Debasmita Lohar

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Research Interests

Formal Methods	Program Analysis, Abstract Interpretation, Model Checking
Approximate Computing	Finite-Precision Analysis and Optimization
Software Testing	Fuzzing Techniques

Education

2017 – 2023 **Ph.D., Saarland University, MPI-SWS**, Saarbrücken, Germany
Thesis: *Expanding the Horizons of Finite-Precision Analysis*
Advisor: Assoc. Prof. Dr. Eva Darulova

2014 – 2017 **M.S. by Research (GPA: 9.47/10.0), Indian Institute of Technology Kharagpur**, India
Thesis: *Formal Methods for Probabilistic Failure Analysis of Behavioral Specifications*
Advisor: Dr. Soumyajit Dey

2009 – 2013 **B.Tech. (GPA: 8.45/10.0), Heritage Institute of Technology**, Kolkata, India

Work Experience

April 2024 – Ongoing **Postdoctoral Researcher, KASTEL**, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany
Group: *Application-oriented Formal Verification* led by *Prof. Dr. Bernhard Beckert*

July 2022 – Oct 2022 **Research Intern, Microsoft Research**, Bangalore, India
Project: *Synthesizing Data Privacy Attacks on Neural Networks*
Advisors: Dr. Akash Lal, Dr. Satya Lokam, and Dr. Rahul Sharma

May 2019 – Jul 2019 **SDE Intern, Amazon Web Services (AWS)**, Boston, USA
Project: *Memory Safety verification of Communication Protocols* (blog post)
Advisor: Dr. Mark R. Tuttle

Jul 2016 – Sept 2016 **Visiting Scholar, MPI-SWS**, Saarbrücken, Germany
Project: *Verification of Programs with Probabilistic Inputs*
Advisor: Dr. Eva Darulova

Feb 2016 – May 2016 **Research Consultant, IIT**, Kharagpur, India
Project: *RTOS Validation Development Support* led by *Prof. Dr. Pallab Dasgupta*
Sponsor: Hindustan Aeronautics Limited

Sept 2013 – Jan 2016 **Research Consultant, IIT**, Kharagpur, India
Project: *Architectural and Algorithmic Optimizations for speech-based Communication Interfaces on Mobile Devices* led by *Dr. Soumyajit Dey*
Sponsor: Intel Semiconductor (US) Limited

Publications

Journal Articles

1. **Lohar**, **D.**, Jeangoudoux, C., Volkova, A., & Darulova, E. (2023). Sound mixed fixed-point quantization of neural networks. *ACM Transactions on Embedded Computing Systems (TECS)*.

2. **Lohar**, **D.**, Darulova, E., Putot, S., & Goubault, E. (2018). Discrete choice in the presence of numerical uncertainties. *International Conference on Embedded Software (EMSOFT) and IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)*.

Conference/Workshop Proceedings

1. **Lohar**, **D.**, Jeangoudoux, C., Sobel, J., Darulova, E., & Christakis, M. (2021). A two-phase approach for conditional floating-point verification. In *International conference on tools and algorithms for the construction and analysis of systems (TACAS)*.
2. **Lohar**, **D.**, Prokop, M., & Darulova, E. (2019). Sound probabilistic numerical error analysis. In *International conference on integrated formal methods (IFM)*.
3. Ghosh, S. K., **Lohar**, **D.**, Das, D., & Dey, S. (2017). Verifying stability guarantees of control software implementations in the presence of sensor level faults: Work-in-progress. In *International conference on embedded software (EMSOFT) companion*.
4. **Lohar**, **D.**, Dunaboyina, A., Das, D., & Dey, S. (2016). Failure estimation of behavioral specifications. In *International symposium on dependable software engineering: Theories, tools, and applications (SETTA)*.
5. **Lohar**, **D.**, & Dey, S. (2015). Integrating formal methods with testing for reliability estimation of component based systems. In *International symposium on software reliability engineering (ISSRE) workshops*.

Open Source Contributions

Aster	A mixed fixed-point quantizer for neural networks
Blossom	A framework for fuzzing numerical programs
Amazon FreeRTOS	IoT operating system for microcontroller
Daisy	A framework for accuracy analysis and synthesis of numerical programs
ProPFA	Probabilistic Path-based Failure Analyzer

Invited Talks

2024	**Sound Mixed Fixed-Point Quantization of Neural Networks**, FPTalks (virtual) (upcoming)
2023	**Making Finite-Precision Analysis Practical**, HLF, Heidelberg, Germany
2022	**Expanding the Horizons of Finite-Precision Analysis**, Microsoft Research, Bangalore, India
2021	**A Two-Phase Approach for Conditional Floating-Point Verification**, FPTalks (virtual)

Mentoring Experience

Jun 2021 – Jun 2022	**SIGPLAN Long-Term Mentor**, Saarbrücken, Germany Mentee: Mugdha Khedkar, Paderborn University
May 2021 – Jul 2021	**MPI-SWS Internship (Co-advisor)**, Saarbrücken, Germany Project: *Probabilistic Analysis of Large Floating-Point Programs* Student: Jai Arora, IIT Delhi
May 2020 – Jul 2020	**MPI-SWS Internship (Co-advisor)**, Saarbrücken, Germany Project: *Automatic Verification of Floating-point Rust programs* Student: Joshua Sobel, University of Rochester
Jun. 2018 – Aug. 2018	**DAAD Rise (Advisor)**, Saarbrücken, Germany Project: *Verifying Floating-Point Computations in Embedded Systems* Student: Milos Prokop, University of Edinburgh
2016	**B.Tech Thesis (Co-advisor)**, Kharagpur, India Project: *Implementation of a Tool for Probabilistic Failure Analysis* Student: Anudeep Dunaboyina, IIT Kharagpur

Teaching Assistance

- **Advanced Program Analysis (Block-seminar)**, Saarland University, March 2019
- **Program Analysis** (WS18/19), Saarland University
- **Fault Tolerant Systems** (Spring 2016, 2015, 2014), IIT Kharagpur
- **Theory of Computation** (Fall 2015), IIT Kharagpur
- **Computer Organization and Architecture Lab** (Fall 2014), IIT Kharagpur

Services

Academic Activities

Program Committee	SETTA'24
Artifact Evaluation	CAV'23, TACAS'22, CAV'21, TACAS'21
WIP Committee	EMSOFT'19
Full Paper Subreview	FM'24, DATE'24, VLSI-D'16

Miscellaneous

2021	1. Student Election Committee Member of MPI-SWS 2. Admissions Committee Member of International Max Planck Research School on Trustworthy Computing (IMPRS-TRUST) 3. Invited to Dagstuhl Seminar on Approximate Systems (21302) 4. Participated in Grace Hopper Celebration EMEA (virtual) 5. Participated in Google's Women's Day Celebration (virtual) 6. Organizing Committee Member of Girl's Day at MPI-SWS
2015	Participated in Grace Hopper Celebration India
2014	Organizing Committee Member of Formal Methods Update Meeting, India

Skills

Coding	Scala, C, Java, HTML, CSS, Shell Scripts
Software Packages	Astrée, CBMC, Z3, KLEE, Frama-C, LattE, Vivado Design Suite

Achievements

- Selected to participate in the **Marktoberdorf Summer School**, 2023
- Selected to participate in the 10th **Heidelberg Laureate Forum**, 2023
- Invited to **(virtual) Grace Hopper Celebration EMEA**, 2021
- Won the **Best Presentation Award** at iFM PhD Symposium, 2019
- Invited to **Google's 6th Compiler and Programming Language Summit**, 2018
- Recipient of the **Max Planck Fellowship** for a wholly funded 3 months Internship (Jul. - Sept. 2016) at MPI-SWS, Saarbrücken, Germany
- Recipient of **Student Scholarship** in Grace Hopper Celebration, India, 2015
- Qualified in Graduate Aptitude Test in Engineering (GATE) with 99.55 percentile, India, 2013