GPA - 3.97/4
M.S., Computer Science, May, 2017

Birla Institute of Technology and Science, Pilani, Goa, India — GPA - 7.44/10
B.E.(Hons.), Computer Science, August, 2014

Skills

- Languages: Python, Rust, Java, Matlab, Scala, OCaml, FStar, R, C
- Web development: AngularJS, Django, Flask, JS, HTML, CSS
- Data processing: Hadoop, Kafka, RabbitMQ, Storm, Spark, Elasticsearch
- Data analysis: Tensorflow, Scikit-learn, GDAL, ArcGIS
- Databases: MySQL, Redis, Cassandra
- Tools: Gurobi, Amazon AWS Cloud, Jenkins, Travis CI, Git

Graduate Coursework

Machine Learning	Big Data Architecture
Computer Aided Verification	Design and Analysis of Algorithms
Chaotic Dynamics	Theory of Computation
Probabilistic Programming Languages	Geospatial Data Analysis
Fundamental Concepts of Programming Languages	User-Centered Design
Advanced Techniques for Incremental Computation	Database Systems

Professional Experience

Amazon, Automated Reasoning Group, Santa Clara, USA
Applied Scientist Intern, advised by Zyad Hassan — **May 2022 - Aug 2022**
Implemented function contracts in Kani, a Rust verification tool.

Five AI, Edinburgh, United Kingdom
Research Intern, advised by Iain Whiteside — **May 2021 - Aug 2021**
Developed a probabilistic domain-specific-language to generate dynamic road scenarios for validation of the self-driving car stack.

Microsoft Research Lab, Cambridge, United Kingdom
Research Intern, advised by Andy Gordon and Simon Peyton Jones — **June 2018 - Sep 2018**
Developed a type system for Excel spreadsheets.

Microsoft Research Lab, Bangalore, India
Research Intern, advised by Aseem Rastogi — **June 2017 - Jan 2018**
Implemented a separation logic library for F*, a verification oriented language.

Amazon, Seattle, Washington, USA
SDE Intern — **May 2016 - Aug 2016**
Built a serverless architecture framework for internal roadmap and sprint planning.

DirectI, Mumbai, India - *Developer Operations* **July 2014 - July 2015**
Developed automation tools and deployed infrastructure for contextual web advertisement platforms.

Apigee, Bangalore, India - *Software Developer Intern* **Jan 2014 - June 2014**
Worked with the Diagnostics team to reduce the customer support ticket resolution time. Built a cloud infrastructure monitoring tool for the DevOps team and contributed to the testing framework.

Academic Experience

CU Programming Languages and Verification Lab, Boulder, Colorado, USA
Research Assistant **since Aug 2016**

- Working on data-driven modeling of cyber-physical systems for control and verification
- Previously worked on extending Adapton, a general-purpose language-based abstraction for incremental computation with Prof. Matthew Hammer

Papers and Drafts

An Algorithm for Learning Switched Linear Dynamics from Data
Guillaume Berger*, Monal Narasimhamurthy*, Kandai Watanabe, Morteza Lahijanian, Sriram Sankaranarayanan. *To appear in Advances in Neural Information Processing Systems 35 (2022).*

Decoding Output Sequences for Discrete-Time Linear Hybrid Systems
Monal Narasimhamurthy, Sriram Sankaranarayanan. In ACM International Conference on Hybrid Systems: Computation and Control (HSCC), pp. 6:1-6:7, 2022

Verifying Conformance of Neural Networks: Invited Paper
Monal Narasimhamurthy, Taisa Kushner, Souradeep Dutta, Sriram Sankaranarayanan
2019 IEEE/ACM International Conference on Computer-Aided Design (ICCAD), 2019.

Meta-F*: Proof automation with SMT, Tactics, and Metaprograms
Guido Martínez, Danel Ahman, Victor Dumitrescu, Nick Giannarakis, Chris Hawblitzel, Cătălin Hriţcu, Monal Narasimhamurthy, Zoe Paraskevopoulou, Clément Pit-Claudel, Jonathan Protzenko, Tahina Ramananandro, Aseem Rastogi, Nikhil Swamy. In 28th European Symposium on Programming (ESOP), Springer, 2019.

ML as a Tactic Language, Again
Guido Martínez, Danel Ahman, Victor Dumitrescu, Nick Giannarakis, Chris Hawblitzel, Cătălin Hriţcu, Monal Narasimhamurthy, Zoe Paraskevopoulou, Clément Pit-Claudel, Jonathan Protzenko, Tahina Ramananandro, Aseem Rastogi, Nikhil Swamy. ML, 2018.

Fungi: Typed incremental computation with names
Matthew A. Hammer, Kyle Headley, Jana Dunfield, Monal Narasimhamurthy,
Dimitrios J. Economou. [draft, arXiv:1610.00097 [cs.PL]]

Posters

Decoding Output Sequences for Discrete-Time Linear Hybrid Systems

- ACM International Conference on Hybrid Systems: Computation and Control (HSCC), 2022
- NSF Center on Pervasive Personalized Intelligence Planning and IAB Workshop 2022
- Computer Science Research Expo, University of Colorado Boulder 2022
  (*Winner of Best Poster Award*)

Types for Sheet-Defined Functions

- Intern Research Expo, Microsoft Research, Cambridge, 2019

Invited Talks

- Decoding Output Sequences for Discrete-Time Linear Hybrid Systems **April 22, 2022**
  ARIA Systems Lab, University of Colorado Boulder
- Introduction to Probabilistic Programming Languages **May 16, 2019**
  Meet a Data Scientist Series, Colorado Data Science Team

Teaching	*Teaching Assistant*, University of Colorado Boulder	
	• CSCI 3155: Principles of Programming Languages,	**Fall 2019**
	• CSCI 3308: Software Development Tools and Methods	**Spring 2016**
Service, Workshops, and Leadership	Artifact Evaluation Committee	**VMCAI 2022, 2021**
	Student Volunteer	**PLDI 2017**
	Co-President, Colorado Data Science Team	**Fall 2016 - Fall 2018**
	3rd Annual Women in Research Lean In (WiRL) 2019	**(By Invitation from Facebook)**
	Summer School on Formal Techniques	**Summer 2018**

Teaching Outreach

GMR group, Bangalore, India **May 2012 - July 2012**
Corporate social responsibility intern Contributed towards empowering underprivileged, uneducated youth by teaching them technical skills, organizing a city-wide non-profit organization meet.

Udaan, BITS Pilani, Goa, India **Aug 2012 - May 2014**
Core member Worked towards empowering the housekeeping women on campus though basic education, social activities, awareness workshops and health-camps.