Victor Retamal Guiberteau

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Experience

- **VU Amsterdam, Robotics Lab** — Amsterdam, Netherlands
  Research Assistant – Prof Dr. Ferrante — Aug 2022 - Current
  - **Controller Design For Aerial Robots Swarm**: Developed swarm controller for aerial robots using C and C++. Wrote onboard code and ground control tools for streamlined experiment management and automation. Implemented an innovative collision avoidance method, enhancing swarm performance and reducing path distance for obstacle avoidance.
  - **Aerial Robot and Drone prototyping**: Prototyped aerial robots and drones, including agile quadrotors, nanodrones, and fixed-wing models. Developed custom firmware for autonomous flight controllers, enabling advanced flight capabilities. Integrated sensor fusion for light-based gradient trailing and optical flow camera utilization. Implemented laser beam obstacle avoidance systems for enhanced navigation. Conducted system identification for optimized power distribution and low-level control through tailored component selection.
  - **Research And Development**: Developed custom onboard P2P communication using UWB and Bi-TWR for precise relative localization estimation with Kalman Filter with constrained information sharing. Optimized trajectory planning for multi-robot systems using RRT* and Dubin Curves in 3D, specifically for take-off sequence of fixed-wing drones.
  - **Framework Development**: Developed frameworks utilizing Software-in-the-Loop (SITL) tools for efficient simulation and testing of concepts. Ensured seamless portability of tested ideas to real-world robotic applications. Ensured seamless portability of tested ideas to real-world robotic applications.
- **TU Eindhoven** — Eindhoven, Netherlands
  Research Intern – Prof Dr. Baier — Feb 2022 - Aug 2022
  - **Attention Guide Monte Carlo Tree Search**: Optimized simulation for high-performance clusters (HPC), enabling training within the 120h allowed. Implemented A3C with attention layers for opponent estimation, then used A3C in model-based RL with Monte Carlo Tree Search for Simultaneous move Multi-agent Environment.
- **Spaarne Labs** — Harlem, Netherlands
  Machine Learning Scientist — Sep 2022 - Jan 2022
  - **Optimization of Surgery Department**: Analyzed surgery room processes in urology and cardiology departments, identifying potential AI applications, one of which was developed. Collected, cleaned, and processed patient and surgery room data to build an XGBoost and ensemble solution to reduce time wasted in the department by 5% daily. Deployed the ML solution using Heroku.

Education

- **Vrije Universiteit Amsterdam** — Amsterdam, Netherlands
  Masters in Artificial Intelligence; GPA: 3.78 — Jul 2023
  Specialization in Robotics: Deep Learning, Computer Vision, Reinforcement Learning, Multi-Robot Systems, Perception, and Control
  Extracurricular: TA manager for Collective intelligence course and TA for computational intelligence course.

Extra Projects

- **Multi Robot Distributed Path Finding With Graph Neural Networks**: Enabled efficient path finding using only local information for each robot, promoting robust decentralized decision-making, by implementing a framework using CNNs and GNNs to repurpose Conflict based Search (CBS) in a distributed manner.
- **Ultrasound image segmentation with ViT**: Developed state-of-the-art ultrasound image segmentation solution using Visual Transformers (ViT) and U-Net for ejection fraction estimation. Incorporated custom augmentations, including Fourier decomposition of images. Currently preparing the publication of the project.

Skills Summary

- **ML/AI Frameworks**: TensorFlow, Pytorch, Gym, SBaseline, XGBoost, scikit-learn, Deer-RL, NEAT, DEAP
- **Programming**: C++, Python, C, Java, SQL, R, Bash scripting
- **Computer Vision**: Camera Calibration, OpenCV, Depth Estimation, stereo reconstruction
- **Cloud & DevOps**: Docker, GIT, CI/CD, AWS, Azure
- **Languages**: Spanish, English, Portuguese

Publications

- **"Onboard Controller Design for Nano UAV Swarm in Operator-Guided Collective Behaviours"**: Accepted for publication in 2023 IEEE International Conference on Robotics and Automation (ICRA)
- **" Learning Methods with Range-Only Interactions in Active Systems"**: Presented in New Perspectives in Active Systems MPIPKS Workshop 2023
- **"From Shadows to Light: A Swarm Robotics Approach with Onboard Control for Source Seeking in Constrained Environments"**: Under review in 2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)