

Josep Maria Barbera

PHD STUDENT

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My research is centered on autonomous vehicles, with a specific focus on trajectory generation and decision-making in driving scenarios. Additionally, I am exploring related topics such as systems simulation, ODD-aware and reinforcement learning.

Education

PhD in Autonomous Driving

CENTER FOR AUTOMATION AND ROBOTICS (UPM-CSIC)

Arganda del Rey, Spain

October 2024 - in progress

- *Maneuver Planning for Autonomous Vehicles* (supervised by Jorge Villagra)

MSc in Robotics

TECHNICAL UNIVERSITY OF MADRID · 1ST CLASS HONOURS (~92%) [FULL TRANSCRIPT]

Madrid, Spain

September 2023 - September 2024

- **Final Thesis:** “Advanced Locomotion for Quadruped Robots through Reinforcement Learning” (94%)
- **Courses:** computer vision, artificial intelligence, autonomous robots, ros, advanced programming, human-machine interaction

BSc in Industrial Engineering

TECHNICAL UNIVERSITY OF MADRID · UPPER 2ND CLASS HONOURS (~72%) [FULL TRANSCRIPT]

Madrid, Spain

September 2017 - September 2023

- **Final Thesis:** “Computational Study of Oscillatory Growth Instability in Directional Solidification of Alloys” (92%)
- **Courses:** thermodynamics, material science, fluidynamics, electronics, mechanics, automation, robotics

Experience

Technical University of Madrid - CEI

RESEARCH INTERNSHIP

Madrid

February 2023 - August 2023

- *Enhanced Neuroevolutionary Algorithms through GPU-based parallelization*
- Configured a GPU microserver with 2 NVIDIA A30 GPUs and 24 CPUs
- Implemented CPU-GPU acceleration architecture using Multi-Instance GPU (MIG) and the multiprocessing library with Python
- Prepared a poster for [XV CEI Annual Meeting](#). [pdf]

Technical University of Madrid - Manufacturing Engineering Group

Certified LABORATORY PRACTICE MONITOR

Madrid

February 2023 - May 2023

- *Served laboratory practicals in the Manufacturing Automation and Robotics course*
- Prepared the laboratory equipment along with safety measures
- Drafted practice scripts and rules for the use of practice tools
- Clarified doubts, maintained students' commitment to the completion of the laboratory tasks

IMDEA Materials Institute

RESEARCH INITIATION FELLOWSHIP

Getafe, Madrid

June 2022 - October 2022

- *Contributed to research on computational oscillatory growth instability in directional solidifications*
- Characterized oscillations and identified their conditions of occurrence through computational modeling
- Analyzed DNN (Dendritic Needle Network - C++ and Cuda based) simulations using Python
- Conducted intensive work in launching simulations on a cluster of GPUs and post-processing them to extract quantitative data using Jupyter Notebooks

Publications

On the occurrence of buoyancy-induced oscillatory growth instability during directional solidification of alloys

[pdf]

2023 MODELLING OF CASTING, WELDING AND ADVANCED SOLIDIFICATION PROCESSES - XVI CONFERENCE

[code]

Projects

Master

[code]

ROBOTICS

Sept 2023 - Sept 2024

- **Robotic Navigation** Strategies for a Nocturnal Surveillance Application [code]
- A **Drowsiness Driving Alert** implementation with the use of MediaPipe [code]
- Exploring Urban and Natural Dynamics with **k-Means Clustering** [code]
- **Bilateral Control** with Wave Variables using Matlab [pdf]

Bachelor

ELECTRONICS AND AUTOMATION

Sept 2020 - Sept 2023

- Building a **SCARA robot** - [pdf]
- **FPGA** programming with VHDL - [code]
- Automatic Car Wash Programming in **Microchip Studio** - [code]
- **C++ object list** to manage an Asteroids-style game by using the OpenGL cross-platform graphics library. [code]
- **Dynamic Backtracking Maze Generator** with a randomized version of the depth-first search algorithm. [code]

Languages

Spanish Native

Catalan Native

English Proficient

[certificate]

Technical Skills

Languages C/C++, Python, Shell

Tools VSCode, Matlab, Jupyter Notebook

Other Git, Latex, Linux OS

Transferable Skills

Creativity Classical music and Literature is for me a source of great inspiration

Teamwork Worked on joint projects during BSc and MSc. Distributing workloads and reaching a compromise in the completion of tasks.

Leadership Certified Leisure Time Monitor. Volunteering for the past 7 years in summer camps as organizer. Instructor and group leader.