Evan Gravelle, Ph.D. Candidate

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SUMMARY

Mechanical engineer with interdisciplinary research experience in control and estimation theory, robotics, and machine learning. Strong foundation in mathematical modeling, probability, and analysis. Extensive programming experience (Python, C++, MATLAB, ROS) with a passion for artificial intelligence.

EDUCATION

University of California, San Diego, California, USA

Ph.D., Mechanical and Aerospace Engineering, cum. GPA: 3.78 — expected March 2017
- Advisor: Sonia Martínez
- Thesis title: Distributed Load Balancing Algorithms under Discrete Constraints

M.S., Mechanical and Aerospace Engineering, cum. GPA: 3.75 — September 2013

University of California, Santa Barbara, California, USA

B.S., Mechanical Engineering, cum. GPA: 3.87, *summa cum laude*, first in class — June 2012

PROFESSIONAL EXPERIENCE

Machine Learning Project — March 2016 - August 2016

- Extensive online coursework and reading on Markov decision processes, support vector machines, policy/value iteration, $TD(\lambda)$, $SARSA(\lambda)$, Q-learning, neural networks, tree search, and deep Q-networks.
- Implemented deep Q-learning (DQN) with experience replay from scratch in Python using Tensorflow, based on "Human-level control through deep reinforcement learning."
- Implemented value iteration, policy iteration, expectation-maximization, and $SARSA(\lambda)$ for various OpenAI Gym environments.
- Currently working on solving each DOOM level in OpenAI Gym, starting with DQN and progressing toward asynchronous advantage actor critic with extensions.

Lab Lead for Multi-Agent Robotics Lab (http://muro.ucsd.edu) — June 2015 - present

- Led undergraduate and graduate researchers in individual projects towards developing capabilities of lab's ground and air robot testbed, helped determine and direct the long-term focus of the testbed.
- Helped successfully implement various algorithms on ground robots (Turtlebot) and quadrotors (Parrot AR.Drone) using Robot Operating System (ROS) including centralized and decentralized multi-agent deployment using Voronoi iteration, centralized and decentralized localization using an overhead camera with ArUco markers, tuned PID motion controllers, cyclic pursuit, simultaneous localization and mapping, and human-swarm interaction via an Android app.
- Achieved first place with team in graduate ROS course competition by solving an autonomous retrieval task using computer vision techniques for identification and tracking, ceiling template matching for localization, waypoint heuristic method for motion planning, PID control for base/arm motion and obstacle avoidance, and a state-based outer loop controller to monitor and change behavior modes.

Graduate Student Researcher at UC San Diego — August 2012 - present

- Designed various distributed algorithms related to load balancing under discrete constraints.
- Designed, proved convergence properties, and analyzed performance of a quantized load balancing algorithm. Designed, proved convergence properties, and analyzed performance of a dynamic lane reversal algorithm and rerouting algorithm for a vehicular road network.

- Simulated and tested each algorithm in MATLAB, including both macroscopic and microscopic traffic models.
- Current work is on an efficient dynamic intersection control policy for the city of San Diego.

Research Intern at SPAWAR Systems Center Pacific   June 2016 - August 2016

- Researched underwater localization techniques for autonomous underwater vehicles using sparse single range measurements.
- Implemented an Unscented Kalman Filter and an Extended Kalman Filter in C++ using MOOS-IvP publish/subscribe architecture for accurate and efficient estimation, tested in simulation, presented a poster.

Research Assistant at Trinity College Dublin   June 2011 - August 2011

- Researched the packing structure of mono-disperse microbubbles in cylinders as a function of the bubble diameter to cylinder diameter ratio. Wrote MATLAB code for visualization of these bubbles as images of 3D structures and helped characterize the packing structure, presented a poster.

Teaching Assistant for Probability and Statistical Methods   Spring 2014, Spring 2015

- Tasks included weekly supplemental lectures, office hours, revising homeworks/tests, grading midterms, and holding review sessions.

Campus Learning Assistance Services Tutor   September 2010 - June 2012

- Group and individual tutor for calculus and differential equations at University of California, Santa Barbara. Held classes which involved clarifying lecture material and demonstrating proper mathematical techniques for solving problems.

ADDITIONAL INFORMATION

- Proficient in C++, Python, MATLAB, ROS, comfortable with git, subversion, LaTeX, Linux, OS-X, Windows.
- Led lab outreach tours for high school and university groups to inspire students to join STEM fields and consider careers in robotics/research.

PUBLICATIONS

E. Gravelle and S. Martínez. *Distributed Dynamic Lane Reversal and Rerouting for Traffic Delay Reduction.* Submitted May 2016 to Automatica.

E. Gravelle and S. Martínez. *Traffic Delay Reduction via Distributed Dynamic Lane Reversal and Rerouting.* 22nd International Symposium on Mathematical Theory of Networks and Systems, July 2016.

E. Gravelle and S. Martínez. *An Anytime Distributed Load Balancing Algorithm Satisfying Capacity and Quantization Constraints.* IEEE Transactions on Control of Networked Systems, November 2015.

E. Gravelle and S. Martínez. *Quantized Distributed Load Balancing with Capacity Constraints.* IEEE Conference on Decision and Control, December 2014.