

Miguel Saavedra-Ruiz

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EDUCATION

Ph.D. Computer Science

Université de Montréal

Advisor: Liam Paull

Montreal, Canada

Sep 2023 - Ongoing

M.Sc. Computer Science

Université de Montréal

Advisor: Liam Paull - GPA: 4.3/4.3

Montreal, Canada

Sep 2021 - Sep 2023

Thesis: *Leveraging Self-Supervision for Visual Embodied Navigation with Neuralized Potential Fields*

PGDip. Artificial Intelligence

Universidad Autonoma de Occidente

GPA: 4.9/5.0

Cali, Colombia

Aug 2020 - Jun 2021

B.Eng. Mechatronics Engineering

Universidad Autonoma de Occidente

Advisor: Victor Romero-Cano - GPA: 4.7/5.0

Cali, Colombia

Jan 2014 - Apr 2019

Thesis: *Autonomous landing system for an unmanned aerial vehicle on a terrestrial vehicle*

RESEARCH INTEREST

Artificial intelligence for robotics vision, state estimation, SLAM, self-supervised representation learning for embodied agents, robot navigation, graphic models, uncertainty estimation.

RESEARCH EXPERIENCE

Mila - Quebec AI Institute

Ph.D. student

Robotics and Embodied AI Lab (REAL)

Montreal, Canada

Sep 2023 - Ongoing

- Lifelong SLAM.
- Nonparametric state estimation [J1]
- Nonparametric state estimation and SLAM [W1].
- Topological and fully-parametric image-based navigation for embodied agents [C1].
- Self-supervised representation learning for embodied navigation [C2].

Sep 2021 - Aug 2023

University Autónoma de Occidente

Undergraduate and graduate student

Robotics & Autonomous Systems lab (RAS)

Cali, Colombia

Jul 2017 - Jun 2021

- Autonomous landing system for an unmanned aerial vehicle on a terrestrial vehicle [J2].
- Simulation of a landing system for a UAV in Gazebo [C3].
- Mapping and localization in indoors with Turtlebot 2.
- 3D object detections for self-driving applications [W2].
- Teleoperation system for a car-like robot (inverse kinematics).
- Object detection and recognition using Convolutional Neural Networks.

WORK EXPERIENCE

Whale & Jaguar

Machine Learning Engineer

Cali, Colombia

Dec 2020 - Jul 2021

Research and development of Machine Learning algorithms for social media analysis (Natural Language Processing).

AirflyD & Romero Cano Ingeniería

R&D Robotics Software Engineer

Cali, Colombia

Jan 2020 - Sep 2020

Research and development of a flight stack and vision application for a heavy-cargo hexacopter with internal combustion engines for precision agriculture applications.

CRT Ingeniería S.A.S. & Romero Cano Ingeniería

Lead Developer

Cali, Colombia

Jan 2019 - Dec 2019

Developed, tested and implemented software solutions for security applications using deep neural networks and computer vision techniques. Some of the achievements were an AI-based license plate recognition system, image-based heat maps for crowd flow estimation, and floor segmentation.

AWARDS

FRQNT doctoral scholarship (B2X)

Les fonds de recherche du Québec - Nature et technologies.

Sep 2023

Excelence scholarship

Le Département d'Informatique et de Recherche Opérationnelle (DIRO)

Apr 2023

Redaction scholarship

Le Département d'Informatique et de Recherche Opérationnelle (DIRO)

Apr 2023

Graduate scholarship

DIRO and Le ministère de l'Enseignement supérieur du Québec

Mar 2022

Colfuturo graduate scholarship (Declined)

Government of Colombia, Minister of sciences and Icetex.

Jul 2021

Academic distinction

Highest GPA of the engineering faculty and number one graduate position.

Apr 2019

Academic Excellence Award

Covered 100% of tuition and fees during undergraduate degree, awarded nine academic periods.

Jul 2014

Academic Excellence Scholarship

Covered 80% of tuition and fees throughout my undergraduate degree.

Jan 2014

TEACHING AND ACADEMIC INVOLVMENT

Reviewer - ICRA (2024)

Topics: SLAM and robot navigation.

Oct 2023

Co-organizer - Montreal Robotics Summer School

Helped organizing the event's challenge and prepared the SLAM tutorial.

Jun 2023

Volunteering - Conference on Robots and Vision (CRV) Helped as a volunteer in the event with general tasks and logistics.	Jun 2023
Reviewer - IROS (2023) Topics: Visual-based navigation, state estimation.	May 2023
Teaching - Autonomous Vehicles (IFT 6757) Graduate class taught by professor Liam Paull.	Sep 2022
Invited Talk - Colfuturo Topics: experience as graduate student and research in robotics.	Sep 2022
Reviewer - IROS (2021) Topics: Multimodal sensor fusion and object tracking.	May 2021

SKILLS

- **Languages:** Python, C++, Matlab, HTML, Shell, \LaTeX
- **Libraries:** OpenCV, PyTorch, Scikit-Learn, GTSAM, ROS, PCL
- **Technologies:** Gazebo, Docker, Git

LANGUAGES

- **Spanish:** Mother-tongue
- **English:** Fluent
 - **IELTS Academic:** 7.5 Overall
- **French:** Intermediate

PUBLICATIONS

* denotes equal contribution.

Journal Publications

- [J1] **M. Saavedra-Ruiz***, S. A. Parkison*, R. Arora, J. R. Forbes, and L. Paull, “The harmonic exponential filter for nonparametric estimation on motion groups”, in *IEEE Robotics and Automation Letters (RA-L)*, 2023. **(Under review)**.
- [J2] **M. Saavedra-Ruiz**, A. M. Pinto-Vargas, and V. Romero-Cano, “Monocular visual autonomous landing system for quadcopter drones using software in the loop”, *IEEE Aerospace and Electronic Systems Magazine*, vol. 37, no. 5, pp. 2–16, 2022.

Conference Proceedings

- [C1] S. Morin*, **M. Saavedra-Ruiz***, and L. Paull, “One-4-all: Neural potential fields for embodied navigation”, in *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2023. [Project page](#).
- [C2] **M. Saavedra-Ruiz***, S. Morin*, and L. Paull, “Monocular robot navigation with self-supervised pretrained vision transformers”, in *2022 19th Conference on Robots and Vision (CRV)*, 2022, 197–204. [Project page](#).
- [C3] **M. Saavedra-Ruiz**, A. M. P. Vargas, and V. R. Cano, “Detection and tracking of a landing platform for aerial robotics applications”, in *2018 IEEE 2nd Colombian Conference on Robotics and Automation (CCRA)*, 2018, pp. 1–6.

Workshops

- [W1] S. A. Parkison, **M. Saavedra-Ruiz**, R. Arora, J. R. Forbes, and L. Paull, “The harmonic exponential filter for recursive nonparametric estimation on motion groups”, in *Robotic Perception and Mapping: Frontier Vision & Learning Techniques @ IROS 2023*, 2023.
- [W2] G. A. Salazar-Gomez*, **M. Saavedra-Ruiz***, and V. Romero-Cano, “High-level camera-lidar fusion for 3d object detection with machine learning”, *LatinX Workshop at CVPR 2021 (Poster Presentation)*, 2021.