Shromona Ghosh

CONTACT INFORMATION

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RESEARCH INTERESTS

My research lies at the intersection of Machine Learning, Control Theory and Robotics; and Formal Methods. I am particularly interested in

- Developing formal analysis tools for robotic systems with ML components such as perception, learning-based control;
- Developing data-efficient techniques that combine control theory and formal methods to improve overall system performance and safety

EDUCATION

University of California, Berkeley 2013 - present
PhD in Electrical Engineering and Computer Sciences
Advised by Prof. Sanjit A. Seshia and Prof. Alberto Sangiovanni-Vincentelli
Thesis co-advised by Prof. Claire Tomlin
CGPA : 3.96/4.0
Minors: Control Theory and Statistics

National Institute of Technology Karnataka, Surathkal 2009 - 2013
BTech. in Electronics and Communication Engineering
CGPA : 9.44/10

INDUSTRIAL INTERNSHIPS

SRI, Menlo Park May-August 2018
Research Intern
Advised by: Susmit Jha and Nataranjan Shankar
Developing an hierarchical safe-control technique with a high level motion planner, synthesized from high level safety specification; and a robust low level motion primitive, that handles model-system mismatch.

Microsoft AI Research Lab, Redmond May-August 2017
Research Intern
Advised by: Ashish Kapoor, Gireeja Ranade and Shaz Qadeer
Developed an active-learning based adversarial example generator for verifying complex robotic systems in simulation. The tool has been integrated with many simulators like OpenAI Gym, AirSim and Webots.

Cadence Design Systems, San Jose June-September 2014
Software Intern
Updates the Cadence Design work-flow to include a functional mapper from the reduced logic to gates. The functional mapper is hash table mapping canonical truth tables to minimal gate logic.

Texas Instruments, Bangalore, India May - July 2012
Digital Design Intern
Developed a novel time-efficient and data-efficient Scan Compression Architecture for efficiently testing digital circuits with minimal resource overhead.

SKILLS

Programming Languages: Python, C++
Simulation Environments: MATLAB, Webots, OpenAI Gym, OpenAI Baselines

SELECTED AWARDS

- **SanDisk Fellowship**, Department of EECS, UC Berkeley, 2013-2014.
- **Best All Round Talented Outgoing Student** , National Institute of Technology Karnataka, 2013.

Conference Publications

VERIFAI: A Toolkit for the Design and Analysis of Artificial Intelligence-Based Systems
Tommaso Dreossi*, Daniel Freemont*, *Shromona Ghosh**, Edward Kim, Hadi Ravanbaksh, Marcell Vazquez-Chanlatte, Sanjit A. Seshia
International Conference on Computer-Aided Verification (CAV) 2019 (submitted)

SOTER: Programming Safe Robotics System using Runtime Assurance
Ankush Desai, *Shromona Ghosh*, Sanjit A. Seshia, Natarajan Shankar, Ashish Tiwari
IEEE/IFIP International Conference on Dependable Systems and Networks (DSN) 2019 (submitted)

A New Simulation Metric to Determine Safe Environments and Controllers for Systems with Unknown Dynamics
*Shromona Ghosh**, Somil Bansal*, Alberto Sangiovanni Vincentelli, Sanjit A. Seshia, Claire J. Tomlin
ACM International Conference on Hybrid Systems Computation and Control (HSCC), 2019

Scenic: A Language for Scenario Specification and Scene Generation
Daniel J. Freemont, Tommaso Dreossi, *Shromona Ghosh*, Xiangyu Yue, Alberto Sangiovanni-Vincentelli, Sanjit A. Seshia
ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI), 2019

Bridging Hamilton-Jacobi Safety Analysis and Reinforcement Learning
Jaime F. Fisac, Neil F. Lugovoy, Vicenç Rubies Royo, *Shromona Ghosh*, Claire J. Tomlin
International Conference on Robotics and Automation (ICRA), 2019

Verifying Controllers Against Adversarial Examples with Bayesian Optimization
Shromona Ghosh, Felix Berkenkamp, Gireeja Ranade, Shaz Qadeer, Ashish Kapoor
International Conference on Robotics and Automation (ICRA), 2018

Formal Specification for Deep Neural Networks
Sanjit A. Seshia, Ankush Desai, Tommaso Dreossi, Daniel J. Fremont, *Shromona Ghosh*, Edward Kim, Sumukh Shivakumar, Marcell Vazquez-Chanlatte, Xiangyu Yue
International Symposium on Automated Technology for Verification and Analysis (ATVA), 2018 (invited paper)

Counterexample-Guided Data Augmentation
Tommaso Dreossi, *Shromona Ghosh*, Xiangyu Yue, Kurt Keutzer, Alberto Sangiovanni-Vincentelli, Sanjit A. Seshia
International Joint Conference on Artificial Intelligence (IJCAI), 2018

Time Series Learning using Monotonic Logical Properties
Marcell Vazquez-Chanlatte, *Shromona Ghosh*, Jyotirmoy Deshmukh, Alberto Sangiovanni-Vincentelli, Sanjit A. Seshia
International Conference on Runtime Verification (RV), 2018

Generating Dominant Strategies for Continuous Two-Player Zero-Sum Games
Marcell Vazquez-Chanlatte, *Shromona Ghosh*, Alberto Sangiovanni-Vincentelli, Sanjit A. Seshia
IFAC Conference on Analysis and Design of Hybrid Systems (ADHS), 2018

Diagnosis and Repair for Synthesis from Signal Temporal Logic Specifications
Shromona Ghosh, Dorsa Sadigh, Pierluigi Nuzzo, Vasumathi Raman, Alexandre Donze, Alberto Sangiovanni-Vincentelli, S. Shankar Sastry, Sanjit A. Seshia
ACM International Conference on Hybrid Systems Computation and Control (HSCC), 2016

Robust Online Monitoring of Signal Temporal Logic
Jyotirmoy V. Deshmukh, Alexandre Donz, *Shromona Ghosh*, Xiaoqing Jin, Garvit Juniwal, Sanjit A. Seshia
International Conference on Runtime Verification (RV), 2015
Best Paper Award

Journal Publications

A Minimum Discounted Reward Hamilton-Jacobi Formulation for Computing Reachable Sets
Anayo K. Akametalu, *Shromona Ghosh*, Jaime F. Fisac, Claire J. Tomlin
IEEE Transactions on Automatic Control (TAC), 2019 (submitted)

Robust Online Monitoring of Signal Temporal Logic
Jyotirmoy V. Deshmukh, Alexandre Donz, *Shromona Ghosh*, Xiaoqing Jin, Garvit Juniwal, Sanjit A. Seshia
Formal Methods in System Design (FMSD), 2017

Workshop Publications

A Formalization of Robustness for Deep Neural Networks
Tommaso Dreossi*, *Shromona Ghosh**, Alberto Sangiovanni-Vincentelli, Sanjit A. Seshia
Verification of Neural Networks (VNN) Workshop at
Association for the Advancement of Artificial Intelligence (AAAI), 2019

Systematic Testing of Convolutional Neural Networks for Autonomous Driving
Tommaso Dreossi*, *Shromona Ghosh**, Alberto Sangiovanni-Vincentelli, Sanjit A. Seshia
Reliable Machine Learning in the Wild (RMLW) Workshop at
International Conference on Machine Learnin (ICML), 2017

Industrial Publications

SmartScan + OPMISR: A Novel Scan Compression Architecture for Multi-Site Testing
Rubin Parekhji, Ramesh Chandal, *Shromona Ghosh*, Ramesh Suthapalli, G. Swathi, Deepak Gaur
Cadence (CDN) Live Conference 2012
Best Paper Award in Digital Front End Track

Program Committee Member

1. **Monitoring and Testing of Cyber-Physical Systems** at Cyber-Physical Week, 2019
2. **ACM International Conference on Hybrid Systems Computation and Control (HSCC) Repeatability Evaluation (RE)** at Cyber-Physical Week, 2019
3. **ACM International Conference on Hybrid Systems Computation and Control (HSCC) Repeatability Evaluation (RE)** at Cyber-Physical Week, 2018

Peer Reviewing

1. **International Conference on Robotics and Automation (ICRA)**, 2019
2. **ACM International Conference on Hybrid Systems Computation and Control (HSCC)** 2019
3. **International Conference on Robotics and Automation (ICRA)**, 2018
4. **International Conference on Computer-Aided Verification (CAV)**, 2018
5. **ACM International Conference on Hybrid Systems Computation and Control (HSCC)** 2018

Teaching Experience

EECS 149: Introduction to Embedded System UC Berkeley, Fall 2018
Graduate Student Instructor

EECS 249A: Embedded System Design: Modeling, Analysis, and Synthesis UC Berkeley, Spring 2016
Graduate Student Instructor