

# Davide Carminati, Ph.D.

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 DavideCarminati

Self-motivated, independent research engineer in the field of robotics, computer vision and probabilistic AI. His academic research was focused on real-time Bayesian models implemented on mobile robots for environment modelling and system identification. He explored parallel implementation of Bayesian sampling methods for real-time robotic applications. He has experience in control design, optimization and embedded system programming. Currently, he is responsible for software development and algorithm design and implementation on UAVs. Interested in pursuing research in robotics and probabilistic AI.

## Work Experience

11/2024 – present  **Industrial Researcher (R&D) – MAVTech s.r.l. (Bolzano, IT)**  
• Leading software development in MAVTech Research and Development team.  
• Enhancing autonomy and safety during flights through AI.

02/2023 – 08/2024  **Research Fellow – Politecnico di Torino (IT)**  
*STREAM robotics* group – Department of Mechanical and Aerospace Engineering.  
• Maintained the robotic platforms in the laboratory for Ph.D. and Master's students.  
• Implemented Bayesian algorithms (SMC/Particle Filter, Parallel Tempering) in CUDA for a faster parallel execution.  
• Research focused on Bayesian methods for data efficient state-space modelling and estimation for mobile robots.

07/2021 – 12/2021  **Intern – IDIAP Research Institute (Martigny, CH)**  
*Robot Learning and Interaction Group* – supervisor: Dr. Sylvain Calinon.  
• Dealt with probabilistic methods applied to robots.  
• Dived into probabilistic modeling of environments and ergodic trajectory planners.

02/2020 – 08/2024  **Collaborator – Politecnico di Torino (IT)**  
*Courses:*  
• 2<sup>nd</sup> level Master in *Space Exploration and Development Systems*: Gave lectures on Guidance, Navigation and Control (GNC) algorithms, and hardware and software technologies for aerospace.  
• *Flight Simulation*, Master of Science in Aerospace Engineering: Introduced students to C++/Python programming in ROS under a Linux environment.

## Education

11/2019 – 11/2023  **Ph.D. in Aerospace Engineering – Politecnico di Torino (IT)**  
Thesis title: *Bayesian-based algorithms for Modeling and Identification for Autonomous Robotic Systems*.  
• Applied Gaussian process regression to ground robots for a data-efficient modelling of their surroundings using depth sensors, as well as for identifying their dynamics.  
• Developed and tested Gaussian process-based algorithms onto customized ground robotic platforms with limited computational resources for real-time applications.

2017 – 2019  **M.Sc., Mechatronic Engineering – Politecnico di Torino (IT)**  
Thesis title: *Design and Testing of Indoor UAS Control Techniques*. GPA: 110/110

2013 – 2017  **B.Sc., Mechanical Engineering – Politecnico di Milano (IT)**

## Skills

Coding	Regular user of C++ and MATLAB/Simulink. Good command of Python and CUDA. Experience with microcontroller programming and real-time operating systems (ARM Mbed OS). Basic knowledge of Bash and Julia.
Operating Systems	Ubuntu, Windows, ARM MbedOS for embedded platforms.
Libraries	Robot Operating System (ROS), Point Cloud Library (PCL), Eigen3, cuBLAS, cuSOLVER, OpenCV, TensorFlow 2.x/Keras.
CAD and 3D printing	Good command of Autodesk Inventor, Solidworks and Simplify3D.
Languages	Italian (Native), English (Fluent), Spanish (Fluent).
Misc.	Git, L <sup>A</sup> T <sub>E</sub> X typesetting and publishing, Docker.

## Research Publications

- 1 D. Carminati, “Parallel Gaussian process with kernel approximation in CUDA,” 2024, (pre-print – submitted to journal).  URL: <https://arxiv.org/abs/2403.12797>.
- 2 I. D. D. M. De Pierrepont Franzetti, R. Parin, D. Carminati, and E. Capello, “Modelling of ground and ceiling effects for quadcopters based on experimental data,” in *2024 International Conference on Unmanned Aircraft Systems (ICUAS)*, 2024, pp. 405–412.  DOI: 10.1109/ICUAS60882.2024.10557056.
- 3 D. Carminati, *Bayesian-based algorithms for Modeling and Identification for Autonomous Robotic Systems*. Politecnico di Torino, 2023, Doctoral thesis.
- 4 M. Mancini, E. I. Trombetta, D. Carminati, and E. Capello, “Adaptive sliding mode control with artificial potential field for ground robots in precision agriculture,” in *2023 IEEE International Workshop on Metrology for Agriculture and Forestry (MetroAgriFor)*, 2023, pp. 325–330.  DOI: 10.1109/MetroAgriFor58484.2023.10424132.
- 5 E. I. Trombetta, D. Carminati, and E. Capello, “Nonlinear UGV Identification Methods via the Gaussian Process Regression Model for Control System Design,” *Applied Sciences*, vol. 12, no. 22, p. 11 769, 2022.
- 6 E. I. Trombetta, I. D. D. M. de Pierrepont, D. Carminati, M. Scanavino, and E. Capello, “Data-Driven Identification Method and Simulation Modeling of a Ground Robot,” en, in *2021 IEEE International Workshop on Metrology for AeroSpace*, 2021, p. 6.
- 7 I. D. D. M. de Pierrepont, D. Carminati, M. Scanavino, E. Capello, *et al.*, “Model-In-the-Loop Testing of Control Systems and Path Planner Algorithms for QuadRotor UAVs,” in *2020 International Conference on Unmanned Aircraft Systems (ICUAS)*, IEEE, 2020, pp. 1809–1818.

## References

### Prof. Elisa Capello

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