

Alejandro Agostini

PI Austrian Science Fund (FWF) project

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Short Biography

- Since 2019. Principal Investigator. Austrian Science Fund (FWF) projects. University of Innsbruck, Austria.
- 2019-2021. Group Leader. Department of Electrical and Computer Engineering, Technical University of Munich, Germany.
- 2011-2018. Group Leader. Bernstein Center for Computational Neuroscience, University of Göttingen, Germany.
- 2011. PhD in Artificial Intelligence. Polytechnic University of Catalonia, Spain.
- 2005-2011. Graduate Research Position. Spanish Research Council (CSIC).
- 2008. Eng. Degree in Electronic Engineering. Polytechnic University of Catalonia, Spain.
- 2003-2005. Graduate Research Grant. Spanish Research Council (CSIC).
- 2004. Dipl. in Informatics. Polytechnic University of Catalonia, Spain.
- 2002-2003. Graduate Research Grant. Polytechnic University of Catalonia, Spain.
- 2001-2002. Head of Department and Deputy Director. Health Care Ministry of Salta, Argentina.
- 2000-2001. Private Consultant to the Health Minister. Health Care Ministry of Salta, Argentina.
- 1999. Eng. Degree in Bioengineering. National University of Entre Rios, Argentina.

Research Interests

My current field of research covers machine learning in robotics, combined task and motion planning, reinforcement learning, and cognitive systems for life science applications.

Projects

- **ABSTRACTRON** (EUREGIO Project). Conceptual Abstraction in Humans and Robots. 2024 - 2027.
- PURSUIT (Principal Investigator FWF Project). Purposeful Signal-symbol Relations for Manipulation Planning. 2023 - 2027.
- SEAROCO (Lise Meitner FWF Project). Seamless Levels of Abstraction for Robot Cognition. 2019 - 2023.
- **ALAIVE** (Innovation Project - SNIC). Automatic Control of Living Systems using Artificial Intelligence and Advanced Sensing. 2018 - 2019.
- **RECONCELL** (FoF EU Project). A Reconfigurable Robot Work-cell for Fast Set-up of Automated Assembly Processes in SMEs. 2015 - 2019.
- **XPERIENCE** (IP EU Project). Robots Bootstrapped through Learning from Experience. 2011 - 2016.
- **INTELLACT** (STREP EU Project). Intelligent Observation and Execution of Actions and Manipulations. 2011 - 2014.
- **GARNICS** (STREP EU Project). Gardening with a Cognitive System. 2010 - 2013.
- **PACO-PLUS** (IP EU Project). Perception, Action, and Cognition through learning Object-Action Complexes. 2006 - 2010.
- **SIRVENT** (CSIC). Reconfigurable System for Vision Based Navigation of Legged and Wheeled Robots in Natural Environments. 2003 - 2006.
- **CARREL** (UPC, Puigvert Foundation and Hospital Santa Creu i Sant Pau). Development of multi-agent architecture for intelligent management of organs and tissues for transplantation. 2002 - 2003.

Teaching

- Machine Learning. University of Innsbruck. SoSe 2022.
- Machine Learning in Robotics. Technical University of Munich. SoSe 2020-2021.
- Reinforcement Learning for Robotics. Technical University of Munich. WS 2019-2020. WS 2020-2021.
- Advanced Seminar Autonomous System. Technical University of Munich. WS 2019-2020. SoSe 2020.
- Project Laboratory Human-centered Robotics. Technical University of Munich. WS 2019-2020.
- Mathematics II. National University of Entre Ríos, Argentina. SoSe and WS 1997.

Publications

Journal Articles

1. Urbaniak, D., Agostini, A., Ramon, P., Rosell, J., Suárez, R., & Suppa, M. (2026). Obstacle Avoidance using Dynamic Movement Primitives and Reinforcement Learning. IEEE Robotics and Automation Letters 11 (5), pp. 5414–5421, 2026. DOI: 10.1109/LRA.2026.3671568.
2. Paulius*, D., Agostini*, A., Lee, D. (2023). Long-Horizon Task and Motion Planning with Functional Object-Oriented Networks. (*) Co-first author. IEEE Robotics and Automation Letters, 8(8), 4513-4520. DOI: 10.1109/LRA.2023.3285510.
3. Agostini, A., Saveriano, M., Lee, D., Piater, J. (2020). Manipulation Planning Using Object-Centered Predicates and Hierarchical Decomposition of Contextual Actions. IEEE Robotics and Automation Letters, 5(4), 5629-5636. DOI: 10.1109/LRA.2020.3009063.

4. Lüddecke, T., Agostini, A., Fauth, M., Tamosiunaite, M., Wörgötter, F. (2019). Distributional Semantics of Objects in Visual Scenes in Comparison to Text. Artificial Intelligence, 274, 44-65. DOI:10.1016/j.artint.2018.12.009. Elsevier.
5. Freudenberg, M., Nölke, N., Agostini, A., Urban, K., Wörgötter, F., Kleinn, C. (2019). Large Scale Palm Tree Detection in High Resolution Satellite Images using U-Net. Remote Sensing, 11(3), 312. DOI: 10.3390/rs11030312. MDPI.
6. Agostini, A., Torras, C., Wörgötter, F. (2017). Efficient Interactive Decision-making Framework for Robotic Applications. Artificial Intelligence, 247:187–212. DOI: 10.1016/j.artint.2015.04.004. Elsevier.
7. Agostini, A., Celaya, E. (2017). Online Reinforcement Learning Using a Probability Density Estimation. Neural Computation, 220-246, 29, 1. DOI: 10.1162/NECO_a_00906. MIT Press.
8. Agostini, A., Alenya, G., Fischbach, A., Scharr, H., Wörgötter, F., and Torras, C. (2017). A Cognitive Architecture for Automatic Gardening. Computers and Electronics in Agriculture, 69–79, 138. DOI: 10.1016/j.compag.2017.04.015. Elsevier.
9. Celaya, E., Agostini, A. (2015). Online EM with Weight-Based Forgetting. Neural Computation, 1142 - 1157, 27, 5. DOI: 10.1162/NECO_a_00723. MIT Press.
10. Agostini, A., Torras, C., Wörgötter, F. (2014). Learning Weakly Correlated Cause-effects for Gardening with a Cognitive System. Engineering Applications of Artificial Intelligence, 178–194, 36. DOI: 10.1016/j.engappai.2014.07.017. Elsevier.
11. Krüger, N., Piater, J., Geib, C., Petrick, R., Steedman, M., Wörgötter, F., Ude, A., Asfour, T., Kraft, D., Omrcen, O., Agostini, A., and Dillmann, R. (2011). Object-Action Complexes: Grounded Abstractions of Sensorimotor Processes. Robotics and Autonomous Systems, 740 - 757, 59, 10. DOI: 10.1016/j.robot.2011.05.009. Elsevier.
12. Wörgötter, F., Agostini, A., Krüger, N., Shylo, N., Porr, B. (2009). Cognitive Agents - A Procedural Perspective relying on the Predictability of Object-Action-Complexes. Robotics and Autonomous Systems. Volume 57, Issue 4. pp. 420-432. DOI: 10.1016/j.robot.2008.06.011. Elsevier.

Refereed Conference Papers

1. Geiss, H. J., Hollenstein, J., Agostini, A., Posner, I., and Piater, J. (2026). Compact Symbolic Representation Learning for Efficient Planning from Unsupervised Interaction. In Joint European Conference on Machine Learning and Knowledge Discovery in Databases (pp. 503-521). DOI: 10.1007/978-3-032-37667-1_29. Cham: Springer Nature Switzerland.
2. Paulius, D., Agostini, A., Quartey, B., and Konidaris, G. (2025). Bootstrapping Object-level Planning with Large Language Models. In: IEEE International Conference on Robotics and Automation (ICRA). pp. 16233-16239. DOI: 10.1109/ICRA55743.2025.11127365. IEEE.
3. Paulius, D., Agostini, A., and Konidaris, G. (2024). From Language to Action with Object-level Planning. In 2nd CoRL Workshop on Learning Effective Abstractions for Planning (CoRL).
4. Orbik, J., Agostini, A., and Lee, D (2021). Inverse Reinforcement Learning for Dexterous Hand Manipulation. In: IEEE International Conference on Development and Learning (ICDL). pp. 1-7. DOI: 10.1109/ICDL49984.2021.9515637. IEEE.
5. Urbaniak, D., Agostini, A., and Lee, D (2021). Combining Task and Motion Planning using Policy Improvement with Path Integrals. In: IEEE International Conference on Humanoid Robots (HUMANOIDS). pp. 149-155. DOI: 10.1109/HUMANOIDS47582.2021.9555684. IEEE.
6. Paulius, D., Agostini, A., Sun, Y., and Lee, D. (2021). A Road-map to Robot Task Execution with the Functional Object-Oriented Network. International Conference on Ubiquitous Robots (UR). WIP.
7. Agostini, A., Wörgötter, F. (2019). Automatic Control of the Growth of Plants using Artificial Intelligence and Internet Technology. In: Poster Proceedings of the 12th European Conference on Precision Agriculture (ECPA). pp. 12-13. SupAgro Montpellier. ISBN 978-2-900792-49-0.
8. Mustafa, W., Waechter, M., Szedmak, S., Agostini, A., Kraft, D., Asfour, T., Piater, J., Wörgötter,

F., and Krüger, N. (2016). Affordance Estimation for Vision-Based Object Replacement on a Humanoid Robot. Proceedings of 47st Int. Symposium on Robotics (ISR), pp. 164-172.
9. Agostini, A., Aein, M.J., Szedmak, S., Aksoy, E.E., Piater, J., Wörgötter, F. (2015). Using Structural Bootstrapping for Object Substitution in Robotic Executions of Human-like Manipulation Tasks. IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS), 6479-6486. DOI: 10.1109/IROS.2015.7354303. IEEE.
10. Quack, B., Wörgötter, F., Agostini, A. (2015). Simultaneously Learning at Different Levels of Abstraction. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), pp. 4600-4607. DOI: 10.1109/IROS.2015.7354032. IEEE.
11. Agostini, A., Torras, C., Wörgötter, F. (2011). Integrating Task Planning and Interactive Learning for Robots to Work in Human Environments. International Joint Conference on Artificial Intelligence (IJCAI), pp. 2386-2391. AAAI Press.
12. Agostini, A. and Celaya, E. (2011). A Competitive Strategy for Function Approximation in Reinforcement Learning. International Joint Conference on Artificial Intelligence (IJCAI), pp. 1146-1151. AAAI Press.
13. Agostini, A. and Celaya, E. (2010). Reinforcement Learning for Robot Control Using Probability Density Estimations. Proc. of the 7th International Conference on Informatics in Control, Automation and Robotics (ICINCO), pp. 160-168.
14. Agostini, A. and Celaya, E. (2010). Reinforcement Learning with a Gaussian Mixture Model. International Joint Conference on Neural Networks (IJCNN), pp. 3485-3492. DOI: 10.1109/IJCNN.2010.5596306. IEEE.
15. Agostini, A. and Celaya, E. (2009). Exploiting Domain Symmetries in Reinforcement Learning with Continuous State and Action Spaces. Int. Conf. on Machine Learning and Applications (ICMLA), pp. 331-336. IEEE.
16. Agostini, A. and Celaya, E. and Torras, C. and Wörgötter, F. (2008). Action Rule Induction from Cause-Effect Pairs Learned through Robot-Teacher Interaction. International Conference on Cognitive Systems (COGSYS), pp. 213-218.
17. Agostini, A. and Celaya, E. (2005). Feasible Control of Complex Systems using Automatic Learning. Proc. of the 2nd International Conference on Informatics in Control, Automation and Robotics (ICINCO), pp. 284-287.
18. Agostini, A. and Celaya, E. (2004). Learning Model-Free Motor Control. Proc. of the 16th European Conference on Artificial intelligence (ECAI), pp. 947-948.
19. Agostini, A. and Celaya, E. (2004). Trajectory Tracking Control of a Rotational Joint using Feature-Based Categorization Learning. IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS), pp. 3489-3494. IEEE.
20. Agostini, A. and Celaya, E. (2004). Learning in Complex Environments with Feature-Based Categorization. In Proc. of the 8th Conference on Intelligent Autonomous Systems (IAS), pp. 446-455.
21. Agostini, A. and Celaya, E. (2004). Applying Categorization to Improve Learning in Complex Environments. 1a Jornada de Recerca en Automàtica, Visió i Robòtica: 263-268.
22. Rollón, E., Isern D., Agostini, A., and Cortes, U. (2003). Towards the distributed management of emergencies: forest fires case study. Workshop on Environmental Decision Support Systems. International Joint Conference on Artificial Intelligence (IJCAI), pp. 77–82. AAAI press.
23. Agostini, A. (2002). Multiagent System for an Intelligent Domiciliary Monitoring of Patients with Cardiovascular Pathologies (in Spanish). Open Discussion Track. Proceedings of the VIII Iberoamerican Conference on Artificial Intelligence (IBERAMIA), pp. 205–210.
24. Agostini, A. and Barreiro, J. (2001). New Hospital El Milagro: Model for the Private Management in the Public Health. In proceedings of the VII Jornadas Internacionales de Ingeniería y Mantenimiento Hospitalario. FIUNER.
25. Agostini, A., Gamero, L., and Rumi, P. (2000). Clinical Application of the Matlab Toolbox VFCLab for the Analysis of the Heart Rate Variability (in Spanish). In Proc. of the XVII Brazilian

Conference in Biomedical Engineering (CBEB).
26. Agostini, A., Gamero, L., and Rumi, P. (1999). VFCLab: Matlab Toolbox for the Analysis of the Heart Rate Variability (in Spanish). In Proc. of the XII Argentinean Conference of Bioengineering (SABI).

Other Publications

1. Agostini, A., & Lee, D. (2020). Efficient state abstraction using object-centered predicates for manipulation planning. arXiv preprint arXiv:2007.08251.
2. Agostini, A. PLANTAR: Automatic control of the growth of plants using artificial intelligence and Internet Technology (2018). URL: https://alaive.github.io/agriculture.html. Accessed: 2022-11-01. Technology transference prototype. ALAIVE, Südniedersachsen Innovations Campus (SNIC).
3. Agostini, A. HRV2: Internet Platform for the Intelligent Monitoring of Cardiovascular Patients using Wearable Technology (2015). URL: https://alaive.github.io/healthcare.html. Accessed: 2022-11-01. Technology transference prototype. ALAIVE, Südniedersachsen Innovations Campus (SNIC).
4. Agostini, A. and Celaya, E. (2014). Competitive function approximation for reinforcement learning. Technical report, IRI-TR-14-05. Institut de Robtica i Informtica Industrial. UPC-CSIC. (Barcelona, Spain).
5. Agostini, A., Wörgötter, F., Celaya, E., and Torras, C. (2008). On-line learning of macro planning operators using probabilistic estimations of cause-effects. Technical report, IRI-TR 05/2008. Institut de Robtica i Informtica Industrial. UPC-CSIC. (Barcelona, Spain).

Theses

1. Agostini, A. (2011). Q-Learning with a Degenerate Function Approximation. Polytechnic University of Catalonia (UPC), Spain. PhD Thesis.
2. Agostini, A. (1999). Mathematical Analysis of the Heart Rate Variability and Its Clinical Implications (in Spanish). National University of Entre Ríos. Eng. Degree Thesis.

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