

Adithya Murali

 <https://muraliadithya.github.io>
 <https://tinyurl.com/muraliadithyaGS>
 adithya5@illinois.edu
 +1 (217) 904 9406



Research Summary

My research focuses on replacing human creativity needed in automated software verification using learning of logical expressions from data, combining ideas from programming languages, formal methods, and (symbolic) machine learning.

Education

University of Illinois Urbana-Champaign, USA <i>Ph.D. Computer Science</i> Advisor: Madhusudan Parthasarathy	August 2017 - 2024
BITS-Pilani Hyderabad, India <i>MSc (Hons) Mathematics</i>	August 2012 - August 2017
BITS-Pilani Hyderabad, India <i>B.E (Hons) Computer Science</i> Gold Medal, 2017 Batch	August 2012 - August 2017

Publications

Conference Publications

(* represents equal contribution)

Complete First-Order Reasoning for Properties of Functional Programs

Adithya Murali, Lucas Peña, Ranjit Jhala, P. Madhusudan

Proc. of the ACM on Programming Languages, Volume 7, Issue OOPSLA2 (OOPSLA 2023)

 <https://doi.org/10.1145/3622835>

Model-Guided Synthesis of Inductive Lemmas for FOL with Least Fixpoints

Adithya Murali, Lucas Peña, Eion Blanchard, Christof Löding, P. Madhusudan

Proc. of the ACM on Programming Languages, Volume 6, Issue OOPSLA2 (OOPSLA 2022)

 <https://doi.org/10.1145/3563354>

Synthesizing Axiomatizations using Learning

Zhengyao Lin*, Paul Krogmeier*, Adithya Murali*, P. Madhusudan

Proc. of the ACM on Programming Languages, Volume 6, Issue OOPSLA2 (OOPSLA 2022)

doi <https://doi.org/10.1145/3563348>

Composing Neural Learning and Symbolic Reasoning with an Application to Visual Discrimination

Adithya Murali, Atharva Sehgal, Paul Krogmeier, P. Madhusudan

Proc. of the 31st International Joint Conf. on Artificial Intelligence Main Track (IJCAI 2022)

doi <https://doi.org/10.24963/ijcai.2022/466>

Decidable Synthesis of Programs with Uninterpreted Functions

Paul Krogmeier, Umang Mathur, Adithya Murali, P. Madhusudan, Mahesh Viswanathan

Computer Aided Verification: 32nd International Conference, Proceedings, Part II (CAV 2020)

doi https://doi.org/10.1007/978-3-030-53291-8_32

Deciding Memory Safety for Single-Pass Heap-Manipulating Programs

Umang Mathur*, Adithya Murali*, Paul Krogmeier, P. Madhusudan, Mahesh Viswanathan

Proc. of the ACM on Programming Languages, Volume 4, Issue POPL (POPL 2020)

doi <https://doi.org/10.1145/3371103>

A First Order Logic with Frames

Adithya Murali*, Lucas Peña*, Christof Löding, P. Madhusudan

Programming Languages and Systems (ESOP 2020), LNCS, Vol 12075

EAPLS Award Finalist. Invited to TOPLAS.

doi https://doi.org/10.1007/978-3-030-44914-8_19

Kaizen: Building a Performant Blockchain System Verified for Consensus and Integrity

Faria Kalim, Karl Palmskog, Jayasi Mehar, Adithya Murali, P. Madhusudan, Indranil Gupta

2019 Formal Methods in Computer Aided Design (FMCAD 2019)

doi <https://doi.org/10.23919/FMCAD.2019.8894248>

Journals

A First Order Logic with Frames

Adithya Murali, Lucas Peña, Christof Löding, P. Madhusudan

ACM Trans. on Programming Languages and Systems, Volume 45, Issue 2 (TOPLAS 2023)

Invited Submission.

doi <https://doi.org/10.1145/3583057>

Tutorials

Automated Datastructure Verification using Unfoldings and SMT Solving

Adithya Murali, P. Madhusudan

POPL 2024 TutorialFest

<https://popl24.sigplan.org/details/POPL-2024-tutorialfest/10/-Automated-Datastructure-Verification-using-Unfoldings-and-SMT-Solving-Foundations-a>

Under Submission

Predictable Verification using Intrinsic Definitions of Datastructures

Adithya Murali, Cody Rivera, P. Madhusudan

[🔗 https://muraliadithya.github.io/static/ids.pdf](https://muraliadithya.github.io/static/ids.pdf)

Automating Program Verification for Frame Logic

Adithya Murali, Hrishikesh Balakrishnan, Aaron Councilman, P. Madhusudan

[🔗 https://muraliadithya.github.io/static/flautomation.pdf](https://muraliadithya.github.io/static/flautomation.pdf)

Delta-Logics: Logics for Change

Adithya Murali, P. Madhusudan

[🔗 https://muraliadithya.github.io/static/deltalogics.pdf](https://muraliadithya.github.io/static/deltalogics.pdf)

Teaching

Teaching Assistant, University of Illinois Urbana-Champaign

Trustworthy AI Systems

Fall 2023

Duties including assignment creation and course project supervision.

Logic in Computer Science

Spring 2023

Duties including assignment creation and course project supervision.

Programming Languages and Compilers

Fall 2019, Spring & Fall 2020

Undergraduate course with ~400 students.

Teaching Assistant, BITS-Pilani Hyderabad

Linear Algebra and Complex Variables

Spring 2013, Spring 2014

Undergraduate course with ~200 students.

Duties including weekly problem-solving tutorials.

Industry Experience

Microsoft

Feb 2021 - Aug 2021

Research Intern

Team: PROSE

Mentors: Sumit Gulwani, Ashish Tiwari

Topic: Machine Learning and Program Synthesis for low-code/no-code scenarios; Behavioural Analysis of Large Language Models (LLMs) for programming tasks.

Facebook

May 2020 - August 2020

Ph.D. Research Intern

Team: Novi Engineering (Research)

Mentor: Shaz Qadeer

Topic: Verification; Quantifier instantiation and its ramifications for proof engineering.

Service

Academic Service

- Subreviewer, PLDI 2024
- Organizer, Formal Methods Seminar, UIUC. Fall 2023
- Subreviewer, CONCUR 2023
- Organizer, Formal Methods Seminar, UIUC. Spring 2023
- Subreviewer, ICALP 2023
- Subreviewer, LICS 2022
- Artifact Evaluation Committee, PLDI 2022
- Artifact Evaluation Committee, POPL 2022
- Co-Editor for Dagstuhl Seminar on Logic and Learning (<https://drops.dagstuhl.de/opus/volltexte/2020/11842/>)
- Chair of departmental student committee on instruction and curriculum, Department of Mathematics, BITS-Pilani Hyderabad AY 2015-16

Administrative Services

- Student Volunteer, SPLASH 2023
- Student Volunteer, PLDI 2023
- Student Volunteer, IJCAI 2022
- Student Volunteer, POPL 2022
- Student Volunteer, POPL 2020

Awards

- SIGPLAN PAC grant for PLDI 2023
- UIUC Graduate College Travel Grant, Spring 2020
- SIGPLAN PAC grant for POPL 2020
- Ray Ozzie CS Fellowship, UIUC, 2018
- Gold medalist, BITS-Pilani Hyderabad, Batch of 2017
- BITS-Pilani Hyderabad, India, Academic Merit Scholarship, 2012-2017
- INSPIRE Scholarship for top 1% of undergraduates in India 2012-2016