Roman Aguilera-Arevalo

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Education

University of California, Santa Barbara   **June 2024**
M.S. Computer Science, Research in Robotics and Machine Learning, GPA: 3.45
Awards: Google-CAHSI Dissertation Fellowship ($25,000), NSF-IGERT Network Science Fellowship ($30,000),
NSF-LSAMP Bridge to Doctorate Fellowship ($64,000)
Relevant Coursework: Robotic Locomotion, Robot Dynamics and Control, Computer Vision, Runtime Systems, Convex Optimization,
High Dimensional Tensor Analysis, Trustworthy Machine Learning in Security

University of California, San Diego   **July 2012 – December 2017**
B.S. Electrical Engineering, Depth in Machine Learning and Controls, GPA: 3.0

Skills

Programming Languages: C++/C, Python, MATLAB, Racket/Rosette, R, PSPICE, MIPS R2000 Assembly
Software Tools: Xenomai, Ubuntu, Linux, Vim, Roboflow, OpenAI Gym, OpenAI Baselines, Stable-Baselines 3, RLlib, PyBullet, Mujoco,
PyTorch, TensorFlow, CVXPY
Algorithms: Model Free Reinforcement Learning, Rapidly Exploring Random Trees

Work Experience

TRIC Robotics - *Field Data Science Intern / Agricultural Imaging Technician*   **September 2024 – November 2024**
40 hours per week
- Trained a neural network to detect the center points of wooden blocks on videoframe images.
- Set up and calibrated the camera system in the office and field, ensuring proper image quality.
- Collected image data according to project guidelines, maintaining organization and documentation.
- Made modifications to data collection software to improve ease of use.

UCSB Dynamic Robotics Lab – *AI Robotics Researcher*   **May 2018 – June 2024**
40 hours per week
- Investigated fundamental performance of control algorithms, as robot parts and simulation environment were changed.
- Investigated performance of Rapidly-Exploring Random Trees and Model-Free/Model-Based Reinforcement Learning.
- Discovered evidence to suggest that the PPO algorithm is learning motions, rather than making sense of goal points.
- Successfully trained a 32-link arm control policy such that the end effector would touch a goal point (Python, OpenAI Gym).
- Developed a Python script that automatically generates a URDF/XML model of a robot's physical properties, for an arbitrary number
of links desired on a robot. URDF model was used in a simulation environment (Python, xml.etree.ElementTree Python Package).
- Created over 8 custom reinforcement learning simulation environments for a multi-link robot arm (Python, OpenAI Gym, OpenAI
Baselines, Stable-Baselines 3, PyBullet Physics Simulator, Mujoco Physics Simulator).
- Applied PPO algorithm to perform policy search for multilink arm control (Python, OpenAI Baselines, Stable Baselines).
- Applied RRT algorithm to perform trajectory search for multi-link robot arm control, such that the end effector reaches a goal point.
Code works for an arbitrary number of links (MATLAB).
- Implemented Value Iteration algorithm with Barycentric Interpolation on both Gridworld and Double Integrator control problems
(MATLAB).
- Performed extensive literature reviews on Reinforcement Learning, Koopman Operator Theory, and Trajectory Optimization.
- Video demonstration of results here https://drive.google.com/file/d/1UX_fEvDkoU-bSyNF386ugiMh_kiHxJVL/view?usp=drive_link .
- Research proposal here https://docs.google.com/document/d/16SNo08ZLLnMyZ6FgPo8fR3_Y8aGxxpDIAwFg4jhn-lw/edit?
usp=sharing .

UCSB Computer Science / Electrical and Computer Engineering / Physics - *Teaching Assistant*   **September 2020 – March 2024**
20 hours per week
- Supervised sections for over 8 courses. Robot Dynamics and Control (MATLAB), Machine Learning (Python), Introduction to Data

Science II (Python), Object Oriented Design and Implementation (C++), Problem Solving with Computers II (C++), Problem Solving with Computers I (C++), Introduction to Computer Science (Python), Introductory Experimental Physics.
- Created solutions for homework and lab assignments, hosted sections and office hours, and graded assignments.

UCSB CSEP / UCSB EUREKA Scholars Program – *Research Mentor*   **June 2020 – August 2020**
25 hours per week
- Supervised undergraduate mentee in their summer research project.
- Taught basic concepts in Object-Oriented Programming, Python, Reinforcement Learning, and PyBullet.
- Met with undergraduate mentee at least 2 times per week to ensure adequate progress.

UCSD Neural Interaction Lab – *Embedded Systems Researcher*   **December 2014 – October 2016**
25 hours per week
- Created a prototype wireless sensor that sends real time skin flexion information to smart phone application.
- Integrated Bluetooth Low Energy (BLE) capabilities from PSoC4 onto wearable microelectronic biosensors.
- Optimized BLE capabilities of microelectronics using C Programming and PSoC Creator integrated development environment.
- Researched, designed, built and validated microelectronic circuits for different wearable biosensor applications.

Project Experience

Runtime Systems Course Project - *'RTOS4ROBOTS: Hard Real-Time Operating Systems for Robots'*   **January 2020 – March 2020**
72 hours per week
- Compiled a hard-real time Kernel based off Xenomai and Ubuntu for time critical applications. (Linux shell scripting).

Computer Vision Course Project - *'Pixel-RNN'*   **May 2019 – May 2019**
20 hours per week
- Implemented the Pixel Recurrent Neural Network algorithm. (PyTorch).

Publications

Yun-Soung Kim, Jesse Lu, Benjamin Shih, Armen A. Gharibans, Zhanan Zou, Kristen Matsuno, Roman Aguilera, Yoonjae Han, Ann Meek, Jianliang Xiao, Michael Thomas Tolley, and Todd P. Coleman. Scalable manufacturing of solderable and stretchable physiologic sensing systems. Advanced materials, 29 39, 2017.