Alejandro Gonzalez-Garcia

Ph.D. Researcher - Robotics

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LinkedIn ● GitHub ● Website ● ResearchGate ● Google Scholar

EDUCATION

KU Leuven, Belgium - Ph.D. in Mechanical Engineering (Robotics)

2022 - Present

Tecnologico de Monterrey, Mexico - M.S. in Engineering (Robotics) - 97.9/100

2020 - 2022

Tecnologico de Monterrey, Mexico - B.S. in Mechatronics Engineering - 95.0/100

2015 - 2020

AREAS OF INTEREST

Unmanned Systems ● Motion Control ● Robust/Adaptive Control ● Heterogeneous Systems ● Reinforcement Learning ● Motion Planning ● Obstacle Avoidance ● Dynamic Modeling

RESEARCH EXPERIENCE

PhD Researcher - KU Leuven, Belgium

11/2022 - Present

PhD robotics researcher at the MECO Research Team from KU Leuven. Project of fast motion planning for robotic systems.

Recurring Visiting Researcher - Massachusetts Institute of Technology, United States

07/2021 - 12/2024

- Recurrent Ph.D. visits to CSAIL as part of a collaboration funded by the MIT International Science and Technology Initiatives (MISTI) MIT-Belgium KU Leuven Seed Fund.
- Robotics research contractor at MIT Senseable City Lab, in collaboration with CSAIL and the AMS Institute.
- M.S. visiting student at the Senseable City Lab from MIT, in collaboration with CSAIL and the AMS Institute.

Graduate Researcher - Tecnologico de Monterrey, Mexico

08/2020 - 06/2022

Research Assistant at the National Robotics Lab from Tecnologico de Monterrey. Projects on robust control for autonomous systems.

Undergraduate Researcher - Tecnologico de Monterrey, Mexico

08/2019 - 12/2019

Research Assistant at the National Robotics Lab from Tecnologico de Monterrey. Project on mechanical design and robust control for unmanned surface vehicles (USVs).

Undergraduate Research Trainee - McGill University/HumanITas Solutions, Canada

05/2018 - 08/2018

Research Intern at the Aerospace Mechatronics Lab from McGill University. Project on payload transportation system with an unmanned aerial vehicle (UAV) using vision-based control.

SELECTED PUBLICATIONS

Fast Motion Planning for Non-Holonomic Mobile Robots via a Rectangular Corridor Representation of Structured Environments

2026 - 2026 IEEE International Conference on Robotics and Automation (ICRA) - **Alejandro Gonzalez-Garcia**, Sebastiaan Wyns, Sonia De Santis, Jan Swevers and Wilm Decré.

Safe Motion Planning and Control Using Predictive and Adaptive Barrier Methods for Autonomous Surface Vessels

2025 - 2025 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) - **Alejandro Gonzalez-Garcia**, Wei Xiao, Wei Wang, Alejandro Astudillo, Wilm Decré, Jan Swevers, Carlo Ratti and Daniela Rus.

Robust Model Predictive Control with Control Barrier Functions for Autonomous Surface Vessels

2024 - 2024 IEEE International Conference on Robotics and Automation (ICRA) - Wei Wang, Wei Xiao, **Alejandro Gonzalez-Garcia**, Jan Swevers, Carlo Ratti and Daniela Rus.

Deep Reinforcement Learning Based Tracking Control of an Autonomous Surface Vessel in Natural Waters

2023 - 2023 IEEE International Conference on Robotics and Automation (ICRA) - Wei Wang, Xiaojing Cao,, **Alejandro Gonzalez-Garcia**, Lianhao Yin, Niklas Hagemann, Yuanyuan Qiao, Carlo Ratti and Daniela Rus.

PROJECTS

VantTec

01/2017 - 08/2020

Head and researcher role at the student group VantTec, focused on research and development of unmanned autonomous vehicles. Chronological responsibilities:

- Teleoperation, mechanical design and manufacturing of multiple USV prototypes.
- Mathematical modeling and identification of USV systems.
- Guidance, Navigation and Control design, development, and deployment for USVs.
- Control systems research for UUV systems.
- Led software development for the simulation and autonomy stacks on USV and UUV systems.

08/2020 - 11/2022

Research advisor and group mentor role.

Roboat

07/2021 - 12/2024

Robotics researcher on autonomous vessel project between MIT and the AMS Institute.

- Control system design and deployment for ASVs subject to payloads and disturbances.
- Motion planning algorithm development for ASVs in urban environments, deployed in scaled environments.

- Framework design and algorithm development for self-reconfiguring system of modular ASVs, deployed with real prototypes of the swarm system.
- Hardware and software development and maintenance of multiple ASV prototypes.

Agile & Reliable Navigation (ARENA)

11/2022 - 12/2026

PhD researcher on Flanders Make SBO project for mobile robot motion planning operating in highly-complex but structured environments.

- Development of a motion planning framework via a geometric abstraction of the free-space.
- Development of simulation environments for multiple mobile robots including unicycle (differential drive), bicycle and truck-trailer systems.
- Experiment design for multiple motion planning frameworks in real-world environments.
- Experimental setup development of a “mobile arena,” to test autonomous behaviors on real-world robots.
- Deployment and maintenance (hardware-software) of multiple mobile robots including differential drive commercial platforms, and truck(-trailer) prototypes.

SKILLS

ROS ● MATLAB/Simulink ● Python ● C++ ● Arduino ● SolidWorks ● Linux ●

HONORS, GRANTS AND AWARDS

MIT-Belgium - KU Leuven Seed Fund (2023) - Grant for the project titled “Safe and Fast Motion Planning and Control for Autonomous Urban Boats using Model Predictive Control”.

Six awards (2021) @ International Roboboat 2021

Premio Romulo Garza (2020) - National award for the best undergraduate research project at Tecnologico de Monterrey between 2018-2020.

CONACYT Graduate Scholarship (2020) - Mexican government monthly stipend scholarship for graduate studies.

Tecnologico de Monterrey Graduate Scholarship (2020) - Scholarship covering full tuition cost for M.S. studies.

Borrego por Liderazgo Estudiantil (2020) - University award for outstanding student leadership.

First Place (2020) - International RoboBoat 2020.

Third Place (2020) - International RoboSub 2020.

Finalist (2019) - International RoboBoat 2019.

Premio FAO (2018) - Tamaulipas State Government Outstanding Youth Award.

Norman Foster Foundation Robotics Atelier (2018) - Part of 10 international selected scholars.

Engineering Integrity (2018) - International RoboBoat 2018.

Special Drone Award (2017) - International RoboBoat 2017.