

# ALESSANDRO CECCONI

+39 392-231-97-22 • ✉ ale.c.cecconi@gmail.com • in alessandro-cecconi • 🌐 aleegeco

📍 Via Mario Bastia 29, 40134, Bologna, Italy

## EDUCATION

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- University of Bologna** • Bologna, Italy ongoing  
*Dottorato di Ricerca* (PhD) in Control Theory • supervisor: Michelangelo Bin, Lorenzo Marconi
- University of Bologna** • Bologna, Italy Nov. 2023  
*Laurea Magistrale* (M.Sc.) in Automation Engineering • major: Systems and Control
- Sapienza University of Rome** • Rome, Italy Dec. 2019  
*Laurea* (B.Sc.) in Management Engineering • major: Operations Research

## EXPERIENCES

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- Master Thesis Intern** - ETH Zurich - Institute for Dynamic Systems and Control Oct. 2022 – Jul. 2023  
Zurich, Switzerland
- *Main topics and languages:* Networked Systems, Graph Theory, Optimization, Control Theory, Python
  - Research intern in the Department of Mechanical Engineering (D-MAVT) in the group of Professor Emilio Frazzoli under the supervision of Gioele Zardini and Marc Albert.
  - Focus on Networked Manufacturing Systems developing an optimization algorithm for Pareto optimal solutions of production scheduling.
- Motion Planning & Control Leader** - Unibo Motorsport - Driverless Division Nov. 2020 – Dec. 2022  
Bologna, Italy
- *Main topics and languages:* Vehicle Dynamics, Control Theory, MATLAB & Simulink, Python, ROS, ROS2
  - Founded the Driverless Division to compete in Formula SAE and F1tenth competitions.
  - Literature review and study of control and state estimation techniques for aggressive autonomous racing vehicles, with focus on Optimal Control strategies for track following and Extended Kalman Filter (EKF) solutions for sensors measurements fusion.
  - Developed dynamic single-track and two-track car models in MATLAB to evaluate the online controller performances.
  - Competed with our F1tenth vehicle at the race held in Philadelphia at ICRA 2022, concluding 5th in our first race appearance.
- Operations Team Member** - Sapienza Gladiators - MotoStudent Team Apr. 2019 – Oct. 2019  
Rome, Italy
- *Main topics and languages:* Operations Research, AMPL, Microsoft Project
  - Part of the Operations Division studying production planning and resource optimization.
  - Electronics team support developing the bill of materials and optimizing the design steps using operations research models for optimal scheduling and resource allocation.

## PROJECTS

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- Optimal Control strategies for Autonomous Vehicles** - exam project project link
- *Main topics and languages:* Control Theory, Nonlinear systems, Dynamic Programming, Nonlinear Optimization, MATLAB
  - Optimal Control algorithms for a single-track car model to perform a lane change maneuver and a skid pad track following.
  - Computed a basic PI controller and simulated the dynamics over the lane change and the track following in order to have feasible state-input initial trajectories.
  - Applied a Differential Dynamic Programming (DDP) algorithm to compute the optimal state-input trajectory for lane change and track following tasks.
  - Tracked the computed optimal (open loop) trajectories using a Linear Quadratic Regulator (LQR).
- Classification via Distributed Neural Networks** - exam project project link
- *Main topics and languages:* Networked Systems, Neural Networks, Distributed Optimization, Supervised Learning, Graph Theory, Python
  - Classification problem via distributed multi-agents training of Neural Networks (NNs).

- Consensus over the agents reached via Causal Gradient Tracking algorithm for different communication topologies described by undirected graphs.

**Formation Control by Bearing Based Maneuvering** - exam project project link

- *Main topics and languages:* Networked Systems, Control Theory, Graph Theory, Python, ROS2
- Distributed maneuver control of multi-agents formations in ROS2.
- Controlled translation and scale of reference static or dynamic formations, dividing agents in two class: followers and leaders.
- Control actions computed only for the followers with a consensus-based proportional controller on velocity and position errors between neighbors. Also the case integral action has been considered, analyzing its behaviour in a distributed context.

**Autonomous and Mobile Robotics** - exam project project link

- *main topics and languages:* Autonomous Systems, Control Theory, Path Planning, SLAM, Python, ROS
- Developed an autonomous robot based on the Turtlebot3 environment to simulate room sanitization from COVID-19.
- Performed tests on the real platform and compared the results with the simulation environment.
- Enhanced the turtlebot3 performances with a new monte-carlo based localization and a new global planner.
- Map discretization and energy analysis of ideal UV lamp mounted on the robot to perform the sanitization.

**Learning and Estimation of Dynamical Systems** - exam project project link

- *main topics and languages:* Discrete Dynamical Systems, Identification, Supervised Learning, MATLAB
- Discrete systems Identification and classification problems developed and solved in MATLAB.
- Defined a recursive weighted least square algorithm to estimate model's parameters and validated the model via whiteness and cross-correlation tests.

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#### TECHNICAL SKILLS

- Programming languages: MATLAB & Simulink, Python
- OS: Linux, ROS, ROS2
- Utilities: git, github, Docker

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#### LANGUAGES

- Italian: First language
- English: C1 - IELTS 7.0

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#### CERTIFICATIONS

- Huawei Seeds for the Future 2023