Shreeram Murali

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Education

2025–present — **Doctor of Philosophy, Ph.D.**, *Aalto University*, Finland.
Affiliated to the *Finnish Center of Artificial Intelligence*
Supervisor: Prof. Dominik Baumann
Co-advisor: Prof. Shankar A. Deka

2023–2025 — **M.Sc. in Electrical Engineering**, *Aalto University*, Finland.
Major: Control, Robotics, and Autonomous Systems
Minor: Computer Science
GPA: 4.67/5.0
Thesis: "Learning Computationally Lightweight Classifiers with Uncertainty Quantification," 2025.
Advisor: Prof. Dominik Baumann
Awards:
- Aalto University Scholarship (Category A, 100%)
- Dean's Incentive Scholarship

2017–2021 — **B.Eng. in Mechanical Engineering**, *Ramaiah Institute of Technology*, India.
GPA: 9.37/10.0
Awards and Honours:
- Graduated First Class with Distinction
- Best Achiever Award, outgoing class of 2021

Experience

Research

9/2025–present — **Doctoral Researcher**, *Aalto University and Finnish Center of Artificial Intelligence*, Espoo, Finland.
Cyber-physical Systems Group, Prof. Dominik Baumann
Towards efficient, safe, and scalable machine learning with nonparmetric methods.

6/2024–11/2024 — **Research Assistant**, *Aalto University*, Espoo, Finland.
Cyber-physical Systems Group, Prof. Dominik Baumann
full-time from 6–8 2024 (3 months); part-time from 9–11/2024 (3 months)
The goal of my research here was to learn a reward transformation that mitigates the effect of low-probability, high-impact scenarios reinforcement learning agents might experience. One way would be to leverage the Koopman operator to learn a transformation that renders rewards ergodic.
Contributions
- Explored RL environments and other dynamical systems potentially exhibiting non-ergodic behaviour.
- Trained Koopman operators on such systems to learn utility functions that can act as reward transformations.

11/2023–5/2024 — Sensor Informatics and Medical Technology Group, Prof. Simo Särkkä
part-time (7 months)
Worked on modelling, simulation, and control of a rotary-inverted pendulum. I wrote a package that simulated and implemented control algorithms (PID, LQR, swing-up control) and handled high-frequency real-time data acquisition and control at 1000Hz. Furthermore, these packages utilised JAX for optimized and accelerated numerical computations.

8/2021–7/2023 — **Junior Research Fellow**, *Indian Institute of Science*, India.
Data, Control, and Autonomous Systems Lab, Prof. Jishnu Keshavan
My main focus at DACAS was to explore how visual information can enable mobile robots to perform autonomous behaviours. I learned about various control methods that depend on vision, such as nonlinear and data-driven approaches, with a focus on adaptability, guarantees, and reduced computational overload. Some of the projects I participated in were: (a) coordinating the movements of ground vehicles using vision-based nonlinear control, (b) guiding quadrotors to land safely using optical flow, (c) identifying the dynamics of complex systems using Koopman autoencoders.

Teaching

2/2025–present — **Teaching Assistant**, *Aalto University*, Finland.
- For the graduate-level course **ELEC-E8121 Networked Control of Multi-agent Systems** taught by Prof. Dominik Baumann.

9/2024- ○ For the graduate-level course **ELEC-E8740 Basics of Sensor Fusion** taught by Prof. Simo Särkkä.
12/2024

Publications

2025 [**C2***] **Murali, S.**, Rojas, R. C., Baumann, D., "Computationally Efficient Classifiers with Frequentist Bounds on Prediction Errors," submitted, 2025.

2023 [**J1**] Keshavan, J., Belgaonkar, S., **Murali, S.**, "Adaptive Control of a Constrained First Order Sliding Mode for Visual Formation Convergence Applications," in IEEE Access, vol. 11, pp. 112263-112275, 2023.
doi: 10.1109/ACCESS.2023.3323896

[**C1**] Singhal, S., Keshavan, J., **Murali, S.**, "Constant Optical Flow Divergence based Robust Adaptive Control Strategy for Autonomous Vertical Landing of Quadrotors," AIAA SCITECH 2023 Forum, Jan. 2023.
doi: 10.2514/6.2023-1150

Posters and Talks

2025 [**Poster**] "A Computationally Efficient Classifier with Frequentist Bounds on Prediction Errors," at the IEEE Finland Workshop on Emerging Trends in Automatic Control, September 2025.

Projects

2024 `Olympic Medals Predictor`: *Python, sklearn* | code
Forecasted the number of medals a country would win based on socioeconomic indicators. Implemented a Random Forest regressor model that yielded R^2 of 0.9; this was benchmarked against baseline linear regression.

`Dual-clip PPO`: *Python (PyTorch)* | code
Implemented a baseline PPO and benchmarked it against an extension motivated by this paper, which adds a second clip to large policy deviations where the advantages are negative.

`Balancing a Pole with Spot`: *Python, ROS2, Docker* | demo video
Sensor integrations, PID controllers for balancing a pole, and data collection for reinforcement learning — with Boston Dynamics' Spot Robot. Diffusion autoencoders for generating synthetic RL data, motivated by this paper.

`Multi-Agent Reinforcement Learning`: *Python* | code
A proof-of-concept implementation of a fully decentralised multi-agent reinforcement learning algorithm with networked agents. Motivated by this paper.

`Extended Kalman Filter GNSS`: *Python* | code, report
Implemented Kalman Filter based algorithms to estimate a receiver's position based on pseudorange estimates.

2023 `Shawshank Text Adventure`: *Scala* | code
A text based adventure game that incorporates multiple aspects of object-oriented programming.

`Sensor Fusion for AGV`: *Python* | code, report
Calibrated the IMUs, cameras, and the motor controller of an autonomous ground vehicle to enable localisation and estimation.

2019–2021 `Edhitha UAS`: *Pixhawk, ArduPilot, px4* | technical paper
Led a competitive student group to develop an autonomous UAV capable of imagery, air delivery, and obstacle avoidance — complete with real-time data acquisition and transmission of GNSS data, imagery, and interoperability.

Skills

Code	Python, Scala, C, C++, MATLAB
Engineering	ROS, ROS2, Gazebo, SOCs (Pi, Arduino, Jetson, Pixhawk), OpenCV, JAX
Tools	Git, Scripting (shell, slurm), Linux, AWS, Docker
Languages	English (bilingual native), Finnish (CEFR A1.1)
Others	Basic Life Support – certified first responder