Ameya Salvi

PhD Student · Automotive Engineering

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Education

Clemson University *Greenville, SC*

PhD Automotive Engineering *2020 - present*

- Thesis: Learning enhanced system identification and control for skid-steered wheel mobile robots

Clemson University *Clemson, SC*

MS Mechanical Engineering *2018 - 2020*

- Professional experience and coursework related to modelling and control of dynamical systems

Mumbai University *Mumbai, India*

BS Mechanical Engineering *2013 - 2017*

- Projects and coursework in design, thermal and manufacturing engineering

Research Interests

Learning for modeling and control of mobility systems; Applied deep reinforcement learning for mechanical systems; Sensor enhanced off-road autonomous navigation; Vision based control for wheel mobile robots.

Research and Work Experience

Clemson Universtiy

VIPR-GS Clemson, Deep Reinforcement Learning for CPS *Greenville, SC*

Graduate Research Assistant *2020 - 2023*

- Investigated learning based methods for modeling, planning and control for off-road autonomous driving tasks and developed deep reinforcement learning based control policies for vertical stabilization and lateral control for small and mid-scale wheel mobile robots.
- Developed ROS-containerized tools for real-time deployment and experimental evaluation of learned controllers for performance synthesis on mildly off-road environments.
- Coordinated interdisciplinary research groups specializing in perception, planning and controls for a holistic deployment using in-house and off-the-shelf autonomy software stacks.

VIPR-GS Clemson, Virtual Sensor Reconstruction *Greenville, SC*

Graduate Research Assistant *2023 - present*

- Investigated contemporary simulators (NVIDIA ISAAC Sim) as a digital twinning ecosystem for vision enhanced off-road autonomy workflows.
- Developed physics informed learning frameworks (model free deep reinforcement learning) for skid-steer lane following on sparse perception features with network induced dropouts.
- Supported visual-inertial data collection and control policy validation on robotic platforms across the project group for cross-domain research.

ARMLab, Clemson Automotive Engineering *Greenville, SC*

Graduate Research Assistant *2020 - present*

- Investigated learning based control methods for articulated robotics systems like redundant cable driven parallel robots (rCDPRs) and robotic arms.
- Advised micro-project groups for developing tools for autonomy research like HPC enabled simulators and ROS code generation.
- Provided logistical and technical support for various robot platforms and numerous small-, mid- and full-scale vehicles for autonomy research.

Industry

Proterra *Greenville, SC*

Summer Intern, Thermal Engineering *Summer 2019*

- Assited mechanical design and development of auxiliary heating and HVAC systems for different EV product versions.
- Supported onboard diagnostics and troubleshooting with CAN Trace analysis using NEXQIC OBD tools & PCAN Explorer.
- Designed test bench for performance testing of electric heaters for auxiliary heating for various energy cycles.

Zeuva Technologies *Mumbai, India*

Mechanical Engineer *2017 - 2018*

- Developed mathematical models for Li-ion battery pack for electric motorcycles using for investigating thermal runaway.
- Assisted electrical team to develop packaging solutions for all the electro-mechanical products to achieve IP68.
- Analyzed the impact of thermo-electrics as a temperature regulation solution for EV battery packs.

Teaching Experience

Courses

Clemson University, Automotive Engineering

Graduate Teaching Assistant, Autonomy Science and Systems *Spring 2022*

- Assist with curating and delivering labs for graduate level robotics course offered by Dr. Venkat Krovi.
- Set and grade student course assignments for topics ranging in robot perception, SLAM, motion planning and control.
- Provide office and recitation hours for student support (both theory and practicals).

Clemson University, Mechanical Engineering

Graduate Grading Assistant, Modeling and Analysis of Dynamical Systems *Spring 2019*

- Assist with assignment grading for undegraduate dynmaics course offered by Dr. Phanindra Tallapragda.
- Course covered junior level concepts for modeling dynmaical systems with focus on mechanical systems.

Research Mentoring

Graduate level

AWS Deepracer league *Fall 2021*

- Advised group of three students for competing in the virtual AWS Deepracer league for racing scaled vehicle with deep reinforcment learning based control.

Mathworks ROS Code generation *Spring 2022*

- Supported two students for exploring Mathworks-ROS toolchain for generating and deploying ROS code for turtlebots.

Containerized simulation with HPC *2022-present*

- Advised two students for leveraging ROS enabled docker containers for running compute heavy multi-body dynamics simulators on Palmetto Cluster (Clemson's super-compute cluster).

High-school/ Undergraduate level

Governors school for science and math, Intern *Summer 2022*

- Advised high-school summer intern for exploring basics of design and development of robotic systems.

Publications

Published

Salvi, A., Buzhardt, J., Tallapragada, P., Krovi, V., Smereka, J.M., Brudnak, M. 2022. Virtual Evaluation of Deep Learning Techniques for Vision-Based Trajectory Tracking. SAE International Journal of Advances and Current Practices in Mobility, 2022-01-0369: 326-334

Salvi, A., Coleman, J., Buzhardt, J., Krovi, V., Tallapragada, P. 2022. Stabilization of Vertical Motion of a Vehicle on Bumpy Terrain using Deep Reinforcement Learning. 2022 Modeling, Estimation and Controls Conference.

Raman, A.,**Salvi, A.**, Schmid, M., Krovi, V. 2023. Reinforcement Learning Control of a Reconfigurable Planar Cable Driven Parallel Manipulator. 2023 International Conference on Robotics and Automation (ICRA).

Salvi, A., Buzhardt, J., Tallapragada, P., Krovi, V., Brudnak, M., Smereka, J.M. 2021. Deep Reinforcement Learning for Simultaneous Path Planning and stabilization of Off-road Vehicles. 2021 NDIA Ground Vehicles System Engineering and Technology Symposium.

Jadhav, S.D., **Salvi, A.**, Kosaraju, K.C, Smereka, J., Brudnak, M., Krovi, V., Gorsich, D. 2023. Containerization Approach for High-Fidelity Terramechanics Simulations. 2023 WCX SAE World Congress Experience.

In Review

Mehta, D., **Salvi, A.**, Krovi, V. 2024. Rough Terrain Path Tracking of an Ackermann Steered Platform using Hybrid Deep Reinforcement Learning. 2024 IEEE/ASME International Conference on Advanced Intelligent Mechatronics(Accepted).

Presentations

Invited Talks

Spring 2023. *Opportunities and Challenges in Robot Autonomy*. Invited talk: MCT's RGIT, Mumbai, India (Webinar)

Contributed Presentations

Salvi, A. 2024. Applied Reinforcement Learning for Autonomous Systems. Departmental seminar: Clemson University Department of Automotive Engineering, Greenville, South Carolina.

Salvi, A., Krovi,V. 2022. Virtual Evaluation of Deep Learning Techniques for Vision-Based Trajectory Tracking. Oral presentation: 2022 SAE WCX, Detroit, Michigan.

Salvi, A., Coleman, J., Buzhardt, J., Krovi,V., Tallapragada, P. 2022. Stabilization of Vertical Motion of a Vehicle on Bumpy Terrain using Deep Reinforcement Learning. Oral presentation: 2022 Modeling, Estimation and Controls Conference, New Jersey.

Salvi, A., Jadhav, S., Krovi,V. 2023. Containerization Approach for High-Fidelity Terramechanics Simulations. Oral presentation: 2023 SAE WCX, Detroit, Michigan.

Outreach & Professional Development

Service and Outreach

2023-2024 **Society of Doctoral Students in Automotive Engineering (SDSAE)**, Treasurer

Peer Review

2023 International Conference on Robotics and Automation (ICRA).

Professional Memberships

IEEE Robotics and Automation Society (IEEE RAS).

Skills

Programming	Matlab, Python, C++
Learning packages	StableBaselines3, PyTorch, Tensorflow
Robot softwares	ROS, ROS2, Docker, Gazebo, CoppeliaSim, ISAAC Sim