Ricardo Gonzalo Cruz Castillo

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EXPERIENCE

Summer Scholar – Robotics Institute, Carnegie Mellon University Pittsburgh, USA • Jun 2024 – Aug 2024

SafeAir: Safety-informed Tree Search for Robust Navigation under Distribution Shifts in General Aviation.

- Applied machine learning models within the Pytorch Lightning framework in human-centered, muti-agent scenarios involving autonomous robots.
- Using a general aviation dataset for training a LLM, a transformer-based (TF) trajectory prediction model.
- Implemented remediation techniques enhancing safety and collision avoidance and improved performance by 70%.
- Ensured safe, long-horizon navigation by leveraging Monte Carlo Tree Search biased by a TF model.

Research Trainee - MACRObotics Research Group, McGill University Montreal, CA • Aug 2023 – Dec 2023

Co-author Mason et al., "Acoustic Tactile Sensing for Mobile Robot Wheels" working paper.

- Established a communication architecture, enabling integration of ROS2, TCP/IP, and SPI protocols within a system.
- Developed scripts in C++, C, and Python for the Arduino and BeagleBone microcontrollers and signal processing.
- Generated a dataset from acoustic data with the purpose of training a self-supervised NLP model.
- Enabled real time visualization with ROS2 using python's 'matplotlib' library.

Software Engineer - VANTTEC, Robotics Team of ITESM Monterrey, MEX • Aug 2022 – Jun 2023

Research and Development of Autonomous Vehicles: Unmanned Underwater Vehicle (UUV) Hydrophones Team Captain

- Implemented Radio Localization Algorithms and signal analysis for the perception of the UUV.
- Researched Adaptive Filter Algorithms such as Kalman Filtering and Recursive Least Squares for improved position accuracy.
- Used MATLAB and Python/C++ with ROS for signal processing and vehicle localization.

SKILLS

Programming Languages
4 Years: C++, C, Python
2 Years: MATLAB/SIMULINK
1 Year: Java, R-Studio, SQL

Technologies
Windows/Linux environment, Free-RTOS, Pytorch, Pytorch Lightning, TensorFlow, SKLearn, SciPy, Jupyter, MLOps, Pandas, Keras, Numpy OpenCV, gRPC, REST, ROS, Docker, Conda, VSCode, Gcc, Cmake Git, Github, Agile.

Languages Spoken
Spanish Native
English TOEFL IBT 107
French Classroom level

EDUCATION

Tecnológico de Monterrey – ITESM

B.Sc. in Robotics and Digital Systems Aug 2020 – Dec 2024

Important Coursework: *Machine Learning, Computer Vision, Mobile Robotics* GPA: 94/100

MAJOR PROJECTS

Manchester Robotics, Puzzlebot 2 Mar 2024 – Jun 2024

Research kit for autonomous vehicle development: Obstacle Avoidance and Payload Delivery

- Avoided obstacles detected with a LiDAR using the Bug 0 algorithm.
- Using ArUco marker camera-based localization an extended Kalman Filter for robust localization.
- Defining a gRPC-ROS2 architecture for image visualization on the web and task offloading.
- Desing and mounted a gripper for payload transportation.

Manchester Robotics, Puzzlebot 1 Feb 2023 – Jun 2023

Research kit for autonomous vehicle development: Computer Vision and Trajectory Planning

- Coursed through an educational program designed by MCR that delves into ROS, Computer Vision, Math, and Kinematics.
- Generated a dataset by capturing, curating, and classifying images personally for training a computer vision model in PyTorch.
- Implemented YOLOv8 and other algorithms for trajectory planning based on traffic-signs and road recognition.