

Pedro Sequeira

Associate Research Scientist @ Northeastern University

Artificial Intelligence – Machine Learning – Reinforcement Learning – Cognitive Systems – Human-Robot Interaction

Summary

I am an associate research scientist at Northeastern University working in the Cognitive Embodied Social Agents Research (CESAR) lab, led by Prof. Stacy Marsella. My research interests are mainly in the area of artificial intelligence (AI), and involve the creation of autonomous and adaptive systems that learn and reason under uncertainty. My approach is to create machine learning (ML) systems inspired by how humans learn and make decisions and use ML techniques to better understand how humans learn and make decisions in complex tasks. This has led to novel combinations and development of ML techniques and evolutionary mechanisms.

I currently do research in the topic of modeling human decision-making. I created a technique for automated cognitive behavior analysis (ACBA) aimed at discovering the underlying structures of human decision-making by using genetic programming. I also participate in the CRISP I (NSF CMMI) initiative in the modeling and implementation of AI decision-makers in the context of pharmaceutical supply-chains. I regularly give invited lectures on the topic of reinforcement learning (RL) for the Foundations of AI course at Northeastern.

Experience

Associate Research Scientist

Oct. 2016 – Present

Northeastern University, Cognitive Embodied Social Agents Research (CESAR) lab

Research on using ACBA to study human negotiation behavior, problem-solving and learning from demonstration. Participation in the NSF CMMI initiative **CRISP Type 1** (Multi-agent Modeling Framework for Mitigating Distributed Disruptions in Critical Supply Chains).

Postdoctoral Associate

Nov. 2013 – Sep. 2016

Intelligent Agents and Synthetic Characters Group (GAIPS) at INESC-ID, Lisbon

Research on the field of RL in multiagent systems and robotics, and on evolutionary game theory. Participation in the CMU-Portugal project **INSIDE** in the creation of methodologies to collect data and develop the robot's interaction behavior, in the context of HRI for children with Autism disorder. Participation in the EU-funded FP7 project **EMOTE** in the development of AI and machine learning techniques to manage the game-play and autonomous interactive behavior of a robotic tutor. Participation in the **CoWriter** project in the context of using robots to aid in the development of children's writing skill.

Research Assistant

2005 – 2013

Research on the field of RL and biologically-inspired learning models.

Education

Ph.D. in Information Systems and Computer Engineering

2008 – 2013

Instituto Superior Técnico, Universidade de Lisboa

Socio-Emotional Reward Design for Intrinsically Motivated Learning Agents

Thesis focused on building more flexible and robust reward mechanisms for intrinsically-motivated RL
Advisors: Prof. Ana Paiva, Prof. Francisco S. Melo

M.Sc. of Information Systems and Computer Engineering (post-Bologna)

2006 – 2007

Instituto Superior Técnico, Universidade de Lisboa

Learning To Interact: Connecting Perception with Action in Virtual Environments

5 yr Degree in Information Systems and Computer Engineering (pre-Bologna)

2001 – 2006

Instituto Superior Técnico, Universidade de Lisboa

"What Can I Do With This?" Finding Possible Interactions Between Characters and Objects

Contacts

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College of Computer and
Information Science

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Links

- web.northeastern.edu/cesar/psequeira
- scholar.google.com
- [github/pedrobs](https://github.com/pedrobs)
- [linkedin/p-sequeira](https://www.linkedin.com/in/p-sequeira)
- [researchgate/pedro_sequeira](https://www.researchgate.net/profile/pedro_sequeira)

Technical Skills

- C#, C, C++, python, ROS, Matlab, Java, Lisp, and others;
- Unity, Ogre 3D, 3DS Max, and others;
- D3.js, HTML, JavaScript, PHP, CSS, and others

Languages

- *English* – speak fluently and read/write with high proficiency
- *Portuguese* – native language
- *French and Spanish* – speak, read, and write with basic competence

Other Training

18th Machine Learning Summer School (MLSS'11) 2011

Organization: INRIA and PASCAL, Bordeaux, France.

Topics: Learning Theory, Bayesian inference, Monte Carlo Methods, Sparse Methods, Reinforcement Learning, Robot Learning, Convex Optimization, Graphical Models, etc.

FIAS Winter School on Intrinsic Motivations: From Brains to Robots 2012

Organization: Frankfurt Institute for Advanced Studies (FIAS), Frankfurt am Main, Germany.

Topics: Intrinsic Motivations (biological and computational perspective), Robot Control, Developmental Robotics, Reinforcement Learning, Self-Organizing Complex Robotics, Action Discovery in Animals, etc.

Other Professional Experience

Internship 2009

Institute for Creative Technologies (ICT) / University of Southern California (USC)

Research intern at the Institute of Creative Technologies under the supervision of Prof. Stacy Marsella, during which I investigated the influence of emotions, social and cultural factors in the human learning process.

Developer / Researcher 2006 – 2008

Intelligent Agents and Synthetic Characters Group (GAIPS) at INESC-ID, Lisbon

Participation in the European Union-funded eCircus (FearNot!) and Orient projects as a software developer and researcher. Development of a framework for the integration of the autonomous agents' architecture with the graphical engine responsible for the representation and coordination of all the characters, objects, sets and cameras of the 3D virtual environment.

Teaching Experience

Invited Lectures 2016 – 2018

Northeastern University, College of Computer and Information Science

RL I and II, *Foundations of Artificial Intelligence (CS 5100)*: Fall 2016, Fall 2017, Spring 2018

Introduction to RL, *Game Artificial Intelligence (CS 5150)*: Spring 2017

Invited Assistant Professor 2016

Instituto Superior Técnico, Universidade de Lisboa

Responsible for teaching some theoretical classes and supervising and grading laboratory classes and projects for the *Autonomous Agents and Multi-Agent Systems* course, corresponding to the 1st year of the MSc Degree in Information Systems and Computer Engineering.

Teaching Assistant 2006 – 2007

Instituto Superior Técnico, Universidade de Lisboa

Responsible for teaching, supervising and grading laboratory and home assignments for the *Human-Computer Interaction* and *Computer Graphics* courses, corresponding respectively to the 3rd and 2nd years of the B.Sc. Degree in Information Systems and Computer Engineering.

Publications

Refereed Journal Articles

Emergence of emotional appraisal signals in reinforcement learning agents

P. Sequeira, F. S. Melo, and A. Paiva

Autonomous Agents and Multi-Agent Systems, vol. 29, no. 4, pp. 537–568, Jul. 2015.

Learning by appraising: an emotion-based approach to intrinsic reward design

P. Sequeira, F. S. Melo, and A. Paiva
Adaptive Behavior, vol. 22, no. 5, pp. 330–349, 2014.

Selected Refereed Conference Papers

Analyzing Human Negotiation using Automated Cognitive Behavior Analysis: The Effect of Personality

P. Sequeira and S. Marsella

Proceedings of the 40th Annual Meeting of the Cognitive Science Society (CogSci 2018), 2018, p. to appear.

An Integrated Simulation Framework for Examining Resiliency in Pharmaceutical Drug Supply Chain Considering Human Behaviors Component.

R. Doroudi, R. Azghandi, Z. Feric, O. Mohaddesi, P. Sequeira, Y. Sun, J. Griffin, O. Ergun, C. Hartevelde, D. Kaeli, and S. Marsella.

Proceedings of the 2018 Winter Simulation Conference, (WSC 2018), p. to appear, 2018.

Towards Modeling Agent Negotiators by Analyzing Human Negotiation Behavior

Y. Xu, P. Sequeira, and S. Marsella

Proc. of the 7th Int. Conference on Affective Computing and Intelligent Interaction (ACII 2017), 2017, pp. 58-64.

The Role that an Educational Robot Plays

P. Alves-Oliveira, P. Sequeira, and A. Paiva

Proc. of the 25th IEEE Int. Symposium on Robot and Human Interactive Communication (RO-MAN 2016), 2016.

Children's Peer Assessment and Self-disclosure in the Presence of an Educational Robot

S. Chandra, P. Alves-Oliveira, S. Lemaignan, P. Sequeira, A. Paiva, and P. Dillenbourg

Proc. of the 25th IEEE Int. Symposium on Robot and Human Interactive Communication (RO-MAN 2016), 2016.

Emergence of Emotional Appraisal Signals in Reinforcement Learning Agents (JAAMAS Extended Abstract)

P. Sequeira, F. S. Melo, and A. Paiva

Proc. of 15th Int. Joint Conf. on Autonomous Agents and Multiagent Systems (AAMAS 16), 2016, pp. 466–467.

Discovering Social Interaction Strategies for Robots from Restricted-Perception Wizard-of-Oz Studies

P. Sequeira, P. Alves-Oliveira, T. Ribeiro, E. Di Tullio, S. Petisca, F. S. Melo, G. Castellano, and A. Paiva

Proc. of the 11th ACM/IEEE International Conference on Human-Robot Interaction (HRI 2016), 2016, pp. 197–204.

Best Paper Award on HRI Interaction Design

“It’s amazing, we are all feeling it!” Emotional Climate as a Group-Level Emotional Expression in HRI

P. Alves-Oliveira, P. Sequeira, E. Di Tullio, S. Petisca, C. Guerra, F. S. Melo, and A. Paiva

Artificial Intelligence and Human-Robot Interaction, AAAI Fall Symposium Series (AI-HRI), 2015.

“Let’s Save Resources!”: A Dynamic, Collaborative AI for a Multiplayer Environmental Awareness Game

P. Sequeira, F. S. Melo, and A. Paiva

Proc. of the 2015 IEEE Conference on Computational Intelligence and Games (CIG 2015), 2015, pp. 399–406.

The Development of Cooperation in Evolving Populations through Social Importance

P. Sequeira, S. Mascarenhas, F. S. Melo, and A. Paiva

Proc. 5th Int. Conf. on Development and Learning and on Epigenetic Robotics (ICDL-EpiRob), 2015, pp. 308–313.

Can a Child Feel Responsible for Another in the Presence of a Robot in a Collaborative Learning Activity?

S. Chandra, P. Alves-Oliveira, S. Lemaignan, P. Sequeira, A. Paiva, and P. Dillenbourg

Proc. 24th IEEE Int. Symp. on Robot and Human Interactive Communication (RO-MAN 2015), 2015, pp. 167–172.

The “Favors Game”: A Framework to Study the Emergence of Cooperation through Social Importance (Ext Abstract)

P. Sequeira, S. Mascarenhas, F. S. Melo, and A. Paiva

Proc. of the 14th Int. Joint Conf. on Autonomous Agents and Multiagent Systems (AAMAS 15), 2015, pp. 1899–1900.

The Influence of Social Display in Competitive Multiagent Learning

P. Sequeira, F. S. Melo, and A. Paiva

Proc. 4th Int. Conf. on Development and Learning and on Epigenetic Robotics (ICDL-EpiRob), 2014, pp. 64–69.

An Associative State-Space Metric for Learning in Factored MDPs

P. Sequeira, F. S. Melo, and A. Paiva

Proceedings of the 16th Portuguese Conference on Artificial Intelligence (EPIA 2013), 2013, pp. 163–174.

Emotion-Based Intrinsic Motivation for Reinforcement Learning Agents

P. Sequeira, F. S. Melo, and A. Paiva

Proc. 4th Int. Conference on Affective Computing and Intelligent Interaction (ACII 2011), 2011, pp. 326–336.

Best Paper Award

Emerging social awareness: Exploring intrinsic motivation in multiagent learning

P. Sequeira, F. S. Melo, R. Prada, and A. Paiva

Proc. 1st Int. Conf. on Development and Learning and on Epigenetic Robotics (ICDL-EpiRob 2011), 2011, pp. 1–6.

Best Poster Award

Learning to Interact: Connecting Perception with action in Virtual Environments (Extended Abstract)

P. Sequeira and A. Paiva

Proc. 7th Int. Joint Conf. on Autonomous Agents and Multiagent Systems (AAMAS 08), 2008, pp. 1257–1260.

“What Can I Do With This?”: Finding Possible Interactions Between Characters And Objects

P. Sequeira, M. Vala, and A. Paiva

Proc. 6th Int. Joint Conf. on Autonomous Agents and Multiagent Systems (AAMAS 07), 2007, pp. 14–18.

Thesis

Socio-Emotional Reward Design for Intrinsically Motivated Learning Agents

P. Sequeira

Ph.D. Thesis, Instituto Superior Técnico, Universidade de Lisboa, 2013.

Awards

Best Paper Award on HRI Interaction Design at the 11th Int. Conf. on Human-Robot Interaction (HRI 2016)

Best Paper Award at the 4th Int. Conference on Affective Computing and Intelligent Interaction (ACII 2011)

Best Poster Award at the 1st Int. Conf. on Develop. and Learning and on Epigenetic Robotics (ICDL-EpiRob 2011)

Best Demo Award at the 6th Int. Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS’07)

Contributions to the Field

Organization

Co-organized the First International Workshop on Educational Robots (WONDER 2015) @ ICSR 2015

Reviewing & Program Committees

Senior PC member

Int. Joint Conference on Artificial Intelligence (IJCAI)

2017

PC member

Int. Joint Conference on Artificial Intelligence (IJCAI)

2016–2018

Int. Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS)

2016–2018

National Conference on Artificial Intelligence (AAAI)

2018

Int. Conference on Affective Computing (ACII)

2017

Reviewer

Journal of Artificial General Intelligence (JAGI); Artificial Intelligence (AI); Transactions on Human-Computer Interaction (TOCHI); Journal of Human-Robot Interaction (JHRI); Int. Conference on Machine Learning (ICML); Advances in Neural Information Processing Systems (NIPS); Int. Conference on Social Robotics (ICSR); Int. Conference on Intelligent Robots and Systems (IROS); Int. Conference on Human-Robot Interaction (HRI).