SHREYAS RAMAKRISHNA

Senior Architect, System Safety Engineer · NVIDIA

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EDUCATION

Vanderbilt University *Nashville, TN*
Ph.D. in Electrical Engineering *Aug 2022*
Dissertation: Dynamic Safety Assurance of Autonomous Cyber-Physical Systems
Advisor: Dr. Abhishek Dubey - Assistant Professor, Electrical Engineering and Computer Science

Technical University Kaiserslautern *Kaiserslautern, Germany*
Masters in Electrical Engineering and Information Technology *June 2015*
Dissertation: Estimation of Processor and Software Power Consumption at Runtime
Advisor: Dr. Christoph Grimm - Professor, Computer Science

BNM Institute of Technology (BNMIT) *Bangalore, India*
Bachelor of Electronics and Communication Engineering *July 2012*
Thesis: Hardware realization of shadow detection algorithm in FPGA
Advisor: Prabhavathi P - Associate Professor, Electronics and Communication Engineering

WORK EXPERIENCE

NVIDIA (nvidia.com) Santa Clara, CA
Senior Architect, System Safety Engineer *Aug 2022 – Present*

- My work includes applying phase 4 of the ISO 26262 automotive standard for safety certification of software and hardware that goes onto an autonomous vehicle.
- My responsibility includes modeling stakeholder's requirements and designing SysML models linking these requirements to different hardware and software components.
- I am also responsible for analyzing the hardware and software failures using specialized methods such as Failure Mode and Effect Analysis and Fault Tree Analysis.
- I am also involved in requirement reviews of the other software and hardware teams.

Professional Service Online
Academic Reviewer *June 2022 – Present*

- Involved in reviewing academic journals for publishers such as Elsevier, Society of Automotive Engineers (SAE), and Prognostics and Health Management (PHM) Society.
- I am responsible for providing feedback on the latest research manuscripts in the areas of Artificial Intelligence, System safety and reliability, Automotive and Autonomous Vehicles.

ScopeLab, Institute of Software Integrated Systems (scopelab.ai) Nashville, TN
Graduate Research Assistant (DARPA Assured Autonomy Project) *Jan 2019 – July 2022*

- Research work focuses on dynamic safety assurance and testing of machine learning enabled autonomous vehicles.
- Developed a risk assessment framework for operational risk assessment of an autonomous system.
- Developed several machine learning based controllers for regression and classification tasks, anomaly detectors for 1/10 scale autonomous race cars, autonomous vehicles in CARLA simulation, and real-world datasets like nuScenes.
- Developed a framework to efficiently and automatically generate test cases for testing autonomous driving pipelines.

Siemens Corporation, Technology Princeton, NJ
Research Intern (DARPA ARCOS Project) *May 2021 – Aug 2021*

- Research focused on automating safety case development for automotive certification in alliance with ISO26262.
- Reduced assurance case development time by 14% by automating the assurance pattern selection process.

Apsis Solutions Bangalore, India
Embedded Design Engineer *Sep 2015 – May 2017*

- Involved in creating requirement and specification documents for several military and commercial products.
- Developed software for products with embedded platforms like PIC, ARM, and Raspberry Pi.

TEACHING EXPERIENCE

Electrical Engineering and Computer Science Department, Vanderbilt University Nashville, TN
Graduate Teaching Assistant *Aug 2017 – Dec 2018*

- Teaching assistant for several courses, including Introduction to Computer Engineering, Operating System, and Resilient Distributed System.
- Assisted professors in creating course content, grading, and holding office hours to help students.

RESEARCH PROJECTS

Runtime Safety Assurance of Autonomous Systems

- Developed the workflow for automating assurance case development. (Assurance Case Workflow)
- Developed the ReSonAte framework for dynamic risk assessment of autonomous systems. (ReSonAte)
- Developed a Variational Autoencoder based anomaly detector for machine learning models. (β-VAE Detector)
- Developed an adversarial testing framework for efficiently testing autonomous driving pipelines. (AV Testing)

DeepNNCar Autonomous Vehicle Research Testbed (DeepNNCar)

- Developed a 1/10 autonomous vehicle testbed with a camera and Lidar to design and test machine learning based driving pipelines.

SKILLS

Programming	Python (proficient), C (familiar), C++ (prior experience)
Machine learning	Keras, TensorFlow, Numpy, Scikit-learn, Pandas
Cloud & Database	AWS, InfluxDB, MongoDB (prior experience)
Hardware Platforms	NVIDIA Jetson, Raspberry Pi, PIC, ARM Cortex M3
Tools & Editors	Docker, Jupyter, Conda, Git, Latex, Microsoft Office
Operating Systems	Windows, Linux, Robotics Operating System (ROS)
Languages	English (proficient), German (Limited working proficiency)

ACHIEVEMENTS

- Publication "Augmenting Learning Components for Safety in Resource Constrained Autonomous Robots." nominated for best paper at ISORC 2019.
- Awarded tuition scholarship for undergraduate studies by the Ministry of HRD, Govt. of India.

RESEARCH PUBLICATIONS

Journal Articles

J1 **Shreyas Ramakrishna**, Zahra Rahiminasab, Gabor Karsai, Arvind Easwaran, and Abhishek Dubey. "Efficient Out-of-Distribution Detection Using Latent Space of β-VAE for Cyber-Physical Systems." In Transactions on Cyber-Physical Systems (TCPS), 2021.

J2 **Shreyas Ramakrishna**, Charles Hartsell, Matthew P. Burruss, Gabor Karsai, and Abhishek Dubey. "Dynamic-weighted simplex strategy for learning enabled cyber physical systems." In the Journal of systems architecture 111 (2020): 101760.

Conference Proceedings Papers

C1 **Shreyas Ramakrishna**, Hyunjee Jin, Abhishek Dubey, and Arun Ramamurthy. "Automating Pattern Selection for Assurance Case Development of Cyber-Physical Systems", In the 41st international conference on Computer Safety, Reliability and Security (SAFECOMP), 2022.

C2 **Shreyas Ramakrishna**[1], Baiting Luo[1], Christopher Kuhn, Gabor Karsai, and Abhishek Dubey. "ANTI-CARLA: An Adversarial Testing Framework for Autonomous Vehicles in CARLA" In the 2022 IEEE Intelligent Transportation Systems Society Conference Management System (ITSC).

C3 **Shreyas Ramakrishna**, Baiting Luo, Yogesh Barve, Gabor Karsai, and Abhishek Dubey. "Risk-Aware Scene Sampling for Dynamic Assurance of Autonomous Systems." In IEEE International Conference on Assured Autonomy (ICAA), IEEE, 2021.

C4 Charles Hartsell[1], **Shreyas Ramakrishna**[1], Abhishek Dubey, Daniel Stojcsics, Nagabhushan Mahadevan, and Gabor Karsai. "ReSonAte: A Runtime Risk Assessment Framework for Autonomous Systems." In Symposium on Software Engineering for Adaptive and Self-Managing Systems (SEAMS), pp. 118-129. IEEE, 2021.

C5 Matthew Burruss, **Shreyas Ramakrishna**, and Abhishek Dubey. "Deep-RBF Networks for Anomaly Detection in Automotive Cyber-Physical Systems." In IEEE International Conference on Smart Computing (SMARTCOMP), pp. 55-60. IEEE, 2021.

C6 Vijaya Kumar Sundar[1], **Shreyas Ramakrishna**[1], Zahra Rahiminasab, Arvind Easwaran, and Abhishek Dubey. "Out-of-distribution detection in multi-label datasets using latent space of β-VAE." In IEEE Security and Privacy Workshops (SPW), pp. 250-255. IEEE, 2020.

C7 **Shreyas Ramakrishna**, Charles Hartsell, Abhishek Dubey, Partha Pal, and Gabor Karsai. "A Methodology for Automating Assurance Case Generation." In Tools and Methods of Competitive Engineering (TMCE), pp. 265-278. 2020.

C8 **Shreyas Ramakrishna**, Abhishek Dubey, Matthew P. Burruss, Charles Hartsell, Nagabhushan Mahadevan, Saideep Nannapaneni, Aron Laszka, and Gabor Karsai. "Augmenting learning components for safety in resource constrained autonomous robots." In 2019 IEEE 22nd International Symposium on Real-Time Distributed Computing (ISORC), pp. 108-117. IEEE, 2019.

C9 Charles Hartsell, Nagabhushan Mahadevan, **Shreyas Ramakrishna**, Abhishek Dubey, Theodore Bapty, Taylor Johnson, Xenofon Koutsoukos, Janos Sztipanovits, and Gabor Karsai. "Model-based design for cps with learning-enabled components." In Proceedings of the Workshop on Design Automation for CPS and IoT, pp. 1-9. 2019.

C10 Charles Hartsell, Nagabhushan Mahadevan, **Shreyas Ramakrishna**, Abhishek Dubey, Theodore Bapty, Taylor Johnson, Xenofon Koutsoukos, Janos Sztipanovits, and Gabor Karsai. "CPS Design with Learning-Enabled Components: A Case Study." In Proceedings of the 30th International Workshop on Rapid System Prototyping (RSP'19), pp. 57-63. 2019.

Poster and Work in Progress Presentations

W1 **Shreyas Ramakrishna**[1], Zahra Rahiminasab[1], Arvind Easwaran, and Abhishek Dubey. "Efficient Multi-Class Out-of-Distribution Reasoning for Perception Based Networks: Work-in-Progress." In 2020 International Conference on Embedded Software (EMSOFT), pp. 40-42. IEEE, 2020.

W2 Matthew P. Burruss, **Shreyas Ramakrishna**, Gabor Karsai, and Abhishek Dubey. "Deepnncar: A testbed for deploying and testing middleware frameworks for autonomous robots." In 2019 IEEE 22nd International Symposium on Real-Time Distributed Computing (ISORC), pp. 87-88. IEEE, 2019.

W3 Charles Hartsell, Nagabhushan Mahadevan, **Shreyas Ramakrishna**, Abhishek Dubey, Theodore Bapty, and Gabor Karsai. "A CPS toolchain for learning-based systems: demo abstract." In Proceedings of the 10th ACM/IEEE International Conference on Cyber-Physical Systems, pp. 342-343. 2019.

[1]These authors have contributed equally