Alberto Castellini

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Personal data (dati personali)

- Nationality and citizenship: Italian
- Languages: Italian (mother tongue), English (advanced)
- Address: Strada le Grazie, 15 - 37134 Verona, Italy
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Academic/Professional History (attività ricerca, partecipazione a gruppi di ricerca)

- Associate professor, ING-INF/05, Department of Computer Science, Verona University, Italy (11/2024 - Present).

  Projects: i) SINERGHY - Sustainable and INnovative Energy systems for Renewables and Green HYdrogen (POR 2024-2027, Principal Investigator). *ii)* NOVA - Navigation-Oriented VLA model with Uncertainty-Aware Reasoning (NVIDIA Academic Grant Program), *iii)* BEHAVE: Learning Safe Behaviours for human-robot cooperation (PNRR MUR project PE0000013-FAIR, 2024-2025). *iv)* iNEST - Interconnected Nord-Est Innovation Ecosystem (Unione Europea e Ministero delle Imprese e del Made in Italy).

  Research group: Intelligent Systems Lab (ISLa) - Prof. Alessandro Farinelli (`https://www.di.univr.it/?ent=grupporic&id=451`).

- Temporary assistant professor type B (RTD-B), ING-INF/05, Department of Computer Science, Verona University, Italy (11/2021 - 10/2024).

  Projects: i) SAFE PLACE: Sistemi IoT per ambienti di vita salubri e sicuri (POR 2014-2020), *ii)* iNEST - Interconnected Nord-Est Innovation Ecosystem (Unione Europea e Ministero delle Imprese e del Made in Italy), *iii)* Analisi comparativa di soluzioni basate su algoritmi evolutivi per VRP generalizzato e multi-obiettivo (HPA S.r.l.).

  Research group: Intelligent Systems Lab (ISLa) - Prof. Alessandro Farinelli.

- Temporary assistant professor type A (RTD-A), INF/01, Department of Computer Science, Verona University, Italy (10/2018 - 10/2021).

  Projects: i) Computer Engineering for Industry 4.0 (dipartimento eccellenza 2018-2022), *ii)* GHOTEM: Global House Thermal & Electrical Energy Management, *iii)* COREWOOD: Riposizionamento competitivo del la filiera del legno, *iv)* PREMANI: Manifattura Predittiva, *v)* RL-HEAT: Intelligent Heating Control based on Reinforcement Learning Techniques.

  Research group: Intelligent Systems Lab (ISLa) - Prof. Alessandro Farinelli.

- Research scholarship holder - postdoc (borsista di ricerca postdoc, ING-INF/05), Department of Computer Science, Verona University, Italy (06/2018 - 09/2018). *Project:* Statistical data analysis for malware analysis (Supervisor: Prof. A. Farinelli).

- Research associate - postdoc (assegnista di ricerca postdoc, ING-INF/05), Department of Computer Science, Verona University, Italy (06/2016 - 05/2018).

  Projects: i) INTCATCH: Development and application of novel, INTegrated tools for monitoring and managing CATCHments (Supervisor: Prof. A. Farinelli), *ii)* EXPO-AGRI: EXtra-field Plant Observation for monitoring and forecast of AGRicultural Infections (Supervisor: Prof. A. Farinelli; coordinator: Dr. D. Quaglia).

- Statistician I, Statistical Analysis and Mathematical Modeling Group, Technical R&D, GlaxoSmithKline Vaccines, Siena, Italy (03/2016 - 05/2016).

- Research associate - postdoc, Bioinformatics group, Institute for Biochemistry and Biology, University of Potsdam/Max Planck Institute of Molecular Plant Physiology, Potsdam, Germany (04/2014 - 01/2016).

  Project: "Regression methods for integrative analysis of large–scale data" (Supervisors: Prof. J. Selbig, Dr. Z. Nikoloski).

- Research collaborator - postdoc (Collaborazione Coordinata Continuativa), Center for BioMedical Computing (CBMC), Verona University, Italy (Supervisor: Prof. V. Manca) (01/2013 - 12/2013).

- Research associate - postdoc (assegnista di ricerca postdoc, INF/01), Center for BioMedical Computing (CBMC), Verona University, Italy (01/2010 - 12/2012).

  Projects: i) "Modeling and simulation of metabolic systems"; *ii)* "Comparative genomics by k-mer based indices" (Supervisor: Prof. V. Manca).

- Business intelligence consultant at Sdg group, Verona, Italy (05/2012 - 03/2014). Projects at Eli Lilly, Benetton, Miroglio, Italcementi, Cattolica assicurazioni.

- Internship, Italian Space Agency (ASI), marketing unit, Rome, Italy (09/2006 - 03/2007). Project: "Analysis of Space Technologies". Supervisor: Ing. D. Rubini.

Research interests (interessi di ricerca)

- *General topics:* artificial intelligence, machine learning, data analysis.
- *Specific topics:* reinforcement learning, planning under uncertainty, predictive modeling/time series forecasting, anomaly detection, safety/interpretability in AI methods.
- *Main applications:* intelligent systems of various kinds, such as, cyber-physical systems, robotic systems, smart grids and smart buildings, building energy management.

Abilitazione scientifica nazionale

Competition sector (settore concorsuale) 09/H1, Information Processing Systems (Sistemi di Elaborazione delle Informazioni), SSD ING-INF/05, II fascia (obtained on 14/04/2021).

Institutional/Administrative roles and assignments (incarichi istituzionali)

- Proponent and Coordinator for the Master's Degree in Artificial Intelligence, Verona University (2021 - Present).
- Chair of the quality assurance commission for the Master's Degree in Artificial Intelligence, Verona University (2022 - Present).

- Participation in the selection committee for the selection procedure for one fixed-term researcher position, Ricercatore tipo A (RTD-a), SSD IINF-05/A, at the Dipartimento di ingegneria informatica, automatica e gestionale "Antonio Ruberti", facoltà di ingegneria dell'informazione, informatica e statistica (01/2025 - 02/2025).
- Participation in interviews for the Visita Accreditamento Periodico (CEV) 2025 at Verona University - Department of Computer Science for PhD students (10/2024 - 11/2024).
- Member of the PhD Faculty Board of PhD in Computer Science, Department Computer Science, Verona University (2025/26, 2024/25, 2023/2024, 2022/2023, 2021/2022, 2020/2021).
- Member of the Computer Science Department Council - Department Computer Science, Verona University (2025/26, 2024/25, 2023/2024, 2022/2023, 2021/2022, 2020/2021, 2019/2020, 2018/2019).
- Member of the Teacher Council of the Bachelor in Computer Science - Department Computer Science, Verona University (2025/26, 2024/25, 2023/2024, 2022/2023, 2021/2022, 2020/2021, 2019/2020, 2018/2019, 2017/2018).
- Member of the Teacher Council of the Master in Data Science - Department Computer Science, Verona University (2025/26, 2024/25, 2023/2024, 2022/2023, 2021/2022, 2020/2021).
- Member of the Teacher Council of the Master in Mathematics - Department Computer Science, Verona University (2025/26, 2024/25, 2023/2024, 2022/2023, 2021/2022, 2020/2021, 2019/2020, 2018/2019).

Education (formazione universitaria)

- Master in Business Intelligence e Knowledge Management, Verona University, Faculty of Economics. Granted by Center for BioMedical Computing (11/2010 - 11/2011).

  Thesis: *Business Intelligence and Data Mining in BioMedical Research.*
- Ph.D. (Doctoris Europaei), Computer Science, Graduate School of Sciences Engineering and Medicine, Verona University, Italy. Supported by a 3-year state scholarship. (01/2007 - 12/2009, thesis defense 27/04/2010).

  Thesis: *Algorithms and Software for Biological MP Modeling by Statistical and Optimization Techniques.* Supervisor: Prof. V. Manca; co-supervisor: Dr. G. Franco.
- Laurea in Informatica (5 years) - (110/110 cum laude), Verona University, Italy (09/2000 - 07/2006).

  Thesis: *Simulazioni computazionali di operazioni del "DNA Computing".* Supervisor: Prof. V. Manca. Co-supervisor: Dr. G. Franco.

Publications (pubblicazioni)

General bibliometric information:

- number of citations: 651 (Scopus), 973 (Google Scholar),
- number of documents: 82 (Scopus),
- h-index: 14 (Scopus source), 18 (Google Scholar).

Papers in international journals

1. *Zuccotto et al. 2025a.* M. Zuccotto, E. Fusa, A. Castellini, and A. Farinelli. Online model adaptation in Monte Carlo tree search planning. *Optimization and Engineering*, Volume 26, pages 2477-2498, 2025 (DOI: 10.1007/s11081-024-09896-2, ISSN: 1573-2924, https://link.springer.com/article/10.1007/s11081-024-09896-2).
2. *Bianchi et al., 2025g.* F. Bianchi, A. Castellini, E. Zorzi, T. D. Simão, M. TJ Spaan, A. Farinelli. Scaling Safe Policy Improvement: Monte Carlo Tree Search and Policy Iteration Strategies. *Journal of Artificial Intelligence Research (JAIR)*, 84, pages 22:1-22:55, 2025 (DOI: 10.1613/jair.1.19649, Print ISSN: 0162-8828, Online ISSN: 1076-9757, https://www.jair.org/index.php/jair/article/view/19649).
3. *Meli et al. 2024a.* D. Meli, A. Castellini and A. Farinelli. Learning logic specifications for policy guidance in POMDPs: an inductive logic programming approach. *Journal of Artificial Intelligence Research (JAIR)*, 79, pages 725-776, 2024 (DOI: 10.1613/jair.1.15826, ISSN: 1076 - 9757, https://www.jair.org/index.php/jair/article/view/15826/27016).
4. *Zuccotto et al. 2024b.* M. Zuccotto, A. Castellini, D. La Torre, L. Mola and A. Farinelli. Reinforcement learning applications in environmental sustainability: a review. *Artificial Intelligence Review*, 57:88, pages 1-68, 2024 (DOI: 10.1007/s10462-024-10706-5, ISSN: 1573-7462, https://link.springer.com/article/10.1007/s10462-024-10706-5).
5. *Castellini et al., 2024f.* F. Taioli, F. Giuliari, Y. Wang, R. Berra, A. Castellini, A. Del Bue, A. Farinelli, M. Cristani, F. Setti. Unsupervised Active Visual Search with Monte Carlo Planning under Uncertain Detections. *IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)*, 46:12, pages 11047?11058, 2024 (DOI: 10.1109/TPAMI.2024.3451994, Print ISSN: 0162-8828, Online ISSN: 0162-8828, https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10659171).
6. *Mazzi et al., 2023g.* G. Mazzi, A. Castellini and A. Farinelli. Risk-aware shielding of Partially Observable Monte Carlo Planning policies. *Artificial Intelligence*, 324:103987, Elsevier, 2023 (DOI: 10.1016/j.artint.2023.103987, ISSN: 0004-3702, https://www.sciencedirect.com/science/article/pii/S0004370223001339).
7. *Castellini et al., 2023f.* A. Castellini, F. Masillo, D. Azzalini, F. Amigoni and A. Farinelli. Adversarial Data Augmentation for HMM-based Anomaly Detection. *IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)*, 45:12, pages 14131-14143, 2023 (DOI: 10.1109/TPAMI.2023.3303099, ISSN: 0162-8828, https://ieeexplore.ieee.org/document/10210524).
8. *Castellini et al., 2022a.* A. Castellini, F. Bianchi and A. Farinelli. Generation and interpretation of parsimonious predictive models for load forecasting in smart heating networks. *Applied Intelligence*, 52:9, pages 9621-9637, Springer Nature, 2022 (DOI:0.1007/s10489-021-02949-4, ISSN: 1573-7497, https://link.springer.com/article/10.1007%2Fs10489-021-02949-4).
9. *Zuccotto et al., 2022e.* M. Zuccotto, M. Piccinelli, A. Castellini, E. Marchesini, and A. Farinelli. Learning state-variable relationships in POMCP: A framework for mobile robots. *Frontiers in Robotics and AI*, 9:819107, pages 1-18, 2022 (DOI: 10.3389/frobt.2022.819107, ISSN: 22969144, https://www.frontiersin.org/articles/10.3389/frobt.2022.819107/full).

10. *Castellini et al., 2021e.* A. Castellini, E. Marchesini and A. Farinelli. Partially Observable Monte Carlo Planning with state variable constraints for mobile robot navigation. *Engineering Applications of Artificial Intelligence*, 104:104382, Elsevier, 2021 (DOI: 10.1016/j.engappai.2021.104382, ISSN: 0952-1976, https://www.sciencedirect.com/science/article/pii/S095219762100230X?via%3Dihub).

11. *Castellini et al., 2020c.* A. Castellini, M. Bicego, F. Masillo, M. Zuccotto, A. Farinelli. Time series segmentation for state-model generation of autonomous aquatic drones: A systematic framework. *Engineering Applications of Artificial Intelligence*, Elsevier, 90:103499, 2020 (DOI: 10.1016/j.engappai.2020.103499, ISSN: 0952-1976, https://www.sciencedirect.com/science/article/pii/S0952197620300142?via%3Dihub).

12. *Castellini et al., 2020h.* A. Castellini, F. Bianchi, A. Farinelli. Predictive model generation for load forecasting in district heating networks. *IEEE Intelligent Systems*, 2020 (DOI: 10.1109/MIS.2020.3005903, ISSN: 1541-1672, https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=9130163).

13. *Castellini et al., 2020f.* A. Castellini, D. Bloisi, J. Blum, F. Masillo, A. Farinelli. Multivariate Sensor Signals Collected by Aquatic Drones Involved in Water Monitoring: a Complete Dataset. *Data in Brief*, Elsevier, 30:105436 2020 (DOI: 10.1016/j.dib.2020.105436, ISSN: 2352-3409, https://www.sciencedirect.com/science/article/pii/S2352340920303309?via%3Dihub).

14. *Steccanella et al., 2020a.* L. Steccanella, D.D. Bloisi, A. Castellini, and A. Farinelli. Waterline and obstacle detection in images from low-cost autonomous boats for environmental monitoring. *Robotics and Autonomous Systems*, Elsevier, 124:103346, 2020 (DOI: 10.1016/j.robot.2019.103346, ISSN: 0921-8890, https://www.sciencedirect.com/science/article/pii/S0921889019302775?via%3Dihub).

15. *Castellini et al., 2019e.* A. Castellini, M. Bicego, D. Bloisi, J. Blum, F. Masillo, S. Peignier, and A. Farinelli. Subspace clustering for situation assessment in aquatic drones: a sensitivity analysis for state-model improvement. *Cybernetics and Systems*, Taylor & Francis, 50(8):658-671, 2019 (DOI: 10.1080/01969722.2019.1677333, ISSN print: 0196-9722, ISSN online: 1087-6553, https://www.tandfonline.com/doi/pdf/10.1080/01969722.2019.1677333?needAccess=true).

16. *Castellini et al., 2015a.* A. Castellini, D. Paltrinieri, V. Manca. MP-GeneticSynth: Inferring biological network regulations from time series. *Bioinformatics*, Oxford University Press, 31(5):785-787, 2015 (DOI: 10.1093/bioinformatics/btu694, ISSN: 1367-4803, https://academic.oup.com/bioinformatics/article/31/5/785/2748138).

17. *Castellini et al., 2015b.* A. Castellini, V. Manca, M. Zucchelli. An evolutionary procedure for inferring MP systems regulation functions of biological networks. *Natural Computing*, Springer, 14(3):375-391, 2015 (DOI: 10.1007/s11047-014-9421-1, ISSN: 1567-7818, https://link.springer.com/article/10.1007/s11047-014-9421-1).

18. *Castellini et al., 2015c.* A. Castellini, G. Franco, A. Milanese. A genome analysis based on repeat sharing gene networks. *Natural Computing*, Springer, 14(3):403-420, 2015 (DOI: 10.1007/s11047-014-9437-6, ISSN: 1567-7818, https://link.springer.com/article/10.1007/s11047-014-9437-6).

19. *Castellini et al., 2013a.* A. Castellini, M. Zucchelli, M. Busato, V. Manca. From time series to biological network regulations: an evolutionary approach. *Molecular BioSystems*, 9(2):225–233, The Royal Society of Chemistry, 2013 (DOI: 10.1039/c2mb25191d,

ISSN: 1742-2051, https://pubs.rsc.org/en/Content/ArticleLanding/MB/2013/C2MB25191D#!divAbstract).

20. *Manca et al., 2013b.* V. Manca, A. Castellini, G. Franco, L. Marchetti, R. Pagliarini. Metabolic P Systems: A discrete model for biological dynamics. *Chinese Journal of Electronics,* 22(4):717–723, 2013 (ISSN 2075-5597).

21. *Castellini et al., 2012a.* A. Castellini, G. Franco, V. Manca. A dictionary based informational genome analysis. *BMC Genomics*, 13(1):485+, 2012 (DOI:10.1186/1471-2164-13-485, ISBN: 1471-2164, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3577435/).

22. *Castellini et al., 2011a.* A. Castellini, G. Franco, R. Pagliarini. Data analysis pipeline from laboratory to MP models. *Natural Computing* 10(1):55–76, Springer, 2011 (DOI: 10.1007/s11047-010-9200-6, ISSN: 1567-7818, https://link.springer.com/article/10.1007/s11047-010-9200-6).

23. *Castellini et al., 2010a.* A. Castellini, G. Franco, V. Manca. Hybrid functional Petri nets as MP systems. *Natural Computing* 9(1):61–81, Springer, 2010 (DOI: 10.1007/s11047-009-9121-4, ISSN: 1567-7818, https://link.springer.com/article/10.1007/s11047-009-9121-4).

Papers at international conferences with refereed published proceedings

24. *Bonanni et al. 2025c.* L. Bonanni, D. Meli, A. Castellini, A. Farinelli. Monte Carlo Tree Search with Velocity Obstacles for safe and efficient motion planning in dynamic environments. In *Proceedings of the 24th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2025)*, 19?23 May 2025, pages 371-380, Detroit, 2025. (DOI: 10.5555/3709347.3743551, ISBN: 9798400714269, https://dl.acm.org/doi/pdf/10.5555/3709347.3743551).

25. *Zorzi et al. 2025d.* E. Zorzi, A. Castellini, L. Bakopoulos, G. Chalkiadakis, A. Farinelli. Seldonian Reinforcement Learning for Ad Hoc Teamwork. In *Reinforcement Learning Journal 6 (Proceedings of Reinforcement Learning Conference 2025)*, August 5?9, 2025, Alberta, Canada, pages 1 - 19, 2025 (DOI: 10.5281/zenodo.13899776, Electronic ISSN: 2996-8577, ISBN: 979-8-218-41163-3, https://rlj.cs.umass.edu/2025/papers/RLJ_RLC_2025_223.pdf).

26. *Villaboni et al. 2025e.* D Villaboni, F Bazzani, A Castellini, A Farinelli. Transformer-Based Anomaly Detection for Mobile Robots. In *2025 European Conference on Mobile Robots (ECMR)*, 2-5 September 2025, Padova, Italy, 2025, pp. 1-6, (DOI: 10.1109/ECMR65884.2025.11163081, Electronic ISSN: 2767-8733, ISBN: 979-8-3315-2705-1, https://ieeexplore.ieee.org/abstract/document/11163081).

27. *Taioli et al. 2025f.* F. Taioli, E. Zorzi, G. Franchi, A. Castellini, A. Farinelli, M, Cristani, Y. Wang. Collaborative Instance Object Navigation: Leveraging Uncertainty-Awareness to Minimize Human-Agent Dialogues. In *Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV)*, pp. 18781-18792, 2025 (Electronic ISSN: 2380-7504, https://arxiv.org/abs/2412.01250).

28. *Marzari et al. 2025h.* L. Marzari, F. Trotti, F. Dal Santo, A. Zhalehmehrabi, C. Veronese, D. Villaboni, F. Bianchi, D. Meli, A. Castellini, A. Farinelli. Enhancing

Safety and Explainability of Reinforcement Learning Agents for Environmental Monitoring Tasks. In *Proc. Ital-IA 2025: 5th National Conference on Artificial Intelligence*, organized by CINI, June 23?24, 2024, Trieste, Italy, CEUR Workshop Proceedings ITAL-IA Series 4121, 2025 (ISSN: 1613-0073, https://ceur-ws.org/Vol-4121/Ital-IA_2025_paper_10.pdf).

29. *Bianchi et al., 2024e.* F. Bianchi, E. Zorzi, A. Castellini, T. Simao, M. T. J. Spaan, A. Farinelli. Scalable Safe Policy Improvement for Factored Multi-Agent MDPs. In *Proc. 41th International Conference on Machine Learning (ICML)*, Vienna, Austria, 21-27 July 2024, pages 3952–3973, PMLR, 2024 (https://raw.githubusercontent.com/mlresearch/v235/main/assets/bianchi24b/bianchi24b.pdf).

30. *Bianchi et al. 2024g.* F. Bianchi, A. Castellini, A. Farinelli, L. Marzari, D. Meli, F. Trotti, C. Veronese. Developing safe and explainable autonomous agents: from simulation to the real world. In *Proc. Ital-IA 2024: 4th National Conference on Artificial Intelligence*, organized by CINI, May 29?30, 2024, Naples, Italy, pages 129-134, CEUR Workshop Proceedings AI*IA Series 3762, 2024 (ISSN: 1613-0073, https://ceur-ws.org/Vol-3762/547.pdf).

31. *Taioli et al. 2024h.* F. Taioli, S. Rosa, A. Castellini, L. Natale, A. Del Bue, A. Farinelli, M. Cristani, Y. Wang. I2EDL: Interactive Instruction Error Detection and Localization. In *Proc. 33rd IEEE International Conference on Robot and Human Interactive Communication (ROMAN)*, August 26?30, 2024, Pasadena, California, USA, pages 1872-1877, 2024 (DOI: 10.1109/RO-MAN60168.2024.10731349, ISSN: 1944-9445, ISBN: 979-835037502-2, https://https://ieeexplore.ieee.org/document/10731349).

32. *Taioli et al. 2024i.* F. Taioli, S. Rosa, A. Castellini, L. Natale, A. Del Bue, A. Farinelli, M. Cristani, Y. Wang. Mind the Error! Detection and Localization of Instruction Errors in Vision-and-Language Navigation. In *Proc. 2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2024)*, October 14?18, 2024, Abu Dabi, United Arab Emirates, pages 12993 - 13000, 2024 (Electronic ISSN: 2153-0866, ISBN: 979-8-3503-7770-5, https://ieeexplore.ieee.org/document/10801822,DOI:10.1109/IROS58592.2024.10801822).

33. *Castellini et al., 2023e.* A. Castellini, F. Bianchi, E. Zorzi, T. D. Simao, A. Farinelli, M. T. J. Spaan. Scalable Safe Policy Improvement via Monte Carlo Tree Search. In *Proc. 40th International Conference on Machine Learning (ICML), Honolulu, Hawaii, USA, 23-29 July 2023*, pages 3732-3756, PMLR, 2023 (https://proceedings.mlr.press/v202/castellini23a.html).

34. *Bianchi et al. 2023h.* F. Bianchi, D. Corsi, L. Marzari, D. Meli, F. Trotti, M. Zuccotto, A. Castellini and A. Farinelli. Safe and Efficient Reinforcement Learning for Environmental Monitoring. In *Proc. Ital-IA 2023: 3rd National Conference on Artificial Intelligence, organized by CINI, May 29-31, 2023, Pisa, Italy*, pages 610-615, CEUR Workshop Proceedings AIxIA Series 3486, 2023 (ISSN: 1613-0073, https://ceur-ws.org/Vol-3486/18.pdf).

35. *Cunico et al., 2023d.* F. Cunico, L. Capogrosso, A. Castellini, F. Setti, P. Pluchino, F. Zordan, V. Santus, A. Spagnolli, S. Cordibella, G. Gennari, M. Borgo, A. Sozza, S. Troiano, R. Flor, A. Zanella, A. Farinelli, L. Gamberini, M. Cristani. The Post-pandemic Effects on IoT for Safety: The Safe Place Project. In *2023 Design, Au-*

tomation & Test in Europe Conference & Exhibition (DATE), pages 1-4 2023 (DOI: 10.23919/DATE56975.2023.10136924, ISBN: 979-8-3503-9624-9, https://ieeexplore.ieee.org/abstract/document/10136924).

36. *Mazzi et al., 2023a.* G. Mazzi, D. Meli, A. Castellini and A. Farinelli. Learning Logic Specifications for Soft Policy Guidance in POMCP. In *Proceedings of the 22th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2023), 29 May - 02 June 2023*, pages 373-381, London, 2023. Nomination for the best paper award. (ISBN: 9781450394321, https://dl.acm.org/doi/abs/10.5555/3545946.3598660).

37. *Mazzi et al., 2022b.* G. Mazzi, A. Castellini and A. Farinelli. Active Generation of Logical Rules for POMCP Shielding. In *Proceedings of the 37rd ACM/SIGAPP Symposium on Applied Computing (SAC 2022), Brno, Czech Republic, April 25-29, 2022*, pages 1696-1698, Virtual Event Auckland, 2022 (ISBN: 9781450392136, https://www.ifaamas.org/Proceedings/aamas2022/pdfs/p1696.pdf).

38. *Zuccotto et al., 2022c.* M. Zuccotto, A. Castellini, and A. Farinelli. Learning state-variable relationships for improving POMCP performance. In *Proceedings of the 21th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2022), 9-13 May 2022*, pages 739-747, Association for Computing Machinery (ACM), 2022 (DOI: 10.1145/3477314.3507049, ISBN: 9781450387132, https://dl.acm.org/doi/10.1145/3477314.3507049).

39. *Capuzzo et al., 2022f.* M. Capuzzo, A. Zanella, M. Zuccotto, F. Cunico, M. Cristani, A. Castellini, A. Farinelli, L. Gamberini. IoT Systems for Healthy and Safe Life Environments. In *Research and Technologies for Society and Industry (RTSI 2022), Paris, France, 24-26 August 2022*, pages 31-37, IEEE, 2022 (DOI: 10.1109/RTSI55261.2022.9905193, ISBN: 978-1-6654-9739-8, ISSN: 2687-6817, https://ieeexplore.ieee.org/document/9905193).

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Description of the main research topics (Descrizione dei principali argomenti di ricerca)

Reinforcement learning and planning under uncertainty: development of methodologies sequential decision making in environments with uncertain observations. Main applications to autonomous agents, robots and cyber-physical systems.

- Model-based reinforcement learning with explicit representation of the uncertainty and safety guarantees in single and multi-agent systems. Development of risk-aware offline reinforcement learning algorithms, distributional reinforcement learning algorithms, model-based reinforcement learning algorithms that explicitly consider uncertainty. Applications to ad hoc teamwork and other problems (Zuccotto et al. 2025a, Zorzi et al., 2025d).
- Safe policy improvement and offline reinforcement learning (Castellini et al., 2023e, Bianchi et al., 2024e, Bianchi et al., 2025g). The goal of these methods is to reliably improve pre-existing policies. We consider having a non-optimal policy, for example developed by experts in a certain application domain, and wanting to improve it while maintaining probabilistic guarantees on the fact that the performance of the policy itself will not worsen (for example to avoid economic losses, damage to equipment or

other domain-specific issues). A particular problem was addressed, the scalability of Safe Policy Improvement techniques, to allow their application to increasingly larger domains, with the aim of being able to apply them to real domains. We started from a state-of-the-art SPI technique based on Dynamic Programming and developed a scalable version based on MCTS, mathematically proving that the two had the same asymptotic guarantees. Current research is focusing on the application of these techniques in multi-agent contexts.

- Transformer based offline-to-online reinforcement learning and time series forecasting. Development of algorithms able to learn policy and forecasting models based on transformers, namely attention-based neural networks able to generate embeddings considering long term interactions. The methodologies developed in this research line investigate the possibility to apply these models to reinforcement learning and time series forecasting (Villaboni et al. 2025e)
- Instance object navigation with reinforcement learning and visual language action models. Development of methods able to navigate in indoor environments using vision and language inputs. The proposed methods focus on uncertainty-aware human-agent collaboration via natural language (Taioli et al. 2025f), error detection in interactive instructions (Taioli et al., 2024h, Taioli et al., 2024i), active visual search in unknown environments with partially observable Monte Carlo optimization - POMCP (Giuliari et al., 2021f, Wang et al., 2021b).
- Integration of heuristics expressed with the Answer Set Programming (ASP) formalism in the search for optimal policies in Monte Carlo Tree Search (MCTS) in partially observable Markov Decision Processes (POMDP) contexts. Initially the parameters of the heuristics were estimated from the data of past traces using solvers based on Satisfiability Modulo Theory (SMT), subsequently the same data were used to also learn the logical rules themselves (i.e., not just their parameters) using efficient methods of Inductive Logic Programming (ILP), such as Inductive Learning of Answer Set Programs (ILASP) (Meli et al. 2024a, Mazzi et al., 2023a, Meli et al., 2022g). The developed methods made it possible to improve the performance of the generated policies and reduce/avoid anomalous behavior through shielding methods. They have also been applied to contexts where explicit risk assessment can have a positive impact on both the performance and reliability of policies (Mazzi et al., 2023g).
- Explainability and shielding of POMCP policies using symbolic approaches based on MAX-SAT (Mazzi et al., 2022b, Mazzi et al., 2021c, Mazzi et al., 2021d). Human-interpretable logical rules are used to improve policy explainability and safety via shielding of dangerous actions (Mazzi et al., 2021e).
- Explainable planning for POMCP based policies (Castellini et al., 2021a).
- Some investigations about scalabilty of MCTS on continuous action spaces have been also performed (Bianchi et al., 2023b).
- Introduction of a priori knowledge into the process of generating optimal policies based on MCTS and POMCP. In this context, a method has been developed capable of integrating knowledge on the "relationships between state variables" of an MDP or a POMDP, showing that this knowledge can produce an effective increase in performance of the generated policy (Zuccotto et al., 2022c). A method is also being developed that allows the transition model used in MCTS simulations to be learned online from

data of previous trajectories (Castellini et al. 2023i). The developed techniques were evaluated both on synthetic benchmarks and on real systems, such as mobile robots (i.e., Turtlebot) (Zuccotto et al., 2022d, Zuccotto et al., 2022e, Castellini et al., 2021e). In general, techniques related to planning through MCTS have also been applied to other contexts, such as systems for managing air quality and thermal comfort in smart buildings (Capuzzo et al., 2022f, Cunico et al., 2023d).

- Applications of reinforcement learning to environmental sustainability. A work was recently published on the application of reliable and efficient reinforcement learning techniques to the context of environmental monitoring (Bianchi et al. 2023h). A survey on the application of reinforcement learning techniques to environmental sustainability contexts has also been recently developed (Zuccotto et al. 2024b).
- Active Visual Search (AVS) using POMCP-based strategies (Wang et al., 2021b; Giuliari et al., 2021f). In this context the research is focusing on transformer-based multimodal planning techniques, in which both natural language information and images are used to guide autonomous robots.
- Application of POMCP to real robots (Castellini et al., 2020d).
- Analysis of the influence of probabilistic constraints due to prior knowledge on state variables in Partially Observable Monte Carlo Planning (POMCP) (Castellini et al., 2019b).
- Intelligent battery management in autonomous acquatic drones (Castellini et al., 2018b).

Anomaly detection and adversarial attack for robotic and cyber-physical systems: development of methodologies for detecting anomalies in sensor signals (i.e., multivariate time series) acquired by robots and cyber-physical systems. Methodologies based on adversarial example generation are used to improve the performance of the approaches.

- An anomaly detection technique for mobile robots has been developed (Azzalini et al., 2020g). The methodology is based on Hidden Markov Models. Initially model the nominal (dynamic) behavior of the system of interest starting from a dataset of observed trajectories. Subsequently, it identifies substantial deviations from nominal behaviors by means of appropriate distance measures both between models (offline method) and between nominal model and new observed data. The approach has been successfully evaluated with data acquired from drones (Autonomous Surface Vehicles, ASV) for monitoring water quality in reservoirs, robots for assisting the elderly and mobile robots (Kairos) in industrial contexts 4.0. .
- A data augmentation technique was recently published (Castellini et al., 2023f). It is based on the possibility of generating specific adversarial samples for the anomaly detector described in the previous point and being able to use them for re-training the detector itself, increasing its performance. Adversarial learning was developed in the context of image classification using neural networks. In our work this technique is instead applied to the context of anomaly detection (rather than classification) in multivariate time series (rather than images) by means of HMMs (rather than neural networks). The evaluation in this case was made on four benchmarks: an industrial chemical process in which the anomalies are due to cyber-attacks, an industrial cyber-physical system for water treatment, an autonomous aerial drone (Unmanned Aerial Vehicle, UAV), and an aquatic drone for monitoring water quality. The comparison of the performance of the detector trained with augmented data compared to the same

one trained with original data showed a significant increase in the case of augmented data. Performance was also superior to anomaly detection methods based on standard autoencoders, LSTM-based autoencoders, and one-class support vector machines.

Interpretable time series forecasting and predictive modeling for smart-grids and smart-buildings: development of models and strategies for predicting system and human behaviours in smart-grids and smart buildings with the goal to improve decision making (e.g., maintenance optimization, enerergy saving, comfort optimization).

- A multi-variate, multi-equation linear regression approach was developed to generate interpretable and parsimonious (in the number of parameters) predictive models for predicting the heat load of smart district heating networks (Castellini et al., 2022a). The approach was validated on real data provided by AGSM, a company that manages the Verona district heating network, for which software was developed capable of making real-time forecasts of the load expected for the next 48 hours in the context of a research project financed by the Veneto region. Research in this area is currently focusing on the use of transformer-based techniques.
- Prediction of the load of a district heating network with autoregressive multivariate linear models (real dataset provided by AGSM, Verona) (Castellini et al., 2020h, Bianchi et al., 2020b).
- Development of the software XM_HeatForecast for predicting in real-time the heating load in a real heating plant. A prototypal version of the software has been released and tested in the power plant of AGSM, Verona (Bianchi et al., 2020j).
- Comparison of the performance of different prediction models (e.g., convolutional neural networks and stochastic variational gaussian processes and regularized regression) in the prediction of heating load (Bianchi et al., 2020i).
- Optimization of thermal comfort and energy consumption in smart buildings using Markov Decision Processes.

Data analysis and predictive modeling for intelligent agents: development of methodologies for time series analysis and clustering, with the aim to identify patterns in sensor signals.

- Activity recognition and situation assessment for autonomous acquatic drones with subspace clustering techniques (Castellini et al., 2020c, Castellini et al., 2019e, Castellini et al., 2019d, Castellini et al., 2018a).
- Data analysis and generation of interpretable models for intelligent systems. Implementation of a software called eXplainable Modeling (XM) (Castellini et al., 2019c).
- Segmentation of multivariate time series related to sensor data acquired by autonomous acquatic drones for water monitoring (Castellini et al., 2020c., Castellini et al., 2019e).
- Obstacle and waterline detection in images acquired from low-cost acquatic drones for environmental monitoring (Steccanella et al., 2020a).
- Detection of age-realted changes in B-cell networks using Hidden Makov Models for immunosenescence (Castellini et al., 2019a, Castellini et al., 2018c, Castellini et al., 2017a).

Project activities (realizzazione di attività progettuale)

Leadership and management in research projects (with funding):

- *SINERGHY - Sustainable and INnovative Energy systems for Renewables and Green HYdrogen*: POR/FESR European Regional Development Fund 2021-2027, Department of Computer Science, Verona University, funding for research activities: 52.000€ (project expenses 2.84M€, project funding 2M€) (11/2024 - 04/2027). Role: principal investigator for the computer science department, research activities related to the development of RL algorithms for control systems for hybrid heat pumps, supervisor of 3 research fellows.

  Description: The project aims to develop an innovative energy system for the efficient and sustainable production, storage, and management of energy from Renewable Energy Sources. UNIVR evaluates RL algorithms for control systems for hybrid heat pumps (air-water and water-water) combined with geothermal probes, thermal-refrigeration storage, photovoltaic systems and electric batteries. Other partners develop electronic controllers, implementing rule-based control strategies for hybrid heat pumps, digital shadow of a multi-source system including storage, and a pilot site.

  - Supervision of pre-doc research fellows: Lorenzo Bonanni (15/04/2025 - 30/01/2026). Research project title: *Reinforcement learning techniques for optimal energy source selection in smart buildings.* Tiziano Tezze (03/11/2025 - Present). Research project title: *Reinforcement learning for energy source optimization in smart buildings.* Davide Cordioli (13/04/2026 - Present). Research project title: *Safe Reinforcement Learning for Autonomous Management of Hybrid Heat Pumps.*

    Description: the research activities developed with Lorenzo, Tiziano and Davide produced a framework to evaluate model-free and model-based RL algorithms in the context of building energy management.

- *NOVA - Navigation-Oriented VLA model with Uncertainty-Aware Reasoning*: NVIDIA Academic Grant Program, funding for research activities (32K GPU-Hours for 1 instance of 8xA100 80GB on Brev - online availability, 2x RTX PRO 6000 Blackwell Max-Q Workstation Edition - physical availability, donation)(04/2026 - 09/2026). PI: Alessandro Farinelli. Participants: Alberto Castellini, Edoardo Zorzi. Role: participant.

  Description: Development of a Vision Language Action model (VLA) for robotic navigation that can handle uncertainty and perform reasoning. These capabilities address key issues for current VLA such as: i) ambiguity in natural language task specifications, ii) object distractors, and iii) unpredictable actions of other agents/humans. To reach this goal, we explore new uncertainty-handling and reasoning techniques, and deploy our model using NVIDIA Hardware on real-world robots.

- *BEHAVE: Learning Safe Behaviours for human-robot cooperation*: PNRR MUR project PE0000013-FAIR, Mission 4 "istruzione e ricerca" - Component 2 "dalla ricerca all'impresa" - Investment 1.3, funded by the European Union - NextGeneration EU of the PNRR, Department of Computer Science, Verona University, funding for research activities: 10K€ (project expenses 200K€, project funding 200K€) (12/2024 - 12/2025). Role: responsible for research activities related to safe reinforcement learning. Production of 3 papers: Bonanni et al. 2025c, Zorzi et al. 2025d, Villaboni et al. 2025e.

Description: The project aims to investigate foundational and applied aspects of safe, robust, and trustworthy RL for human-robot cooperation. The project provided novel methodologies for learning and certifying safe behaviors in human-robot cooperation scenarios, with a focus on RL systems operating in dynamic, multi-agent environments. The project addressed the challenge of ensuring that AI agents can act autonomously while maintaining safety guarantees, particularly when interacting with humans or other agents without prior coordination.

- *iNEST - Interconnected Nord-Est Innovation Ecosystem, Spoke 6, Tourism, Cultural Industries and Urban Manufacturing*: PNRR, mission 4, component 2, NextGenerationEU, European Union and the Ministry of Business and Made in Italy, Department of Computer Science, Verona University, funding for research activities: 5.581€ (01/2023 - 03/2026). Role: responsible for research activities related to Autonomous Surface Vehicles (ASV) for collecting data about water quality in tourism-affected environments, supervisor of students and a research fellows.

  Description: The project aims to develop new tecnologies for tourism, culture and creative industries. The spoke operates at the convergence of management, economics, science, arts, and humanities for the creation of a digital tourism ecosystem in which cultural industries are a key driver of strategic innovation. My activities in the project are related to task RT1.2 - User-generated content, big data and machine learning for a smarter tourism industry. I deal with the definition of new methodologies based on reinforcement learning for dealing with autonomous planning and control of ASVs used for monitoring catchments in touristic areas and providing alerts if anomalous water parameter or other situations are detected. Main subtasks: i) development of the physical platform (marlin-v2); ii) development of a simulation environment for aquatic operations; iii) development of novel techniques for autonomous navigation with deep reinforcement learning; iv) development of a data analysis and visualization system. The activities led to the development of three master thesis (see section Student supervision, below).

  - Supervision of postdoc research fellow, Davide Corsi (01/10/2023 - 29/02/2024). Research project title: *Development of AI techniques for autonomous robots employed in water monitoring for sustainable tourism.*

    Description: the research activities developed with Davide produced three master thesis related to simulation and data acquisition/analysis tools for the iNEST project.

  - Research officer (with Prof. Alessandro Farinelli) for a project in the "Bandi a cascata" grant (project expenses 218.562€, project funding 139.996€)(05/2024 - 12/2025). Company (grant winner): A5 Srl. Project title: Metis sistema di navigazione. *Description:* The METIS project enables automated monitoring of water quality and navigation parameters in lakes and marine environments, supporting eco-conscious coastal tourism. It uses satellite data to plan optimal routes for autonomous electric surface vessels, considering both operational and environmental factors. The system maps areas of interest requiring in situ sampling and develops digital models combined with classical and reinforcement learning for route planning. It emphasizes explainable AI, validates performance, and showcases results through a live web application. Role: Research officer.

- *DM 1062/2021 - PON RICERCA E INNOVAZIONE*: Supervisor of an assistant pro-

fessor (temporary researcher RTD-A), Daniele Meli (01/2022 - 12/2024, 3 years contract). Research project title: *Planning for autonomous robotic platforms used in environmental monitoring*. Competitive funding provided by the Italian Ministery of University and Research (MUR) of FSE REACT EU - PON R&I 2014-2020, about 50.000€. Role: responsible for the activities of the researcher.

Description: The research has mainly focused on the development of task and motion planning techniques for autonomous agents (e.g., mobile robots and aquatic drones), using probabilistic (reinforcement learning) and symbolic (answer set programming) techniqu temporary researchermuches. The problems were modeled using partially observable Markov Decision Process (POMDP), i.e. with state uncertainty, e.g., inaccuracy of sensors on board autonomous robots. Monte Carlo Tree Search (MCTS) has been modified to exploit the information from heuristics and direct the search towards more promising or safe actions, while maintaining the theoretical guarantees of optimality. The heuristics are expressed in first-order logic, possibly with temporal semantics, and are learned from execution examples (e.g., collected in the field or in simulation) using logic induction techniques (Inductive Learning of Answer Set Programs - ILASP). Our MCTS solver has proven to be more efficient in terms of computational time and number of online simulations required on several standard domains. Furthermore, it has been shown that the performances are comparable or sometimes superior to the case in which the heuristics are defined directly by expert humans. Finally, the use of logical rules allows a simpler definition of the constraints and heuristics of the task in semi-natural language, increasing the transparency and reliability of the methods. In a work on motion planning in the social navigation field, we modeled the domain as an MDP, integrating MCTS techniques with the Velocity Obstacles (VO) paradigm to guarantee the exploration of only safe actions, i.e., which do not lead to 'collision agent. The integration of VO in MCTS allows us to drastically reduce the computational cost and the number of simulations required by MCTS, allowing us to consider a large action space (tending to be continuous), and therefore realistic for integration on real autonomous robotic platforms. The activities developed with Daniele led to the publication of four papers (Meli et al. 2024a; Bianchi et al. 2023h; Mazzi et al., 2023a; Meli et al., 2022g), one is in print and other works are in progress.

- *SAFE PLACE - Sistemi IoT per ambienti di vita salubri e sicuri*: POR/FESR European Regional Development Fund 2014-2020, Department of Computer Science, Verona University, funding for research activities: 7.749€ (10/2020 - 02/2023). Role: responsible for research activities related to the module for safe air conditioning control, supervisor of students and research fellows.

  Description: The project aims to systematically address problems relating to the Covid-19 health emergency through the integration of technologies for *i)* monitoring the flow of people, *ii)* air conditioning, *iii)* light management, in systems based on IoT. The goal is to create modular solutions capable of synergistically and flexibly combining different technologies based on the specific needs of the various use cases. My activities in the project are related to the development of artificial intelligence methodologies, in particular planning approaches, for controlling air climatization systems with the aim to guarantee safety and maximize comfort and energy saving. These activities led to the publication of two papers (Cunico et al., 2023d, Capuzzo et al., 2022f)

  - Supervision of research fellow, Lorenzo Bonanni (1/12/2022 - 31/12/2022). Research project title: *Development of algorithms for air quality control in smart buildings.*
  - Supervision of research fellow, Edoardo Fusa (1/8/2022 - 31/10/2022). Research project title: *Development of environmental simulators and evaluation of adaptive air quality control methods for intelligent buildings.*

- *Analysis of malware dynamic behaviors based on reinforcement learning and statistical data analysis*: Fondo Unico per la Ricerca (FUR), Department of Computer Science, Verona University, funding of 1-year contract for a postdoc research fellow: 24.000€ with co-funding from Prof. Alessandro Farinelli (assigned to Dr. Riccardo Sartea) (10/2019 - 09/2020).

  Description: The project aims at developing defense techniques from malicious behaviors targeting cyber physical systems. A prototype Intrusion Detection System (IDS) based on statistical data analysis (e.g., subspace clustering), and probabilistic modeling methods (e.g., Hidden Markov Models (HMM)) is used. The core activity of the project is the development of a multi-agent system based on game theoretical concepts. One of the two agents aims at creating new types of attack targeting the vulnerabilities of the defense system to further imrpove it. The attacking agent will make use of Reinforcement Learning methodologies, focusing on the Generative Adversarial Network (GAN) framework. The long term goal of the proposed research is the development of an Intrusion Detection System (IDS) to be installed in the autonomous aquatic drones of the INTCATCH European project.

- *Online Situation Assessment and Anomaly Detection for Intelligent Systems*: progetto giovane ricercatore, Fondo Unico per la Ricerca (FUR), Department of Computer Science, Verona University, funding for project activities: 2500€ (01/2020 - 12/2020).

  Description: The main objectives of the project and its expected contributions to the state-of-the-art are: *i)* the development of new algorithms for online situation assessment and anomaly detection for intelligent systems by extending recent offline (subspace) clustering and segmentation methods. The task concerns the usage of HMMs to represent dynamical behaviors of intelligent systems but it also includes the usage of SubCMedians, Toeplitz Inverse Covariance-based Clustering (TICC) and Inertial Hidden Markov Models (IHMM); *ii)* the integration of situation assessment with anomaly detection, prediction of future states and state-model explanation. The activities led to the publication of two papers (Castellini et al., 2023f, Azzalini et al., 2020g).

Participation in research projects:

- *Comparative analysis of solutions based on evolutionary algorithms for generalized and multi-objective VRP, within the AIDESS project (L.P. n. 6 of 1999 of the Province of Trento).* Research project funded by the company HPA s.r.l. (`https://www.di.univr.it/?ent=progetto&id=5929`), Department of Computer Science, Verona University, Italy (12/2023 - Present). Role: participation in project development activities.

  Description: Constrained optimization algorithms for route planning in road transportation requires innovative approaches that must be flexible (e.g., capable of optimizing different utility functions) and adaptable to dynamic and not totally predictable

configurations of the environment (e.g., traffic congestion). The aim of this project is to perform comparative analysis and to design innovative solutions based on evolutionary algorithms for the generalized and multi-objective Vehicle Routing Problem (VRP). The analysis considers how the main features of the problem (e.g., graph topology, selected performance metrics etc.) influence the solutions that the algorithms provide considering both the quality of the solution and the computational aspects (e.g., time and memory needed to execute the algorithm). My role consists in supporting the development of innovative methods for the parameterization of state-of-the-art approaches through the use of solutions based on machine learning and reinforcement learning.

- *RL-HEAT: Intelligent Heating Control based on Reinforcement Learning Techniques.* Joint project (`https://www.di.univr.it/?ent=progetto&id=5643`), Department of Computer Science, Verona University, Italy (10/2020 - 09/2021). Role: participation in project development activities.

  Description: A key goal for RL-HEAT is to apply Safe Reinforcement Learning to perform adaptive control for an intelligent boiler. The aim is to properly model the control problem for the intelligent boiler so to devise and apply novel Safe RL techniques. The RL-HEAT project will focus on model-based approaches to RL (e.g., POMDP) and will investigate recent, approximate solution techniques (e.g., the POMCP algorithm). Within this context it is beconsidered the specific challenge of inserting a-priori knowledge inside the model by leveraging on ad-hoc solutions already applied by the industrial partner to perform adaptive control. The empirical evaluation is performed on a prototype intelligent boiler provided by an industrial partner.

- *Dipartimento di Eccellenza: Informatica per Industria 4.0:* Italian Ministry of Education, Universities and Research (MIUR) project (`https://www.di.univr.it/?ent=home&page=eccellenza&lang=en`), Department of Computer Science, Verona University, Italy (10/2018 - 12/2022). Role: responsible for research activities related to planning of mobile robots, supervisor of students and research fellows.

  Description: Industry 4.0 is the convergence of computer science, robotics, automation and automatic reasoning for the creation of new production processes and new more flexible products, which improve the competitive capabilities of Italian companies, with particular attention to SMEs. The project aims to better combine mathematical and computer skills with information engineering to arrive at a holistic approach to design, bringing the challenges of Industry 4.0 to the reach of SMEs in the reference area. My activities in the project are related to the development of online planning techniques for controlling mobile robots while guaranteeing safety (Castellini et al. 2021a, Wang et al. 2021b, Castellini et al., 2020d, Azzalini et al., 2020g, Castellini et al., 2019b).

- *GHOTEM - Global House Thermal & Electrical Energy Management:* POR/FESR European Regional Development Fund 2014-2020 (`https://www.di.univr.it/?ent=progetto&id=5233&lang=it`), Department of Computer Science, Verona University, Italy (10/2018 - 12/2020). Role: responsible for research activities related to the module for heating load forecasting in AGSM district heating network, supervisor of students and research fellows.

  Description: The GHOTEM project aims to promote the acceleration of technological innovation to support the energy transition, taking up some important challenges

relating to the energy sector such as the massive use of renewables, technological development in energy efficiency, innovation for heating/cost-effective and zero-emission cooling, the development of efficient batteries and storage systems, the integration of control and management in the perspective of smart grids. My activities in the project are related to the development of predictive models for multivariate time series acquired from sensors. The goal is to predict heating load in power plants of smart district heating networks (AGSM case study). A second activity is related to techniques for thermal comfort optimization in smart buildings. In this context the goal is to develop planning techniques able to adapt to different environments or dynamical changes of the environment (Castellini et al., 2020h, Bianchi et al., 2020j, Bianchi et al., 2020i, Bianchi et al., 2020b, Castellini et al., 2019c).

- *COREWOOD - Riposizionamento competitivo del la filiera del legno*: POR/FESR European Regional Development Fund 2014-2020 (`https://www.di.univr.it/?ent=progetto&id=5232&lang=it`), Department of Computer Science, Verona University, Italy (10/2018 - 12/2020). Role: responsible for research activities related to the module for adaptive control of the temperature, supervisor of students and research fellows.

  Description: The project intends to address a strategic issue of the supply chain, namely its competitive repositioning in a changed international context. My activities in the project are related to the development of heating control methods for the optimization of thermal comfort and energy consumption in wooden housing structures (Castellini et al., 2019c).

- *PreMANI - Manifattura Predittiva: progettazione, sviluppo e implementazione di soluzioni di Digital Manufacturing per la previsione della qualità e la manutenzione intelligente*: POR/FESR European Regional Development Fund 2014-2020 (`https://www.di.univr.it/?ent=progetto&id=5235&lang=en`), Department of Computer Science, Verona University, Italy (10/2018 - 12/2020). Role: participation in the research activities of the project.

  Description: The project aims to develop techniques that can address the issue of predicting the operating characteristics of machines and plants, combining the analysis of quality (of the product) with that of efficiency (of the plants), in a context that is therefore described as predictive manufacturing.

- *INTCATCH - INTegrated tools for monitoring and managing CATCHments:* European project, Call: H2020 WATER 2015 (`http://intcatch.eu`), Department of Computer Science, Verona University, Italy (06/2017 - 09/2018). Role: responsible for research activities related to the data analysis and situation assessment module, supervisor of students and research fellows.

  Description: Monitoring of catchments by autonomous aquatic drones has recently gained increasing interest. In this context robotic boats must navigate rivers and lakes to acquire real-time data concerning important water parameters, such as dissolved oxygen and electrical conductivity. My activity in this project focuses on the development of tools for situation assessment and activity recognition from sensor data based on supervised and unsupervised methods. Multivariate time-series segmentation (e.g., Hidden Markov Models) and clustering (e.g., Gaussian Mixture Models) methods were employed, for instance, to support on-line decision making of drones/operators and off-line analysis of large datasets collected by drone sensors (Castellini et al., 2020c,

Castellini et al., 2019e, Castellini et al., 2018b, Castellini et al., 2018a, Castellini et al., 2017e). These methods aim also to overcome some issues related to manual data labeling which is sometimes impracticable for real datasets.

- *EXPO-AGRI - EXtra-field Plant Observation for monitoring and forecast of AGRicultural Infections:* Joint project (http://www.di.univr.it/?ent=progetto&id=4589), Department of Computer Science, Verona University, Italy (06/2016 - 09/2018). Role: responsible for research activities related to the data analysis and predictive modeling module, supervisor of student.

  Description: In agriculture, several plant pathogens, e.g., bacteria and fungi, can cause serious damages to crops, consumers and economy. Traditional greenhouse control systems react to threshold crossing events on each monitored parameter but they do not consider the global relationship between all these parameters and crop behavior. The aim of this project is to develop a greenhouse control system which directly maximizes crop yield and minimizes infection based on real time data acquired though a sensor network. The main focus of my research is threefold: the creation of mathematical models linking multivariate time-series of observed environmental parameters to disease development; the creation of prediction models of plant disease development as a function of physical environmental parameters and weather forecast; the creation of a monitoring and control system fostering plant grow and reducing disease development with application to the binomia "Basil-Peronospora". Methodologies based on regularized regression and Bayesian networks are being used to reach these goals (*Castellini et al., 2017b*).

- *Regression methods for integrative analysis of large–scale data:* MPI project, Bioinformatics group, Institute for Biochemistry and Biology, Max Planck Institute of Molecular Plant Physiology/University of Potsdam, Potsdam, Germany (04/2014 - 01/2016). Role: responsible for research activities related to the prediction of the biomass of new hybridized maize plants.

  Description: The problem is to pre-select the best plant crosses from a huge number of potential candidates, with the goal to increase the production of this crop to meet its rising demand for feed and biofuels. Regression and regularization techniques, such as LASSO and elastic net, were used and extended in order to generate models that integrate data from different biological layers with the aim to predict traits (e.g., biomass) of crosses from SNPs, metabolic and enzymatic profiles of parent plants. Prediction performance, model interpretability and generalizability are fundamental aspects in this context since a small number of biomarkers should be identified among a large set of candidates to predict the biomass of new plants across different environments (*Castellini et al., 2015d; Edlich-Muth et al., 2015e*). From a mathematical and computational point of view this problem is challenging because it involves high-throughput datasets with thousands of variables, and a relative small number (usually hundreds) of observations. Model generation in these conditions is ill-posed and affected by instability, overfitting and multicollinearity. Various search strategies grounded in statistics, machine learning and optimization theory, can be used to select predictors and tune model parameters. Each methodology could select different biomarkers and generate models having different performance and interpretability. Interesting theoretical questions concern the analysis of the effect of data distribution, number of samples, data correlation structure and other parameters on model performance.

Moreover, the transfer of knowledge from greenhouse experiments to field cultivation, and the development of network-based and multi-layer predictive models which reflect the multi-level structure of omics datasets, are other important challenges.

- *Business intelligence projects* at Eli Lilly, Benetton, Miroglio, Italcementi, Cattolica assicurazioni. Sdg group, Verona, Italy (05/2012 - 03/2014). Role: senior consultant.
- *Comparative genomics by k-mer based indices:* Univr and CMBC internal project, Center for BioMedical Computing (CBMC), Verona University, Italy (01/2010 - 03/2014). Role: responsible for research activities related to methods for comparative genomics.

  Description: This project concerns genomic sequence analysis and comparative genomics by means of dictionary-based indexes. The final goal is to discover statistical/informational properties and patterns in genomes (*Castellini et al., 2012a*). As sequences of symbols, genomes determine dictionaries constituted by k-mers (factors) occurring in them. The starting point of our analysis was the computation of dictionaries of k-mers, with k = 6, 12, 18, of given genomes. Some properties of such dictionaries, such as the distributions of k-mers, and their compared statistics guided the research along lines of development which emerged from the empirical evidence of computed data. A new (mathematical) perspective on genomes stemmed from this approach and a Java client-server application was developed to provide the high computational power required for this kind of analysis. Suitable data structures and ad-hoc parallel algorithms were implemented for systematically storing, querying, analyzing and comparing k-mer dictionaries and a web portal for accessing this data was designed. Analyses moved in various directions, among them, the investigation of k-repeat-sharing gene networks (networks of genes connected if sharing k-mers of a given length) using statistical and graph theoretical methods (*Castellini et al., 2015c*), and genome classification (*Castellini et al., 2011b*).
- *Modeling and simulation of metabolic systems:* Univr and CMBC internal project, Center for BioMedical Computing (CBMC), Verona University, Italy (01/2007 - 03/2014). Role: responsible for research activities related to metabolic system modeling and simulation.

  Description: This project concerns the development of reverse engineering methods for the synthesis of metabolic and gene regulatory networks from time series. The final aim is to infer the topology and the regulative mechanisms of these networks from observed data (*Castellini et al., 2014a; Manca et al., 2013b; Castellini et al., 2010a; Castellini et al., 2009b; Castellini et al., 2008a*) and to simulate their dynamics in-silico with different conditions. Differential equations are a standard modeling framework in this context. I have collaborated to the development of a non-conventional and time-discrete approach based on difference equations, called Metabolic P systems. Several techniques were used to infer metabolic flux regulation functions. Multiple linear regression was used together with stepwise procedures for selecting flux regulators (*Castellini et al., 2011a*). A machine learning approach based on artificial neural networks was developed for generating nonlinear models, wherein both back-propagation and bio-inspired optimization techniques (e.g., genetic algorithms, particle swarm optimization and some heuristics) were used for training the models (*Castellini et al., 2010b; Castellini et al., 2009c*). Finally, a methodology based on genetic algorithms and multiple linear regression was proposed which deals with model generation as an evolutionary process (*Castellini et al., 2015b; Castellini et al., 2013a; Castellini et al., 2012b; Castellini et al., 2012c*). An open source Java software called MetaPlab (http://mplab.sci.univr.it/) (*Castellini et al., 2009a; Castellini et al., 2007a*) was released along with some plugins, such as, GeneticSynth (*Castellini et al., 2015a*), that provide support for specific tasks related to the model building process. Last developments of this project focus on the development of data-driven models for immunosenescence. The goal is to describe age-related changes in the network of relationships among different subpopulations of peripheral B lymphocytes. A dataset generated by the University Hospital of Verona (Italy) of about six thousands samples of patients between one day and ninety-six years has been analyzed by different statistical methods. My research activities involve the development of state-of-the-art and novel modeling methods, such as, difference equations/metabolic P systems and multivariate time-series segmentation

for the analysis of these data (*Castellini et al., 2019e; Castellini et al., 2018c; Castellini et al., 2017c; Castellini et al., 2017d; Castellini et al., 2014a*).

- *Analysis of Space Technologies:* Italian Space Agency, marketing unit, Rome, Italy (09/2006 - 03/2007). Role: intern.

Organization/coordination/participation of/in national/international research groups

- Participation in the activities of the *Intelligent Systems Lab* (ISLa) group (10/2018 - Present) - Prof. Alessandro Farinelli (`https://www.di.univr.it/?ent=grupporic&id=451` - `https://isla-lab.github.io/`)
- Coordination of the *Working Group in Artificial Intelligence and Robotics (AIRO)* (01/2024 - Present) with Prof. Alberto Finzi and Dr. Gloria Beraldo. (`https://aixia.it/gruppi/gruppo-di-lavoro-in-ai-e-robotica-airo/`)

Participation in editorial committees (partecipazione a comitati editoriali)

- *Special issue Planning and Learning for Autonomous Robotics - Robotics and Autonomous Systems* (01/2024 - 12/2026). 32 papers published. Editors: Gloria Beraldo (CNR, Roma), Alberto Castellini (Executive Guest Editor), Alberto Finzi (Università Federico II, Napoli), Fabio Patrizi (Sapienza Università di Roma), Salvatore Anzalone (Université Paris 8), Enrico Pagello (Università di Padova).
`https://www.sciencedirect.com/special-issue/10FR1DKKK7D`
- *Paper editor for Frontiers Sustainable Cities* (01/2022 - 06/2022). Lourdes Montalvo, David Fosca, Diego Paredes, Monica Abarca, Carlos Saito, Edwin Villanueva. An Air Quality Monitoring and Forecasting System for Lima City With Low-Cost Sensors and Artificial Intelligence Models. Frontiers in Sustainable Cities, volume 4, doi: 10.3389/frsc.2022.849762, issn: 2624-9634, 2022 (url: `https://www.frontiersin.org/journals/sustainable-cities/articles/10.3389/frsc.2022.849762`)
- *Proceedings of AIRO 2025. The 12th Italian Workshop on Artificial Intelligence and Robotics*, Workshop co-located with 7th edition of the Italian Conference of Robotics and Intelligent Machines (I-RIM 2025), Roma, October 17th, 2025. Editors: Gloria Beraldo, Alberto Castellini, Alberto Finzi, Fabio Patrizi. CEUR Workshop Proceedings AIxIA Series Series, 2025, ISSN: 1613-0073.
- *Proceedings of AIRO 2024. The 11th Italian Workshop on Artificial Intelligence and Robotics*, Workshop co-located with AIxIA 2024, Bolzano, November 25th, 2024. Editors: Gloria Beraldo, Alberto Castellini, Alberto Finzi, Fabio Patrizi. CEUR Workshop Proceedings AIxIA Series Series, 2024, ISSN: 1613-0073.
- *Proceedings of AIRO 2023. The 10th Italian Workshop on Artificial Intelligence and Robotics*, Workshop co-located with AIxIA 2023, Rome, November 11th , 2023. Editors: Salvatore Anzalone, Gloria Beraldo, Alberto Castellini, Alberto Finzi, Fabio Patrizi. CEUR Workshop Proceedings AIxIA Series Series, 2023, ISSN: 1613-0073.
- *Proceedings of AIRO 2022. The 9th Italian Workshop on Artificial Intelligence and Robotics*, Workshop co-located with AIxIA 2022, Udine, November 30th , 2022. Editors: Salvatore Anzalone, Gloria Beraldo, Luca Buoncompagni, Alberto Castellini, Alberto Finzi. CEUR Workshop Proceedings AIxIA Series Series 3417, 2023, ISSN: 1613-0073.

- *Proceedings of AIRO 2021. The 8th Italian Workshop on Artificial Intelligence and Robotics*, Workshop co-located with AIxIA 2021, Online, November 30th , 2021. Editors: Salvatore Anzalone, Luca Buoncompagni, Alberto Castellini, Alberto Finzi. CEUR Workshop Proceedings AIxIA Series Series 3162, 2022, ISSN: 1613-0073.
- *Proceedings of AIRO 2020. The 7th Italian Workshop on Artificial Intelligence and Robotics*, Workshop co-located with AIxIA 2020, Online, November 26, 2020. Editors: Salvatore Anzalone, Luca Buoncompagni, Alberto Castellini, Alberto Finzi. CEUR Workshop Proceedings AIxIA Series Series 2806, 2021, ISSN: 1613-0073.
- *Proceedings of AIRO 2019. The 6th Italian Workshop on Artificial Intelligence and Robotics*, Workshop co-located with AIxIA 2019 Rende, Italy, November 22, 2019. Editors: Salvatore Anzalone, Luca Buoncompagni, Alberto Castellini, Alberto Finzi. CEUR Workshop Proceedings AIxIA Series 2594, 2020, ISSN: 1613-0073.

Organization of conferences and workshops (organizzazione di conferenze/workshop)

- Italian Workshop on Artificial Intelligence and Robotics at the International Conference of the Italian Association for Artificial Intelligence (AIRO@AIxIA - `https://www.airo-aixia.it/airo2020/`). Member of organizing committee: 2026, 2025, 2024, 2023, 2022, 2021, 2020, 2019.
- International Conference on Machine Learning, Optimization, and Data Science (LOD - `https://lod2021.icas.cc/`). Member of organizing committee: 2021, 2020, 2019, 2018. Chair and organizer of special session on Data Science for Sustainable Cities `https://lod2021.icas.cc/special-sessions/`: 2021.
- Advanced Course on Data Science and Machine Learning (ACDM - `https://acdl2021` `https://acdl2025.icas.events/`). Member of organizing committee: 2021, 2020, 2019, 2018.
- Advanced Course & Symposium on Artificial Intelligence and Neuroscience (ACAIN - `https://acain2021.artificial-intelligence-sas.org/`). Member of organizing committee: 2021.
- International Synthetic and Systems Biology Summer School (SSBSS - `https://ssbss2020.icas.xyz/`). Member of organizing committee: 2020, 2019, 2018.

Program committee of international conferences (comitati di programma)

I reviewed about 110 papers of top-tier international AI conferences in the last three-year period (2021-2024).

- Annual Conference on Neural Information Processing Systems (NeurIPS). Member of program committee: 2026, 2025.
- International Conference of Machine Learning (ICML). Member of program committee: 2026.
- AAAI Conference on Artificial Intelligence (AAAI - `https://aaai.org/Conferences/AAAI-21/`). Member of program committee: 2026, 2025, 2024, 2023, 2022, 2021, 2020, 2019, 2018. Member of program committee for Student Abstracts Tracks: 2020, 2021.
- International Joint Conference on Artificial Intelligence (IJCAI - `https://ijcai-21.org/`). Member of program committee: 2026, 2025, 2024, 2023, 2022, 2021, 2020, 2019. Session chair: 2019.

- International Conference on Autonomous Agents and Multiagent Systems (AAMAS - https://aamas2021.soton.ac.uk/). Member of program committee: 2026, 2025, 2024, 2023, 2022, 2021, 2019. Distinguished reviewer 2026 https://cyprusconferences.org/aamas2026/distinguished-committee/. Session chair: 2022.
- International Conference on Automated Planning and Scheduling (ICAPS). Member of program committee: 2026, 2025, 2024.
- IEEE International Conference on Robotics and Automation (ICRA). Member of program committee: 2022, 2021.
- Workshop on Autonomous Robots and Multirobot Systems at the International Conference on Autonomous Agents and Multiagent Systems (ARMS@AAMAS - https://u.cs.biu.ac.il/~agmon/arms2021/). Member of program committee: 2026, 2025, 2024, 2023, 2022, 2021.
- Conference on Uncertainty in Artificial Intelligence (UAI - https://auai.org/uai2021/). Member of program committee: 2023, 2022, 2021. Best reviewer award in 2023.
- European Conference on Artificial Intelligence (ECAI - http://ecai2020.eu/). Member of program committee: 2025, 2024, 2023, 2020.
- European Conference on Multi-Agent Systems (EUMAS - https://biu-ai.com/EUMAS21/). Member of program committee: 2021, 2020.
- ACM Symposium on Applied Computing (SAC - https://www.sigapp.org/sac/sac2021/), track on Intelligent Robotics and Multi-Agent Systems (IRMAS). Member of program committee: 2026, 2025, 2024, 2023, 2022, 2021, 2020.
- International Conference on Principles of Knowledge Representation and Reasoning (KR - https://kr.org/KR2025/)
- British Machine Vision Conference (BMVC - https://www.bmvc2020-conference.com/). Member of program committee: 2025.
- IEEE International Symposium on Multi-Robot and Multi-Agent Systems (IEEE MRS - https://robotics.cs.rutgers.edu/mrs2019/). Member of program committee: 2019.
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS - https://www.iros2019.org/). Member of program committee: 2019, 2018.
- IEEE Congress on Evolutionary Computation (IEEE CEC - https://cec2021.mini.pw.edu.pl/). Member of program committee: 2019, 2018, 2017.
- International Conference on Machine Learning, Optimization, and Data Science (LOD - https://lod2021.icas.cc/). Member of organizing and program committee: 2021, 2020, 2019, 2018.
- International Conference on Machine Learning, Optimization and Big Data (MOD 2017 - https://mod2017.taosciences.org/): session chair.
- Genetic and Evolutionary Computation Conference (GECCO - http://www.sigevo.org/gecco-2010/). Member of program committee: 2014, 2013, 2012, 2011, 2010.
- International Conference on Parallel Problem Solving From Nature (PPSN). Member of program committee: 2012.

Activity as a referee for international journals (referaggi per giornali internazionali)

- IEEE Transactions on Pattern Analysis and Machine Intelligence (IEEE, Q1 Artificial intelligence, h-index 397),
- Journal of Machine Learning Research (IEEE, Q1 Artificial intelligence, h-index 302),
- Engineering Applications of Artificial Intelligence (Elsevier, Q1 Artificial intelligence, h-index 169),
- IEEE Transactions on Robotics (IEEE, Q1 Computer Science Applications, h-index 177),
- IEEE Transactions on Neural Networks and Learning Systems (IEEE, Q1 Artificial intelligence, h-index 234)
- IEEE Transactions on Industrial Informatics (IEEE, Q1 Computer Science Applications, h-index 170),
- Journal of Machine Learning Research (IEEE, Q1 Artificial intelligence, h-index 302),
- International Journal of Approximate Reasoning (Elsevier, Q1 Teoretical computer science, Q2 Artificial Intelligence, h-index 105),
- International Journal of Advanced Robotic Systems (SAGE, Q3 Artificial Intelligence, Q2 Computer Science Applications),
- Intelligent Service Robotics (Springer, Q2 Artificial Intelligence, h-index 35)
- Computer Science and Engineering (Springer, Q1 Computer Science Applications, h-index 23),
- Sustainable Energy, Grides and Networks (Elsevier, Q1 Control and System Engineering, h-index 41),
- Journal of Building Engineering (Elsevier, Q1 Building and construction, h-index 72)
- Bioinformatics (Oxford Journals, Q1 Computer Science Applications, h-index 442),
- BioSystems (Elsevier, Q3 Modeling and simulation, h-index 80),
- Journal of Global Optimization (Springer, Q1 Control and Optimization, h-index 93),
- Journal of Regenerative Medicine and Tissue Engineering (HOAJ, Q2 Medicine, h-index 85),
- Letters in Drug Design and Discovery (LDDD, Q3 Pharmaceutical Science, h-index 36),
- Energy Systems - Optimization, Modeling, Simulation, Economic Aspects (Springer).

Participation in conferences and related talks (relatore a congressi e convegni)

Symbols * and ** denote personal presentation of, respectively, papers or posters in the conference.

- Unistem day (**invited talk**), L'infinito viaggio delle ricerca scientifica, Università di Verona, March 23, 2026, Verona, Italy. Talk title: Intelligenza Artificiale: una Passeggiata tra Automobili Autonome e Città Intelligenti con ChatGPT.

- Trasformazione digitale e sostenibile delle PMI venete (**invited talk**): Intelligenza Artificiale di supporto alla trasformazione dei processi di filiera e cybersecurity, Department of Management, Università di Verona, October 03, 2025, Verona, Italy. Talk title: Intelligenza Artificiale: Un alleato per le aziende del futuro.
- Associazione culturale CTG un volto nuovo (**invited talk**): Incontri culturali autunno 2025, September 09, 2025, Verona, Italy. Talk title: Intelligenza artificiale: tra automobili autonome e ChatGPT.
- Festival Fregona borghi e natura (**invited talk**): Sfide, September 06, 2025, Fregona, Italy. Talk title: Pensare con le macchine? Le sfide dell?intelligenza artificiale.
- RLC 2025**: The Reinforcement Learning Conference 2025, August 5-9, 2025, Edmonton, Canada. Presented paper (*Zorzi et al. 2025d*).
- Behave Project (**project talk**): Workshop, Learning and Planning Agents, Department of Information Engineering, University of Brescia, Italy (Workshop organized by Prof. Alfonso Gerevini), Future of Artificial Intelligence Research - FAIR. Talk title: Model-Based approaches for safe planning and learning in autonomous agents.
- ICML 2024**: The 41th International Conference of Machine Learning 2024, July 21-27, 2024, Vienna, Austria. Presented paper (*Bianchi et al., 2024e*).
- AIRO 2024: The 11th Italian Workshop on Artificial Intelligence and Robotics, at the 23th International Conference of the Italian Association for Artificial Intelligence (AIxIA 2024), November 26, 2024, Bolzano, Italy. Presented paper (*Bianchi et al., 2025b*).
- Scuola per l'imprenditoria (**invited talk**): Leader Geniali - L?innovazione in equilibrio tra uomo e IA, May 04, 2024, Verona, Italy. Talk title: Intelligenza Artificiale tra Presente e Futuro: Opportunità, Rischi e Casi Pratici.
- IPS 2023*: Italian Workshop on Planning and Scheduling, at the 22th International Conference of the Italian Association for Artificial Intelligence (AIxIA 2023), November 07-09, 2023, Roma, Italy. Presented paper (*Castellini et al. 2023i*).
- BIMU - Fieramilano Rho (**invited talk**): Tavola Rotonda, IA e Robotica: verso un'integrazione sinergica, October 11, 2023, Milano, Italy. Speakers: Matteo Matteucci (Politecnico di Milano); Luca Iocchi (Sapienza Università di Roma); Alberto Finzi (Università di Napoli-Federico II); Francesco Amigoni (Politecnico di Milano); Alberto Castellini (Università di Verona); Gloria Beraldo (Istituto di Scienze e Tecnologie della Cognizione del CNR); Domenico Appendino (presidente SIRI); Alessandro Santamaria (vicepresidente SIRI); Ennio Chiatante (consigliere SIRI).
- AIRO 2023: The 10th Italian Workshop on Artificial Intelligence and Robotics, at the 22th International Conference of the Italian Association for Artificial Intelligence (AIxIA 2023), November 08, 2023, Rome, Italy. Participation as organizer.
- ICML 2023**: The 40th International Conference of Machine Learning 2023, July 23-29, 2023, Honolulu, USA. Presented paper (*Castellini et al., 2023e*).
- ITAL-IA - Cini National Lab*: Italia Intelligenza Artificiale, May 29-31, 2023, Pisa, Italy. Presented paper (*Bianchi et al. 2023h*).
- Workshop Dynamical Systems Afternoon (**invited talk**): Laboratory for Computer Science, Signals and Systems (I3S), Universitè Cote D'azur, May 25-26, 2023, Sophia Antipolis, France. Talk title: Improving safety and sample efficiency in reinforcement

Reinforcement Learning: Methods and Applications. Workshop organized by Davide La Torre and Enrico Formenti.

- AIRO 2022*: The 9th Italian Workshop on Artificial Intelligence and Robotics, at the 21th International Conference of the Italian Association for Artificial Intelligence (AIxIA 2022), November 30, 2022, Udine, Italy. Presented paper (*Castellini et al., 2023c*).
- National Workshop for Technology Transfer and Higher Education**: ICE Lab, June 16-17, 2022, Verona, Italy. Presented poster titled *Data driven anomaly detection for mobile robots in Industry 4.0*.
- Cluster Tecnologico Nazionale Energia (**invited talk**): Workshop - Le Comunità e le Reti Energetiche: modelli di sviluppo sostenibile a confronto per la valorizzazione delle risorse termiche, March 16, 2022, Radicondoli (Siena), Italy, and online. Talk title: Intelligenza artificiale per la produzione e la gestione di energia nel teleriscaldamento.
- Innovation lab space13 (**invited talk**): Workshop - Intelligenza artificiale per le aziende, March 11, 2022, Legnago, Italy. Talk title: Come ottenere un valore aggiunto a prodotti e servizi attraverso l'Intelligenza Artificiale.
- AIRO 2021: The 8th Italian Workshop on Artificial Intelligence and Robotics, at the 20th International Conference of the Italian Association for Artificial Intelligence (AIxIA 2021), November 30, 2021, Online. Participation as organizer.
- EUMAS 2020*: The 17th European Conference on Multi-Agent Systems, September 14-15, 2020, Thessaloniki, Greece. Presented paper (*Castellini et al. 2021a*).
- LOD 2020*: The 6th International Conference on Machine Learning, Optimization, and Data Science, July 19-22, 2020 - Certosa di Pontignano, Siena - Tuscany, Italy. Presented paper (*Bianchi et al., 2020i*).
- AIRO 2020: The 7th Italian Workshop on Artificial Intelligence and Robotics, at the 19th International Conference of the Italian Association for Artificial Intelligence (AIxIA 2020), November 26, 2020, Online. Participation as organizer.
- ARMS 2020*: Autonomous Robots and Multirobot Systems 2020, a workshop affiliated with the 19th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2020), 9-13th May 2020, Auckland, New Zealand. Presented paper (*Castellini et al. 2021a*).
- AIRO 2019*: The 6th Italian Workshop on Artificial Intelligence and Robotics, at the 18th International Conference of the Italian Association for Artificial Intelligence (AIxIA 2019), November 19-22, 2019, Rende, Italy. Presented paper (*Castellini et al., 2020d*).
- IJCAI 2019*: The 28th International Joint Conference on Artificial Intelligence, August 10-16, 2019, Macao, China. Presented paper (*Castellini et al., 2019b*).
- SAC 2019*: The 34th ACM/SIGAPP Symposium On Applied Computing, April 8-12, 2019, Limassol, Cyprus, track on Intelligent Robotics and Multi-Agent Systems (IRMAS). Presented paper (*Castellini et al., 2019d*).
- FAIR 2018*: Federated AI for Robotics Workshop 2018, at the 27th International Joint Conference on Artificial Intelligence and the 23rd European Conference on Artificial Intelligence (IJCAI-ECAI 2018), July 13-19 2018, Stockholm, Sweden. Presented paper (*Castellini et al., 2018b*).

- SAC 2018**: The 33rd ACM/SIGAPP Symposium On Applied Computing, 9-13 April 2018, Pau, France. Presented poster (*Castellini et al., 2018a*). Winner of best poster award.
- LOD 2018*: The 4th International Conference on Machine Learning, Optimization, and Data Science, September 13-16, 2018 - Certosa di Pontignano, Siena - Tuscany, Italy. Presented paper (*Castellini et al., 2019e*).
- MOD 2017*: The Third International Conference on Machine Learning, Optimization and Big Data, 14-17 September 2017, Volterra, Italy. Presented paper (*Castellini et al., 2017d*).
- DataMod 2017*: 6th International Symposium "From Data to Models and Back", Satellite event of SEFM 2017, 4-5 September 2017, Trento, Italy. Presented paper (*Castellini et al., 2017c*).
- IPCAT 2015*: Information Processing in Cells and Tissues, 14-16 September 2015, San Diego, USA. Presented paper (*Castellini et al., 2015d*).
- PLANT 2030**: Status Seminar 2015, 04-06 March 2015, Potsdam, Germany. Presented poster (*Edlich-Muth et al., 2015e*).
- GECCO 2012**: Genetic and Evolutionary Computation COnference, 7-11 July 2012, Philadelphia, USA. Presented paper (*Castellini et al., 2012c*).
- ICARIS 2012*: The 11th International Conference on Artificial Immune Systems, 28-31 August, Taormina, Italy. **Invited talk**, paper (*Castellini et al., 2010b*).
- MIMOS 2012*: Italian Movement for Modeling and Simulation, 9-11 October 2012, Rome, Italy. **Invited talk**, Ph.D. thesis (*Castellini, 2010c*).
- PRIB 2011**: The 6th IAPR International Conference on Pattern Recognition in Bioinformatics, November 2-4 2011, Delft, The Netherlands. Presented poster (*Castellini et al., 2011b*).
- GECCO 2009*: Eleventh annual conference on Genetic and evolutionary computation, 8-12 July 2009, Montréal, Québec, Canada. Presented paper (*Castellini et al., 2009c*)
- WMC 2009*: Tenth workshop on Membrane Computing, 24-27 August 2009, Curtea de Argeş, Romania. Presented paper (*Castellini et al., 2010b*).
- QAPL 2009*: Seventh Workshop on Quantitative Aspects of Programming Languages, 28-29 March 2009, York, UK. Presented abstract: *Artificial Neural Networks for synthesizing Metabolic P Systems.*
- WMC 2008*: Ninth Workshop on Membrane Computing, 28-31 July 2008, Edinburgh, UK. Presented paper (*Castellini et al., 2009a*)
- Modern Software Solutions in Drug Discovery Design and Planning Methods, FQS Poland (Fujitsu), 7 March 2008 Basel, Switzerland.
- BWMC6*: Sixth Brainstorming Week on Membrane Computing, 4-8 February 2008, Sevilla, Spain. Presented abstract (*Castellini et al., 2008b*).
- NICSO 2007*: International Workshop on Nature Inspired Cooperative Strategies for Optimization, 8-10 November 2007, Acireale, Italy. Presented paper (*Castellini et al., 2008a*).

Internal talks (seminari interni)

- Research interest and activities. Selections for the RTD-B position. Verona University, Department of Computer Science, October 18, 2021.
- Research interest and activities. Selections for the RTD-A position. Verona University, Department of Computer Science, September 20, 2018.
- Data integration and prediction. OPTIMAL consortium internal meeting ("Genetic and biomarker-based predictive breeding of corn cultivars"). Max Planck Institute of Molecular Plant Physiology, Potsdam, Germany, April 2015.
- Statistical learning approaches for integrative modeling of molecular phenotypes in the context of biomass heterosis and metabolic networks. Progress seminar. Max Planck Institute of Molecular Plant Physiology, Potsdam, Germany, March 2015.
- Towards genetic and biomarker-assisted predictive breeding of maize hybrids. Affinity seminar. Max Planck Institute of Molecular Plant Physiology, Potsdam, Germany, December 2014.
- Business intelligence and data mining in biomedical research. Center for BioMedical Computing (CBMC), November 2011.
- Variable selection for linear regression models: stepwise regression. Verona University, Department of Computer Science, November 2009.
- Metabolic P systems for systems biology. Graduate School of Information Science, Nagoya University, Japan, December 2008.
- Metabolic P systems for modelling biological processes. ASAP group, School of Computer Science, University of Nottingham, UK, October 2008.
- The MetaPlab plugin-based architecture. Infobiotics software meeting, ASAP group, School of Computer Science, University of Nottingham, UK, June 2008.
- Theories and applications of modelling by Metabolic P systems. Research Away Day (RAD'08), ASAP group, Crown Plaza hotel, Nottingham, UK, June 2008.
- Modelling biological systems by MP systems. Verona University, Department of Computer Science, January 2008.
- Genetic Programming for the Automatic Synthesis of Metabolic Pathways. Verona University, Department of Computer Science, January 2008.
- Comparing models in computational systems biology. Verona University, Department of Computer Science, October 2007.

Teaching (attività didattica a livello universitario)

Lecturer at Verona University (Italy):

- **Planning and Reinforcement learning (Reinforcement Learning)**, Laurea Magistrale in Artificial Intelligence, Department of Computer Science (6 ETCS, academic year **2025-26**). Topics: introduction to RL, multi armed bandits, Markov Decision Processes, RL based on Dynamic Programming (value and policy iteration), RL based on Monte Carlo, RL based on temporal-difference learning, RL and planning, model-based RL, on-policy prediction and control with approximation, deep Q networks,

policy gradient methods, REINFORCE, actor-critic methods, A2C, advanced model-based and model-free methods. Lab sessions with Python, Tensorflow and PyTorch.

- **Natural Language Processing (LLMs)**, Laurea Magistrale in Artificial Intelligence, Department of Computer Science (3 ETCS, academic year **2025-26**). Topics: attention, transformers, large language models, encoder and decoder architectures, prompting, fine-tuning, pre-training, analysis and re-implementation of GPT2 (lab).
- **Reinforcement learning and Advanced programming for AI (Reinforcement Learning)**, Laurea Magistrale in Artificial Intelligence, Department of Computer Science (6 ETCS, academic year **2022-23, 2023-24, 2024-25**). Topics: introduction to RL, multi armed bandits, Markov Decision Processes, RL based on Dynamic Programming (value and policy iteration), RL based on Monte Carlo, RL based on temporal-difference learning, RL and planning, model-based RL, on-policy prediction and control with approximation, deep Q networks, policy gradient methods, REINFORCE, actor-critic methods, A2C, advanced model-based and model-free methods. Lab sessions with Python, Tensorflow and PyTorch.
- **Statistical learning (Part I+II)**, Laurea Magistrale in Artificial Intelligence, Laurea Magistrale in Data Science, Laurea Magistrale in Mathematics, Department of Computer Science (6 ETCS, academic year **2023-24, 2024-25, 2025-26**). Topics: linear regression, variable subset selection, regularization, k-means clustering, logistic regression, K nearest neighbour, linear discriminant analysis for classification, decision trees for regression and classification, neural networks, analysis of real datsets with Python (telco customer churn, prostate cancer, fraud detection in supply chain, human tumor, house value prediction).
- **Programming I** - theory, Bachelor in Computer Science, Department of Computer Science (3 ETCS, academic year **2022-23, 2023-24, 2024-25, 2025-26**). Topics: algorithms, flow charts, introduction to the C programming language - instructions, variable types, conditions, loops, arrays and matrices, structures.
- **Corso di formazione**, Cromodora Wheels Spa, Ghedi, Brescia (14 hours, **2025-26**). Topics: linear regression, regularized regression, classification with KNN, LDA, decision treees, anomaly detection for industrial applications.
- **Corso di formazione**, Salvagnini Spa, Sarego, Vicenza (4 hours, **2025-26**). Topics: linear regression, regularized regression, model selection, tree-based methods for industrial applications.
- **Statistical learning (Part I+II)**, Laurea Magistrale in Data Science, Laurea Magistrale in Mathematics, Department of Computer Science (6 ETCS, academic year **2022-23**). Topics: linear regression, variable subset selection, regularization, k-means clustering, logistic regression, K nearest neighbour, linear discriminant analysis for classification, decision trees for regression and classification, neural networks, analysis of real datsets with Python (telco customer churn, prostate cancer, fraud detection in supply chain, human tumor, house value prediction).
- **Computer Science (Informatica)**, Bachelor in Biotechnology, Department of Biotechnology (6 ETCS, academic year **2021-22**). Topics: introduction to computer science; information coding, binary numbers and digital signals; computer architecture, Von Neumann model and CPU, memory and external devices; operating systems; application software, spreadsheets; programming: languages, programming methods, data

structures and algorithms, program development; basics of python language; other tools for data analysis; computer networks; databases.

- **Operating Systems (Laboratory)**, Bachelor in Computer Science, Department of Computer Science (4 ETCS, academic year **2021-22**). Topics: system calls for I/O, system calls for process management, system calls for inter-process communication and synchronization (signals, pipe, fifo, message queue, share memory, semaphores).
- **Statistical learning (Part II)**, Laurea Magistrale in Data Science, Laurea Magistrale in Mathematics, Department of Computer Science (3 ETCS, academic year **2019-20, 2020-21, 2021-22**). Topics: linear regression, variable subset selection, regularization, k-means clustering, logistic regression for classification, neural networks, analysis of real datsets with Python (telco customer churn, prostate cancer, human tumor, house value).
- **Operating Systems (Laboratory)**, Bachelor in Computer Science, Department of Computer Science (2 ETCS, academic year **2018-19, 2019-20, 2020-21**). Topics: system calls for I/O, system calls for process management, system calls for inter-process communication and synchronization (signals, pipe, fifo, message queue, share memory, semaphores).
- **Statistical methods for data analysis**, Laurea Magistrale in Mathematics, Department of Computer Science (3 ETCS, academic year **2018-19**). Topics: linear regression, variable subset selection, regularization, k-means clustering, logistic regression for classification, neural networks, analysis of real datsets with Python (telco customer churn, prostate cancer, human tumor, house value). I collaborated in the design of this course, which was given for the first time in the master's degree in Mathematics, and later renamed *Statistical learning* and taught also in the master's degree in Data Science.
- **Foundations of Data Analysis and Machine Learning**, Master in Logistica Integrata - Supply Chain Management (LogiMaster), Department of Economics (4 hours, academic year **2019-20, 2020-21, 2021-22, 2022-23, 2023-24, 2024-25, 2025-26**). Topics: linear regression and regularized regression for predictive modeling in logistics with Python.
- **Laboratory of data analysis**, ARPA Veneto, Teolo, Padova (8 hours, **2019**). Topics: linear regression and regularized regression for predictive modeling in logistics with Python.
- **Programming** - theory, Bachelor in Bioinformatics (3 ETCS, academic year **2017-18**). Topics: C programming language.
- **Algorithms and Languages for Bioinformatics** - module "Languages", Laurea Magistrale in Bioinformatics and Medical Biotechnology (6 ETCS, academic years **2011-12, 2012-13, 2013-14**). Topics: introduction to the main elements of Java, Matlab (bioinformatics toolbox) and Python (biopython).
- **Algorithms and Languages for Bioinformatics**, Laurea Magistrale in Bioinformatics and Medical Biotechnology (6 ETCS, academic years **2010-11**). Topics: descriptive statistics, hypothesis testing, correlation, regression and variable selection, time series analysis, alignment algorithms, web services in bioinformatics, introduction to the main elements of Java, Matlab (bioinformatics toolbox) and Python (biopython).

Lecturer at the University of Potsdam (Germany):

- **Network and Profile Data Analysis**, Master in Bioinformatics (6 ETCS, academic years **2014-15, 2015-16**). Topics: graph theory, network motifs, community structures, graph comparison, similarity measures, clustering algorithms, multiple hypothesis testing, time-series segmentation.
- **Selected methods and techniques for systems biology and informatics**, Master in Bioinformatics (6 ETCS, academic years **2014-15, 2015-16**). Topics: kinetic modeling, time-course simulation and linear stability, bifurcations and metabolic control analysis, genome-scale network reconstruction, constraint-based modeling, flux balance analysis, metabolic pathway analysis, chemical reaction network theory.

Lecturer at CUOA Business School, Vicenza:

- **Intelligenza Artificiale: soluzioni operative**, Master in Digital Transformation, Analytics & IoT (6 ore, academic years **2025-26**). Topics: Introduction to AI, regression, LLMs.

Teaching assistant at Verona University, Faculty of Mathematical, Physical and Natural Science:

- **2009-10**: **Programming II - laboratory** (Laboratorio di Programmazione II), bachelor in bioinformatics.
- **2009-10**: **Programming I - laboratory** (Laboratorio di Programmazione I), bachelor in computer science.
- **2008-09**: **Programming - laboratory** (Laboratorio di Programmazione), bachelor in applied mathematics.
- **2008-09**: **Algorithms and data structures - laboratory** (Laboratorio di Algoritmi e Strutture Dati), bachelor in bioinformatics.
- **2007-08**: **Informational Methods - laboratory** (Laboratorio di Metodi Informazionali), bachelor in bioinformatics.

Supervision of students and researchers (supervisione studenti e ricercatori)

Assistant professors (ricercatori):

- Daniele Meli. Ricercatore a tempo determinato tipo A (RTD-A). Project title: Planning for autonomous robotic platforms used in environmental monitoring. Funded by "DM 1062/2021 - PON RICERCA E INNOVAZIONE", Department of Computer Science, Verona University (01/2022 - 12/2024).

Postdoc research fellows:

- Davide Corsi. Postdoc research grant (Assegno di ricerca). Project title: Development of AI techniques for autonomous robots employed in water monitoring for sustainable tourism. Funded by Interconnected Nord-Est Innovation Ecosystem (I-Nest), spoke 6, Department of Computer Science, Verona University (10/2023 - 02/2024).
- Riccardo Sartea. Postdoc research grant (Assegno di ricerca). Project title: Analysis of malware dynamic behaviors based on reinforcement learning and statistical data analysis. Funded by Fondo Unico per la Ricerca (FUR), Department of Computer Science, Verona University (10/2019 - 09/2020).

Research fellows (without PhD):

- Davide Cordioli. Research grant (Borsa di ricerca). Project title: Safe Reinforcement Learning for Autonomous Management of Hybrid Heat Pumps (Safe Reinforcement learning per la gestione autonoma di pompe di calore ibride). Funded by the Sinerghy project, POR/FESR European Regional Development Fund 2021-2027, Department of Computer Science, Verona University (04/2026 - 09/2026).
- Tiziano Tezze. Research grant (Borsa di ricerca). Project title: Reinforcement learning for optimizing energy sources in smart buildings (Reinforcement learning per l'ottimizzazione delle sorgenti energetiche in edifici intelligenti). Funded by the Sinerghy project, POR/FESR European Regional Development Fund 2021-2027, Department of Computer Science, Verona University (11/2025 - 10/2026).
- Lorenzo Bonanni. Research grant (Borsa di ricerca). Project title: Reinforcement learning techniques for optimal energy source selection in smart buildings (Tecniche di reinforcement learning per la selezione ottimale di sorgenti energetiche in smart building). Funded by the Sinerghy project, POR/FESR European Regional Development Fund 2021-2027, Department of Computer Science, Verona University (04/2025 - 12/2025).
- Lorenzo Bonanni. Research grant (Borsa di ricerca). Project title: Development of algorithms for air quality control in smart buildings. Funded by the SAFE PLACE project, Department of Computer Science, Verona University (1/12/2022 - 31/12/2022).
- Edoardo Fusa. Research grant (Borsa di ricerca). Project title: Development of environmental simulators and evaluation of adaptive air quality control methods for intelligent buildings. Funded by the SAFE PLACE project, Department of Computer Science, Verona University (1/8/2022 - 31/10/2022).

PhD students:

- Davide Villaboni, PhD in computer science (XXXIX cycle), Verona University (Supervisor: Prof. Alessandro Farinelli, Co-supervisor: Prof. Alberto Castellini). Thesis title: To be defined (10/2023 - Present).
- Federico Bianchi, PhD in computer science (XXXVII cycle), Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title (potential): Scalable Safe Policy Improvement via Monte Carlo Tree Search (10/2021 - 09/2024, discussion 04/2025).
- Maddalena Zuccotto, PhD in computer science (XXXVI cycle), Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title (thesis submitted to the external commission): Learning in Monte Carlo Tree Search Planning (10/2020 - 12/2023, discussion 05/2024).
- Giulio Mazzi, PhD in computer science (XXXIII cycle), Verona University (Supervisor: Prof. Alessandro Farinelli, Co-supervisor: Dr. Alberto Castellini). Thesis title: Rule-Based Policy Interpretation and Shielding for Partially Observable Monte Carlo Planning (10/2019-10/2021, discussion 06/2022).

Master's students:

- Tiziano Tezze, master's degree in artificial intelligence, Verona University (Supervisor: Prof. Alberto Castellini, co-supervisor Prof. Alessandro Farinelli). Thesis title: Risk Awareness in Offline Reinforcement Learning (06/2025-03/2026).
- Davide Cordioli, master's degree in artificial intelligence, Verona University (Supervisor: Prof. Alberto Castellini, co-supervisor Prof. Alessandro Farinelli). Thesis title: Seldonian-inspired distributional shielding for autonomous navigation (06/2025-03/2026).
- Matteo Ingusci, master's degree in artificial intelligence, Verona University (Supervisor: Prof. Alberto Castellini,). Thesis title: Enabling Scene Transfer in Vision-based Robotic Navigation via Sensor-Guided Contrastive Learning (06/2025-03/2026).
- Giulio Di Bernardo, master's degree in artificial intelligence, Verona University (Supervisor: Prof. Alberto Castellini). Thesis title: Transformer based models: analysis and comparison of three state-of-art approaches to forecasting (06/2025-03/2026).
- Asad Ahmed, master's degree in data science, Verona University (Supervisor: Prof. Alberto Castellini). Thesis title: Comparing Transformer-Based Large Language Models: Architectural, Performance, and Computational Perspectives (03/2025-10/2025).
- Syed Farzan Hussain, master's degree in data science, Verona University (Supervisor: Prof. Alberto Castellini). Thesis title: Edge-Deployable Machine Learning Approaches for Low-Cost Sensor Calibration (01/2025-10/2025). Thesis developed at the Centre for Sensing Solutions (CSS), Eurac Research.
- Edoardo Zorzi, master's degree in artificial intelligence, Verona University (Supervisor: Prof. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title: Reliable Offline Reinforcement Learning for Multi-Agent Systems (07/2024-07/2025).
- Abel Abebe, master's degree in artificial intelligence, Verona University (Supervisor: Prof. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title: Merging Text and Time Series for Transformer-Based Forecasting (01/2025-07/2025).
- Eleni Georgantzi, Erasmus+, School of Engineering, Department of Electrical and Computer Engineering, University of Thessaly (supervisor at Univr: Prof. Alberto Castellini, internal supervisor Prof. Aspassia Daskalopulu). Thesis title: Fairness in Machine Learning: Seldonian Approaches (01/2025-07/2025).
- Alberto Righetti, master's degree in artificial intelligence, Verona University (Supervisor: Prof. Alberto Castellini, Co-supervisor: Dr. Thiago Simao - TU Eindhoven - thesis partially developed in an Erasmus+ program). Thesis title: Risk Averse Safe Policy Improvement Baseline Bootstrapping (03/2024-03/2025).
- Alberto Righetti, master's degree in artificial intelligence, Verona University (Supervisor: Prof. Alberto Castellini, Co-supervisor: Dr. Sara Svaluto Ferro). Thesis title: Risk-aware Deep Reinforcement Learning for Portfolio Management (01/2024-03/2025).
- Dettori Annalisa, master's degree in mathematics, Verona University (Supervisor: Prof. Alberto Castellini). Thesis title: Risk-Sensitive Reinforcement Learning for an Electric Vehicle Routing Problem (07/2024-03/2025).
- Nicolo' Squarzoni, Laurea Magistrale in Ingegneria e Scienze Informatiche, Verona University (Supervisor: Prof. Alberto Castellini, co-supervisor Prof. Alessandro Farinelli).

Thesis title: A Reinforcement Learning approach to strategy optimization for Battery Energy Storage Systems (03/2024-10/2025).

- Nicolò Fretti, master's degree in computer science and engineering, Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title: Online Anomaly Detection for Autonomous Mobile Robots: a Real-World Application (03/2023-07/2023).
- Pietro Tarocco, master's degree in computer science and engineering, Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title: Definition of Adversarial Attacks for Probabilistic Planners (07/2021-07/2022).
- Giovanni Bagolin, master's degree in computer science and engineering, Verona University (Supervisor: Prof. Alessandro Farinelli, Co-supervisor: Dr. Alberto Castellini). Thesis title: Analysis and Visualization of the Decisions of Autonomous Agents Acting in Uncertain Environments (01/2021-10/2021).
- Emanuele Crema, master's degree in computer science and engineering, Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title: Generation of adversarial examples via black-box methods for an HMM-based anomaly detector (09/2020-03/2021).
- Cristian Depalo, master's degree in computer science and engineering, Verona University (Supervisor: Prof. Alessandro Farinelli, Co-supervisor: Dr. Alberto Castellini). Thesis title: Adversarial Examples Transferability from Neural Network-Based to HMM-Based Anomaly Detectors (09/2020-03/2021).
- Matteo Castagnaro, master's degree in computer science and engineering, Verona University (Supervisor: Dr. Alberto Castellini). Thesis title: Anomaly detection and linear approximation of POMCP-based policies (10/2020-03/2021).
- Valentina Cantù, master's degree in computer science and engineering, Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title: Heat demand forecasting in district heating networks: model generation by regularized regression methods (10/2018-07/2019).
- Maddalena Zuccotto, master's degree in computer science and engineering, Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title: Data analysis of multivariate time series for situation assessment of mobile robots. Extended and published in (*Castellini et al., 2020c*) (02/2018-03/2019).
- Federico Bianchi, master's degree in computer science and engineering, Verona University (Supervisor: Prof. Alessandro Farinelli, Co-supervisor: Dr. Alberto Castellini). Thesis title: Intrusion Detection System for Autonomous Surface Vessels: a Statistical Learning Approach (02/2018-10/2018).
- Valeria Gottelli, master's degree in computer science and engineering, Verona University (Supervisor: Prof. Alessandro Farinelli, Co-supervisor: Dr. Alberto Castellini). Thesis title: Situation assessment for water drones based on statistical methods. (02/2017-10/2017).

- Gianni Di Dio, master's degree in computer science and engineering, Verona University (Supervisor: Prof. Alessandro Farinelli, Co-supervisor: Dr. Alberto Castellini). Thesis title: Rule-based anomaly detection for precision agriculture. (10/2016-07/2017).
- Gianni Di Dio, master's degree in computer science and engineering, Verona University (Supervisor: Prof. Alessandro Farinelli, Co-supervisor: Dr. Alberto Castellini). Project title (course Artificial Intelligence): Regularized linear regression methods for predicting Peronospora belbahrii in sweet basil. (06/2015-08/2016).
- Nicolò Danzi, master's degree in computer science and engineering, Verona University (Supervisor: Prof. Alessandro Farinelli, Co-supervisor: Dr. Alberto Castellini). Project title (course Artificial Intelligence): Regularized linear regression methods for predicting Peronospora belbahrii in sweet basil. (06/2016-08/2016).
- Alessio Milanese, Max Planck Institute of Molecular Plant Physiology (Potsdam, Germany), Erasmus+ program (Supervisor: Dr. Alberto Castellini). Project title: Regularization techniques for reconstruction of metabolic networks. (03/2015-07/2015).
- Daniele Paltrinieri, master's degree in bioinformatics and medical biotechnology, Verona University (Supervisor: Dr. Alberto Castellini). Project title (course Languages for bioinformatics): MP-GeneticSynth plugin (`http://mplab.sci.univr.it/plugins/mpgs/index.html`) for MetaPlab. Extended and published in (*Castellini et al., 2015a*) (01/2013-03/2014).
- Luca Barbon, master's degree in bioinformatics and medical biotechnology, Verona University (Supervisor: Dr. Alberto Castellini). Project title (course Languages for bioinformatics): pipeline for genomic sequence analysis by dictionary-based indexes (01/2012-12/2012).
- Luca Barbon, master's degree in bioinformatics and medical biotechnology, Verona University (Supervisor: Dr. Alberto Castellini). Project title (course Languages for bioinformatics): algorithms for symbolic regression of metabolic flux-regulation functions by genetic programming (Matlab) (01/2013-07/2013).
- Mauro Zucchelli, master's degree in bioinformatics and medical biotechnology, Verona University (Supervisor: Dr. Alberto Castellini). Project title (course Languages for bioinformatics): genetic algorithms and regression techniques for reverse-engineering of biological systems (Matlab). Extended and published in (*Castellini et al., 2015b; Castellini et al., 2013a; Castellini et al., 2012b*) (05/2011-12/2012).
- Mirko Busato, master's degree in bioinformatics and medical biotechnology, Verona University (Supervisor: Dr. Alberto Castellini). Project title (course Languages for bioinformatics): genetic algorithms and regression techniques for reverse-engineering of biological systems (Matlab). Extended and published in (*Castellini et al., 2013a; Castellini et al., 2012c*) (05/2011-03/2012).
- Matteo Denitto, master's degree in bioinformatics and medical biotechnology, Verona University (Supervisor: Dr. Alberto Castellini). Project title (course Languages for bioinformatics): software tools for correlation analysis of immunological data (Matlab) (01/2012-07/2012).
- Sara Compri, Valerio Marino and Gabriele Tosadori, master's degree in bioinformatics and medical biotechnology, Verona University (Supervisor: Dr. Alberto Castellini).

Project title (course Languages for bioinformatics): genome classification by dictionary based indexes (Matlab/Python). Poster published in (*Castellini et al., 2011b*) (04/2011-09/2011).

- Marika Rodegher, master's degree in bioinformatics and medical biotechnology, Verona University (Supervisor: Dr. Alberto Castellini). Project title (course Languages for bioinformatics): linear regression plugin for MetaPlab (Java,`http://mplab.scienze.univr.it/plugins`) (05/2008-01/2009).

Bachelor's students:

- Luca Ceriani, bachelor's degree in computer science, Verona University (Supervisor: Prof. Alberto Castellini). Thesis title: Reinforcement Learning Techniques for Energy Management in Smart Buildings (09/2025-03/2026).
- Rakib Haque, bachelor's degree in computer science, Verona University (Supervisor: Prof. Alberto Castellini). Thesis title: Data Analysis with Machine Learning Modules for Energy Management in Smart Buildings (09/2025-03/2026).
- Manuel Zuanetti, bachelor's degree in computer science, Verona University (Supervisor: Prof. Alberto Castellini). Thesis title: Comparison between RL algorithms and constrained RL algorithms (09/2025-03/2026).
- Leonardo Novazzi, bachelor's degree in computer science, Verona University (Supervisor: Prof. Alberto Castellini). Thesis title: Rapid Adaptation and Robustness to Perturbations in Reinforcement Learning: Experiments with SAC in CityLearn (03/2025-10/2025).
- Davide Piccoli, bachelor's degree in computer science, Verona University (Supervisor: Prof. Alberto Castellini). Thesis title: Reinforcement Learning for energy management in smart cities (03/2025-10/2025).
- Andrea Bluschi, bachelor's degree in computer science, Verona University (Supervisor: Prof. Alberto Castellini). Thesis title: Model-Based Reinforcement Learning for energy management in smart buildings (01/2025-07/2025).
- Lorenzo Bianchi, bachelor's degree in computer science, Verona University (Supervisor: Prof. Alberto Castellini). Thesis title: Benchmarking RL Algorithms on Gymnasium and Model Building Environments (01/2024-07/2024).
- Mirco Furini, bachelor's degree in computer science, Verona University (Supervisor: Dr. Alberto Castellini). Thesis title: A graphical tool for human-in-the-loop reinforcement learning (09/2023-03/2024).
- Davide Bragantini, Davide Rossignolo, Federico Braga, bachelor's degree in computer science, Verona University (Supervisor: Dr. Alberto Castellini). Thesis title: Tabular Model Learning in Monte Carlo Tree Search (01/2023-10/2023).
- Federico Quintarelli, bachelor's degree in computer science, Verona University (Supervisor: Dr. Alberto Castellini). Thesis title: Analysis and Application of Model-Based Reinforcement Learning Algorithms (06/2023-10/2023).
- Cristian Morasso, bachelor's degree in computer science, Verona University (Supervisor: Dr. Alberto Castellini). Thesis title: Data driven anomaly detection for mobile robots in Industry 4.0 (03/2022-10/2022).

- Edoardo Fusa, bachelor's degree in computer science, Verona University (Supervisor: Dr. Alberto Castellini). Thesis title: Monte-Carlo tree search based planning for Markov decision processes (01/2022-07/2022).
- Alberto Galiotto, bachelor's degree in computer science, Verona University (Supervisor: Dr. Alberto Castellini). Thesis title: Time series anomaly detection for industrial and robotic control systems: comparison and improvement (06/2020-03/2021).
- Leonardo Zecchin, bachelor's degree in computer science, Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title: Analysis of policy generated by Partially Observable Monte-Carlo Planning (09/2020-03/2021).
- Elena Veronesi, bachelor's degree in computer science, Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title: Analysis and comparison of environments and solvers for probabilistic planning (06/2020-10/2020).
- Celeste Veronese, bachelor's degree in computer science, Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Internship (04/2020-05/2020).
- Edoardo Zorzi, bachelor's degree in computer science, Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title: Safe policy improvement for Partially Observable Monte Carlo Planning (04/2020-10/2020).
- Fabio Righetti, bachelor's degree in computer science, Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title: Artificial Neural Networks for Behavior Analysis in Robotics Applications (07/2019-11/2019).
- Pietro Tarocco, bachelor's degree in computer science, Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title: Autoregressive and Gussian process modeling of time series for heating load forecasting. Extended and published in (*Bianchi et al., 2020i; Bianchi et al., 2020b*) (08/2018-11/2019).
- Francesco Masillo, bachelor's degree in computer science, Verona University (Supervisor: Dr. Alberto Castellini, Co-supervisor: Prof. Alessandro Farinelli). Thesis title: Data analysis for autonomous aquatic drones: tools and methods Extended and published in (*Castellini et al., 2020c; Castellini et al., 2020f; Castellini et al., 2019e; Castellini et al., 2019d*) (04/2018-07/2019).
- Manuel Tognon, bachelor's degree in bioinformatics, Verona University (Supervisor: Prof. Alessandro Farinelli, Co-supervisor: Dr. Alberto Castellini). Thesis title: Probabilistic approaches for disease prediction in precision agricolture (10/2017-07/2018).
- Giovanni Alberto Beltrame, bachelor's degree in bioinformatics, Verona University (Supervisor: Prof. Alessandro Farinelli, Co-supervisor: Dr. Alberto Castellini). Thesis title: Situation assessment for autonomous water drones based on probabilistic graphical models. Extended and published in (*Castellini et al., 2018a; Castellini et al., 2017e*). (10/2017-07/2018).

- Tom Janetzek, bachelor's degree in molecular biology and physiology, Potsdam University (Supervisor: Dr. Alberto Castellini). Thesis title: Clustering and feature selection analysis of time-course maize phenotypic data (03/2015-08/2015).
- Emiliano Maresi, bachelor's degree in bioinformatics, Verona University (Supervisor Dr. Giuditta Franco, Co-supervisor: Dr. Alberto Castellini). Project title: analysis of repeat-sharing gene networks (01/2013-12/2012).
- Nicola Gaburro, bachelor's degree in bioinformatics, Verona University (Supervisor Dr. Giuditta Franco, Co-supervisor: Dr. Alberto Castellini). Project title: tools for symbolic regression of metabolic flux-regulation functions by genetic programming (Matlab, GPLab) (07/2010-12/2012).
- Alessio Milanese, bachelor's degree in bioinformatics, Verona University (Supervisor Dr. Giuditta Franco, Co-supervisor: Dr. Alberto Castellini). Project title: algorithms for the analysis of repeat-sharing gene networks by means of statistical and graph-theory based techniques (Matlab). Extended ed published in (*Castellini et al., 2015c*) (05/2012-12/2012).
- Marika Albrizio, bachelor's degree in bioinformatics, Verona University (Supervisor Dr. Giuditta Franco, Co-supervisor: Dr. Alberto Castellini). Project title: algorithms for detection and analysis of palindromic strings in genomic sequences (03/2012-04/2012).
- Cesare Centomo, bachelor's degree in bioinformatics, Verona University (Supervisor Dr. Giuditta Franco, Co-supervisor: Dr. Alberto Castellini). Project title: analysis of repeat-sharing gene networks by gene ontology techniques (03/2012-04/2012).
- Federica Agosta, bachelor's degree in computer science, Verona University (Supervisor Dr. Giuditta Franco, Co-supervisor: Dr. Alberto Castellini). Project title: MetaPlab website (PHP/MySql, http://mplab.scienze.univr.it/) (04/2008-07/2008).

Awards (premi e riconoscimenti per attività di ricerca)

- Best reviewer award, International Conference on Autonomous Agents and Multiagent Systems (AAMAS) 2026 (conf. ranking A).
- Paper "G. Mazzi, D. Meli, A. Castellini and A. Farinelli. Learning Logic Specifications for Soft Policy Guidance in POMCP" (Mazzi et al., 2023a), *22th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2023)*. Nominated for the "best paper award".
- Best reviewer award, International Conference Uncertainty in Artificial Intelligence (UAI) 2023 (conf. ranking A).
- Poster "A. Castellini, G. Beltrame, M. Bicego, J. Blum, M. Denitto, A. Farinelli. Unsupervised activity recognition for autonomous water drones", *ACM SAC 2018*. Nominated for the "best poster award" (four selected finalists - joint winners).
- PhD thesis "A. Castellini. Algorithms and software for biological MP modeling by statistical and optimization techniques". Winner of *Premio MIMOS 2011* for the best research thesis about simulation - MIMOS: Italian Movement for Modeling and Simulation - www.mimos.it (1500€).
- Master thesis "A. Castellini. Business intelligence and data mining in biomedical research". Winner of *premio Martello 2010/11* for the best project work, Master in Business Intelligence e Knowledge Management 2010/11, Verona University (2000€).

- Paper "A. Castellini and V. Manca. Learning regulation functions of metabolic systems by artificial neural networks", *GECCO 2009*. Nominated for the "best paper award" in the *Bioinformatics and Computational Biology track* (2nd position).

Grants (borse di studio)

- Travel and accommodation costs for the visit at University of California Riverside (UCR) and participation in the international conference IPCAT 2015, San Diego, California, US. Provided by Potsdam Graduate School, University of Potsdam (3800€, 2015).
- Travel costs for the participation in the international conference GECCO 2009, Montreal, Canada. Provided by GECCO committee and Graduate School of Sciences Engineering and Medicine, Verona University (about 2000€, 2009).
- Application costs for the participation in the "Stochastic modeling" course at the Business school of Lancaster university, UK. Provided by the Operational Research Society - Prof. Natalio Krasnogor (2009).
- Travel and accommodation costs for the visit at the Science of Complex Interaction Lab (SCI-LAB), department of Complex Systems Science, Nagoya University, Japan. Provided by CooperInt funds, Verona University (3000€, 2008).
- State Scholarship, PhD program in Computer Science, Verona University (3-years, 2007-2009).
- Grant for the internship at the Agenzia Spaziale Italiana (ASI, Roma). Provided by the Verona University (3000€, 2006-2007).

Research visits (visite presso gruppi di ricerca internazionali)

- Visiting associate researcher: Algorithms and Computational Biology Lab, Dept. Computer Science & Engineering, University of California Riverside, (1.5 months, 08/2015 - 09/2015). Prof. S. Lonardi. Grant from University of Potsdam.
- Visiting Ph.D. student: Science of Complex Interaction Lab (SCI-LAB), Dept. Complex Systems Science, Nagoya University, Japan (1.5 months, 11/2008 - 12/2008). Dr. Y. Suzuki. Grant from Verona University.
- Visiting Ph.D. student: Automated Scheduling Optimization and Planning (ASAP) group, School of Computer Science, Nottingham University, UK (5 months, 06/2008 - 11/2008). Prof. N. Krasnogor.
- Erasmus student: Computer Vision Group, Dept. Electrical Electronic and Computer Engineering, Heriot Watt University, Edinburgh, UK (3 months, 06/2005 - 09/2005). Prof. M. Trucco. Grant from Verona University.

Courses attended during PhD with exam (partecipazione a corsi durante dottorato)

- Stochastic modeling, Business School of Lancaster University, UK. Supported by the Operational Research Society (30 hours, 23/03/09 - 27/03/09).
- Bioinformatics, master degree in biotechnology, University of Verona, Prof. Giorgetti (40 hours, 09/11/07 - 23/01/08).

- Summer school "Computazione evolutiva e vita artificiale (SeCeVita 07)", University of Catania. Keynoters: Proff. Nicosia, Cagnoni, Maniezzo, Mirolli, Vanneschi, Serra, Della Cioppa, Tettamanzi, Arena, Nolfi, Maglino (35 hours, 31/08/07 - 04/09/07).
- Advanced algorithms for the analysis and visualization of DNA and protein sequences, Department of Computer Science, Verona University, Prof. Zu-Guo Yu (20 hours, 16/07/07 - 26/07/07).
- Advanced algorithms, master degree in computer science, Verona University, Prof. Posenato (40 hours, 2/04/07 - 08/06/07).
- Project Management, ISTUD Business School (32 hours, 09/09/06 - 17/09/06), Italian Space Agency.

Other courses attended (partecipazione ad altri corsi)

- IBM Big Data Platform: Infosphere Data Explorer (5 days, 08/07/2013 - 12/07/2013). IBM, London. Supported by Sdg group.
- SAS: Information Retrieval Studio (crawling web, Twitter, Facebook), Text Miner/Enterprise Miner, Sentiment Analysis Studio, Enterprise Guide, Enterprise Business Intelligence (7 days, 2012-2013). SAS, Milan and Rome. Supported by Sdg group.
- Statistical software "Stata" (24 hours, 20/01/2010 - 24/02/2010). Club economia applicata, Faculty of Economics, Verona University.
- Modern software solutions in drug discovery design and planning methods (8 hours, 07/03/2008), Fujitsu FQS, Basel, Switzerland.

Technical skills (conoscenze software e linguaggi di programmazione)

- Programming languages and tools for software development:
  - Good knowledge: Python and related AI/Deep Learning/ML libraries, R, Matlab, Java, SQL, MySql.
  - Basic/Medium knowledge: Biopython, C/C++, J2EE, SAS language, XML/XSLT/SBML, PHP, JavaScript, Apache/Tomcat, GlassFish, Twitter/Facebook API, IBM Netezza, Oracle database, PostgreSql, MS Access, UML.
- Operating systems and software applications: Linux, MS Windows, Latex, MS Word, MS Excel, MS PowerPoint, IBM Data Explorer (IBM Big Data Platform), SAS Information Retrieval Studio/Enterprise Guide/JMP/Sentiment Analysis Studio/Enterprise Miner, Stata, Weka, SAP Business objects, QlikView, Cytoscape.

Other activities (altre attività, terza missione)

- Organization of GardAI (2022, 2023, 2024, 2025, 2026), an event for high schools students in which applications of artificial intelligence and robotics are presented and shown in action. The event has been organized in collaboration with Sapienza University of Rome, University of Basilicata, Italian Space Agency. Approximately 300 students participate in the event each year `https://profs.scienze.univr.it/~castellini/gardai.html`.

- Interview for Corriere del Veneto (national newspaper, in italian): *Droni, Robot ed IA aiuteranno l'uomo, non sono il nemico* (`https://www.di.univr.it/?ent=iniziativa&id=11867&lang=en`).

Quanto dichiarato in questo documento corrisponde a verità e le dichiarazioni rese nel curriculum sono rilasciate ai sensi degli articoli 46 e 47 del D.P.R. 445/2000.

Autorizzo il trattamento dei dati personali ai sensi del D. lgs. 196/03.