Manuela M. Veloso

Computer Science Department, Carnegie Mellon University, Pittsburgh PA 15213, U.S.A.
+1-412-268-1474, veloso@cs.cmu.edu, www.cs.cmu.edu/~mmv/

Academic Positions

current:

since 05/14	**University Professor**, Carnegie Mellon University
since 07/06	**Herbert A. Simon Professor**, Computer Science Department, Carnegie Mellon University
	Courtesy Professor, Robotics Institute, Machine Learning Department, Electrical and Computer Engineering Department, and Mechanical Engineering Department, Carnegie Mellon University

past:

09/13 - 08/14	**Visiting Professor**, Center for Urban Science and Progress (CUSP), New York University, sabbatical leave
08/06 - 07/07 -	**Sargent-Faull Fellow**, Radcliffe Institute for Advanced Study, Harvard University, sabbatical leave
07/02 - 06/06	**Professor**, Computer Science Department, Carnegie Mellon University
07/97 - 07/02	**Associate Professor**, Computer Science Department, Carnegie Mellon University
08/99 - 08/00	**Visiting Associate Professor**, Electrical Engineering and Computer Science Department, AI Lab, Massachusetts Institute of Technology, sabbatical leave
09/92 - 06/97	**Assistant Professor** Computer Science Department, Carnegie Mellon University
08/87 - 08/92	Research Assistant, Computer Science Department, Carnegie Mellon University
01/85 - 07/86	Teaching Assistant/Lecturer, Computer Science Department, Boston University
10/80 - 07/84	Teaching Assistant/Lecturer, Department of Electrical and Computer Engineering, Instituto Superior Técnico, Lisbon, Portugal

Education

1992	**Ph.D. in Computer Science** School of Computer Science, Carnegie Mellon University, Pittsburgh
1986	M.A. in Computer Science Computer Science Department, Boston University, Boston
1984	M.Sc. in Electrical and Computer Engineering Electrical and Computer Engineering Department, Instituto Superior Técnico, Lisbon, Portugal
1980	Licenciatura in Electrical Engineering Electrical and Computer Engineering Department, Instituto Superior Técnico, Lisbon, Portugal

Honors
Academic

- **University Professor**, since 2014.
- **Herbert A. Simon Chair**, since 2006.
- **Einstein Chair Professor**, 2012, awarded by the Chinese Academy of Sciences.
  (see http://en.cs.ustc.edu.cn/news_8/201201/t20120161_128841.html)
- **Finmeccanica Junior Faculty Chair**, 1994-1997.

Research Awards

- **AAAS Fellow**, the American Association for the Advancement of Science, elected December 2010.
- **IEEE Fellow**, the Institute of Electrical and Electronics Engineers, elected November 2010.
- **The 2009/10 Distinguished Alumna Award.** Boston University, Department of Computer Science.
- **The 2009 ACM/SIGART Autonomous Agents Research Award.** with citation: *"The selection committee for the ACM/SIGART Autonomous Agents Research Award is pleased to announce that Prof. Manuela M. Veloso of Carnegie Mellon University is the recipient of the 2009 award. Prof. Veloso has made significant and sustained contributions to Autonomous Agents and Multiagent Systems in the areas of planning and control learning in multi-agent systems. Prof. Veloso's research is particularly noteworthy for its focus on the effective construction of teams of robot agents where cognition, perception, and action are seamlessly integrated to address planning, execution, and learning tasks. She has made significant contributions to agents in uncertain and dynamic environments, including distributed robot localization and world modeling, strategy selection in multiagent systems in the presence of adversaries, planning by analogical reuse, and more recently, robot learning from demonstration. Her research contributions have also been realized concretely in the form of teams of robot soccer playing agents that have won several international championships at the annual RoboCup robot soccer competitions. Her impact and visibility has been consistently high over the past two decades for her technical contributions, for her impressive robot teams, and for her leadership within the research community."*
- **AAAI Fellow**, the Association for the Advancement of Artificial Intelligence, elected May 2003.
- **Allen Newell Excellence in Research** Award, 1997.
- **National Science Foundation Career** Award, 1995.
- **AT&T Information Systems Award for Outstanding Academic Achievement**, 1986.
- Fellowship from the National Institute for Scientific Research, Portugal, 1984-1987.

Best Paper Awards and Competitions

- Outstanding Paper Award, Twenty-Second on Artificial Intelligence (AAAI), "Thresholded Rewards: Acting Optimally in Timed Zero-Sum Games," C. McMillen and M. Veloso, 2007.
- The 2005 Professional Engineering (PE) Publishing Award, Journal of Systems and Control Engineering, "STP: Skills, Tactics and Plays for Multi-Robot Control in Adversarial Environments," B. Browning, J. Bruce, M. Bowling, and M. Veloso, 2007.
- Best Paper Award, European Conference on Case-Based Reasoning, "Retrieving and reusing game plays for robot soccer," R. Ros, M. Veloso, R. L. Mantaras, C. Sierra, and J. L. Arcos, 2006.
- Best Paper Award, International Conference on AI Planning Systems "Planning for distributed execution through use of probabilistic opponent models," P. Riley and M. Veloso, 2002.
- RoboCup Simulation League Placings: 1st (1998, 1999), 3rd (1997, 2000).
- RoboCup Small Robot League Placings: 1st (1997, 1998, 2006, 2007), 2nd (2008, 2010), QF (2009).
- RoboCup Sony AIBO Robot League Placings: 1st (1998, 2002), 2nd (2001), 3rd (1999, 2000, 2007).
- RoboCup Standard Platform League, NAO Humanoids, Placing: 2nd (2008), QF (2009), SF (2010).

Peer Community Service Honors

- **AAAI President** (2011-2016), Elect (2011–2012), Past (2015–2016)
- **President**, The RoboCup Federation, (2008–2011).
- **Vice-President**, The RoboCup Federation, (2000–2008).
- **Trustee and co-Founder**, The RoboCup Federation, 1997 – present.
- Member of the CRA-W Board, since 2009.
- **Trustee** of IJCAII, 2005–2009.

- Member of the Robot Hall of Fame Jury, since 2005.
- **IJCAI'07 Program Chair**, the Twentieth International Joint Conference on Artificial Intelligence, Hydebarad, India, 2007.
- **AAAI'05 Program Co-Chair**, the Twentieth National Conference on Artificial Intelligence), 2005.

Teaching

- Founder and co-Director of the "V-Unit", a project-based course for graduate students to have an opportunity "to grow a Vision" on how technology can address and impact societal problems (www.cs.cmu.edu/˜vunit/), since 2004.
- AI for Sustainability and Health Care (graduate)
- CMRoboBits: Creating Complete Intelligent Robots (undergraduate)
- Planning, Execution, and Learning (graduate)
- Introduction to Artificial Intelligence (undergraduate)
- Artificial Intelligence (graduate)
- Multiagent Systems: Theory and Hands-On Experience (graduate)
- Embodied Intelligence (graduate) - MIT 6.836
- Artificial Intelligence (undergraduate) - MIT 6.034
- Fundamentals of Computer Science
- Several conference tutorials and short courses on *Robot Soccer* and on *Planning and Learning*

Brief Research Highlights *(see www.cs.cmu.edu/˜ mmv/ for updated* **publications** *and details)*

I research in artificial intelligence and robotics. My long-term research goal is the effective construction of autonomous agents where cognition, perception, and action are combined to address planning, execution, and learning tasks. My vision is that multiple intelligent robots with different sets of complementary capabilities will provide a seamless synergy of intelligence. With my students, I investigate effective planning, execution, and learning algorithms for autonomous robots and agents within my CORAL laboratory.

Sampled Recent Research Highlights - June 2014

- **Symbiotic Autonomy** (Ongoing, Stephanie Rosenthal's PhD Thesis, May 2012, Joydeep Biswas, PhD Thesis, December 2014, expected) - We have introduced the concept of "symbiotic autonomy" in which intelligent robots are aware of their perceptual, cognitive, and actuation limitations, and know how to address such limitations: they rely on asking for help from humans in the environments for what they are not able to perform, or accessing the web for what they miss to know. Our mobile collaborative robots, CoBots, have been running in our multi-floor buildings under this new symbiotic autonomy, completely unsupervised performing tasks for users. For the last three years, they have navigated for more than 500km. With this novel symbiotic autonomy approach, robots have a potential to be effectively viable in many applications, ranging from providing intelligent telepresence, and assisting and helping disabled people, elderly, and humans in general (further extended information below). http://www.cs.cmu.edu/˜coral/cobot
- **Multiagent Planning with Transfers** (Brian Coltin's PhD Thesis, May 2014) - We have introduced a novel planning and scheduling algorithm for pickup and delivery tasks with multiple autonomous mobile agents, such as robots or vehicles. The algorithm searches for possible transfers and plans for routes where vehicles can transfer carried items, in order to improve total task metrics, such as traveled time and fuel. The algorithm extensively includes a variety of vehicle capacity, route, item, time, fuel and global situation-dependent constraints. We have demonstrated the benefits of planning

with transfers in benchmark problems, as well as to sampled data from pickup and delivery tasks in the cities of New York and San Francisco.

- **Multiagent Learning for the Smart Grid** (Prashant Reddy's PhD Thesis, December 2013) - Following up on our extensive research in distributed agents in complex environments, we focused on researching on modeling the Smart Grid as a distributed multiagent system with broker, customer, and producer agents. We have modeled the complex state, actions, and goals and research on autonomous learning agents that can lead to a sustainable Smart Grid environment.

- **Short-Sighted Probabilistic Planning** (Felipe Trevizan's PhD Thesis, August 2013) - Classical planning, inaccurately, assumes that the world is deterministic, and while probabilistic planning models the uncertainty in the world, but is computationally expensive. We have introduced short-sighted probabilistic planning, in which the planner uses a complete model of uncertainty within a neighborhood of the state of the agent, while it switches to using a deterministic model or heuristic estimation outside of its short sighted neighborhood. The planner successfully combines computational efficiency with an accurate model of the world.

- **Representation, Planning, and Learning of Dynamic Ad Hoc Robot Teams** (Somchaya Liemhetcharat, August 2013) - Forming task-effective teams of agents is a complex problem that was previously addressed just in terms of the capabilities of individual agents. We have contributed a new representation for the capabilities of multiple agents as a Synergy Graph, where the individual capabilities are represented associated with nodes in the graph, while an edge between two nodes captures the synergistic value of the joint task performance of the two node agents. We then introduced a team formation algorithm, as well as a learning algorithm to learn the synergy graph from observation of ad hoc team performance. We have demonstrated the effectiveness of the Synergy Graph representation, planning, and learning in a variety of robot platforms.

Other Sampled Highlights - June 2014

- I founded and direct the CORAL research group for the study of agents, robots, that Collaborate, Observe, Reason, Act and Learn. Since 1992. (www.cs.cmu.edu/~coral/). The CORAL lab has had, at a time, a maximum of twenty five members, and an average of fifteen members.

- My CORAL research lab has a large number of functioning robots, including four large human-size wheeled robots (CoBots), and twelve small-size wheeled soccer playing robots (CMDragons) constructed by a lab member, ten humanoid NAO robots, thirty two AIBO robots, and a variety of other robots for educational purposes.

- As of September 2014, I have graduated twenty nine Ph.D. students, and currently advise ten Ph.D. students. I have advised more than forty undergraduate and master students.

- I have supervised thirteen PostDoctoral Fellows, and currently I work with one PostDoctoral Fellow. I have been a member of the PhD thesis committees of more than twenty Ph.D. students, and I have hosted more about twenty Ph.D. students for a few months visits.

- Patent: Method of Autonomous Machine Learning, Astro Teller and Manuela Veloso, Patent Number 5,781,698, July 14, 1998.