Juan Pablo Mendoza

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Education

Ph.D., Robotics, Carnegie Mellon University, Pittsburgh, PA, USA	Expected Spring 2017
M.S., Robotics, Carnegie Mellon University, Pittsburgh, PA, USA	2014
M.A., Computer Science, Wesleyan University, Middletown, CT, USA	2011
B.A., Computer Science and Physics, Wesleyan University, Middletown, CT, USA	2010

Areas of Expertise

Artificial Intelligence: Individual and team Planning and Execution in dynamic environments

Robust Robot Autonomy: Execution Monitoring and Anomaly Detection in high-dimensional domains

Machine Learning: Online Learning and Model Correction from sparse contextual data

Honors and Awards

Champion, RoboCup SSL, as co-leader of the CMDragons autonomous robot soccer team	2015
Best Team Description Paper Award, RoboCup SSL, with the CMDragons	2014, 2015
AAAI Robotics Fellowship, awarded to 10 PhD students in Robotics	2015
Second Place, RoboCup SSL, as a leader or member of the CMDragons team	2013, 2014, 2016
Computer Science Senior Prize, Wesleyan University awarded to one senior in CS	2010
Phi Beta Kappa Fall Election, Wesleyan University	2010
High Honors for Senior Thesis, Wesleyan University	2010
Outlaw Research Fund, Wesleyan University, awarded to one rising senior in Math and CS	2009
Siver Scholarship, Wesleyan University, awarded to a student in Physics	2009
First Place, A. Einstein National Physics Contest, Ecuador, 12th grade category	2006

Research and Engineering Work

Graduate Researcher, Carnegie Mellon University   2011 - present

- Created Focused Anomalous Region Optimization (FARO) algorithm for online detection of subtle context-dependent anomalies in robot execution
- Created Detection of Multiple Anomalous Subspaces (DMAPS) algorithm for online detection of multiple subtle context-dependent anomalies in robot execution
- Created HMM-based algorithm for early detection of failure in robot motion
- Successfully applied HMM-based detection to monitor the motion of CoBot mobile robots
- Successfully applied FARO to detect context-dependent anomalies in the CoBot's motion

Successfully applied DMAPS to detect multiple anomalies in the passing behavior of the CMDragons soccer-playing robots and improve performance online

Created multi-scale time-window monitoring algorithm to detect time-correlated execution anomalies, and successfully applied it to detect sensor hijacking in the LandShark outdoor ground robot

Co-leader, CMDragons Autonomous Robot Soccer Team 2015 - present

Obtained first place in RoboCup 2015 and second place in RoboCup 2016

Created Selectively Reactive Coordination algorithm for offense planning and execution

Created Online Free Kick Play Adaptation algorithm to balance exploitation and exploration against unknown opponents online

Created Parametric Free Kick Plays to script and optimize free kick plays

Created highlights videos of the CMDragons performance at RoboCup 2015 (see Media section)

Software Development Engineering Intern, Amazon Robotics Summer 2016

Developed software libraries for high-level intelligence to use depth information effectively

Developed mapping and localization technology to enhance warehouse robot autonomy

Team member, CMDragons Autonomous Robot Soccer Team 2013-2014

Obtained second place in RoboCup 2013 and 2014

Created Pass-Ahead algorithm for multi-robot pass timing coordination

Created Zone-based attacking algorithm for offense coordination

Created Fast Dribbling While Turning algorithm to maintain control of a ball under physical robot and carpet constraints

Created a controlled-acceleration diving skill for a robot goalkeeper to intercept fast-moving balls

Maintained CMDragons robot hardware

Undergraduate and Graduate Researcher. Wesleyan University 2007 - 2011

Created a dynamical-systems-based reactive autonomous navigation algorithm

Successfully applied the algorithm to iRobot Create robots for navigation around dynamic obstacles

Collaborated in the creation of a Hybrid Dynamical Cognitive Agent (HDCA)-based learning algorithm for interactive autonomous agents

Successfully applied the HDCA-based learning algorithm to an interactive game of tag

Teaching and Outreach Work

Teaching Assistant

Served as a Teaching Assistant for Robotics, Computer Science, Physics and Mathematics courses:

Adaptive Control and Reinforcement Learning, Carnegie Mellon University	2014
Creating Intelligent Robots, Carnegie Mellon University	2012
Automata Theory and Formal Languages, Wesleyan University	2010
Data Structures, Wesleyan University	2010
Human and Machine Inference, Wesleyan University	2009
Waves and Oscillations, Wesleyan University	2008
Multivariable Calculus, Wesleyan University	2008
Introduction to Programming, Wesleyan University	2008

  Computer Science I, Wesleyan University   2007

Gained experience in various areas of teaching:

  Conducted group sessions to guide students through class work

  Conducted one-on-one meetings with students to aid them with class work

  Designed homework and exams

  Graded homework and exams

  Prepared and conducted class lectures

  Mentored undergraduate students in class projects

Other Teaching and Outreach

Robotics Independent Study Mentor, Carnegie Mellon University   2014-2015

  Mentored undergraduate and graduate students on semester-long robotics project

  Co-created project ideas that were of mutual interest for the students and the CORAL lab projects

  Guided students through project code-bases, and necessary mathematical background

Technical Committee Member, RoboCup Small Size League (SSL)   2014-2015

  Co-create a vision for the evolution of the SSL

  Co-create rule changes to push research progress forward

  Co-create technical challenges to push the boundaries of SSL progress

FIRST Robotics Mentor, for the Girls of Steel team, Pittsburgh, PA   2011

  Co-taught high school girls principles of programming

  Co-taught high school girls elementary programming in Java

Computer Science Tutor, Wesleyan University   2008

  Aided classmates in Algorithms class with classwork

Software Developer, Humanitarian Free and Open Source Software   2008

  Developed Support Vector Machine algorithm for early detection of disease outbreak from news articles

  Developed User Interface to input articles and queries into the algorithm

After school tutor, La Macarena school, Quito, Ecuador   2004-2005

  Tutored elementary school students from low-income families with their classwork

  Addressed learning disability problems that often accompany unstable family environments

Computer and Robot Experience

Extended experience programming in C++, Python, MATLAB, Java, and experience programming in C

Extended experience working with Robot Operating System (ROS), UNIX and Windows systems

Extended experience working with the CMDragons team of Small-size soccer robots, equipped with omnidirectional wheeled bases, kicking and dribbling mechanisms, and a central vision system

Extended experience with the CoBot mobile robot, equipped with an omnidirectional wheeled base, a depth camera, a laser rangefinder, a RGB camera, wheel encoders, and an infrared marker detector

Experience working with the Amazon Robotics mobile warehouse robots, equipped with a differential drive base, fiducial-reading cameras and depth sensors

Experience working with the LandShark outdoor ground vehicle, equipped with wheel encoders, RGB and infrared cameras, Inertial Measurement Units, and a GPS sensor

Experience with the iRobot Create mobile robot, equipped with a non-holonomic wheeled base, a bumper sensor and wheel encoders

Publications

Philip Cooksey, Juan Pablo Mendoza and Manuela Veloso. Opponent-Aware Ball-Manipulation Skills for an Autonomous Soccer Robot. In *RoboCup 2016: Robot World Cup XX*, to appear. Best Paper Award Finalist.

Juan Pablo Mendoza, Reid Simmons and Manuela Veloso. Online Learning of Robot Soccer Free Kick Plans using a Bandit Approach. In *International Conference on Automated Planning and Scheduling (ICAPS)*, June 2016

Juan Pablo Mendoza, Joydeep Biswas, Philip Cooksey, Richard Wang, Steven Klee, Danny Zhu and Manuela Veloso. Selectively Reactive Coordination for a Team of Robot Soccer Champions. In *Proceedings of Association for the Advancement of Artificial Intelligence Conference (AAAI)*, February 2016.

Juan Pablo Mendoza, Joydeep Biswas, Danny Zhu, Richard Wang, Philip Cooksey, Steven Klee and Manuela Veloso. CMDragons 2015: Coordinated Offense and Defense of the SSL Champions. In *RoboCup 2015: Robot World Cup XIX*, January 2016.

Juan Pablo Mendoza, Manuela Veloso and Reid Simmons. Detecting and correcting model anomalies in subspaces of robot planning domains. In *Proceedings of International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS)*, May, 2015.

Juan Pablo Mendoza, Manuela Veloso and Reid Simmons. Plan Execution Monitoring through Detection of Unmet Expectations about Action Outcomes. In *Proceedings of the International Conference on Robotics and Automation (ICRA)*, May, 2015.

Juan Pablo Mendoza, Manuela Veloso and Reid Simmons. Focused Optimization for Online Detection of Anomalous Regions. In *Proceedings of the International Conference on Robotics and Automation (ICRA)*, June, 2014.

Joydeep Biswas, Juan Pablo Mendoza, Danny Zhu, Benjamin Choi, Steven Klee, and Manuela Veloso. Opponent-driven planning and execution for pass, attack, and defense in a multi-robot soccer team. In *Proceedings of International Conference on Autonomous Agents and Multi-Agent Systems (AAMAS)*, May, 2014.

Juan Pablo Mendoza, Manuela Veloso and Reid Simmons. Motion Interference Detection in Mobile Robots. In *Proceedings of the International Conference on Intelligent Robots and Systems (IROS)*, October 2012.

Juan Pablo Mendoza, Manuela Veloso and Reid Simmons. Mobile Robot Fault Detection based on Redundant Information Statistics. In *IROS Workshop on Safety in human-robot coexistence and interaction: How can standardization and research benefit from each other?*, October 2012.

Eric Aaron, Juan Pablo Mendoza, and Foster Nichols. Adaptive Obstacle Representations for Dynamical Navigation. In *Proceedings of the Twenty-Fifth International Florida Artificial Intelligence Research Society Conference (FLAIRS)*, May 2012.

Eric Aaron and Juan Pablo Mendoza. Dynamic Obstacle Representations for Robot and Virtual Agent Navigation. *Advances in Artificial Intelligence*, 2011: 1-12.

Eric Aaron and Juan Pablo Mendoza. Dynamic Obstacle Representations for Robot and Virtual Agent Navigation. In *Proceedings of the Canadian Conference on Artificial Intelligence*, May 2011.

Eric Aaron, Juan Pablo Mendoza and Henny Admoni. Integrated Dynamical Intelligence for Interactive Embodied Agents. In *Proceedings of the International Conference on Agents and Artificial Intelligence (ICAART)*, January 2011.

Press and Media

El Comercio article on RoboCup Victory, http://tinyurl.com/elcomercio-robocup   2015

Pittsburgh Post-Gazette article on RoboCup Victory, http://tinyurl.com/pg-robocup   2015

CMU Press Release on RoboCup Victory, http://tinyurl.com/cmdragons15-cmu-press   2015

CMDragons'15 RoboCup Highlights, http://tinyurl.com/cmdragons15-highlights   2015

CMDragons'15 RoboCup Finals Highlights, http://tinyurl.com/cmdragons15-final   2015