

CAROLINA CRESPI

SUMMARY

Computer scientist with a background in physics, working on swarm intelligence, agent-based modelling and autonomous navigation in unknown environments, with experience in agent-based simulation and optimization in Python and NetLogo. Author and reviewer for international journals and conferences, Guest Editor of two Springer collections, co-organizer of conferences and summer schools. Active in public engagement, designing games in which the public challenges AI algorithms.

WORK EXPERIENCE

Department of Mathematics and Computer Science, University of Catania **Jan 2025 - ongoing**

Postdoctoral Research Fellow at Complex Intelligent Systems (CIS) Research Group

- Conducting advanced research on dynamic optimization, collective behaviours and autonomous navigation in unknown environments
- Developing a continuous-space framework for energy-aware multi-agent exploration and communication
- Authoring papers accepted and submitted to international conferences and journals
- Supervisor and co-supervisor of BSc and MSc theses
- Guest Editor of two Springer collections: "Advances in Large-Scale and Intelligent Optimization: Algorithms, Models, and Applications" (Soft Computing) and "Bio-Inspired Adaptive Systems for Collective Behaviors and Intelligent Optimization" (Discover Computing)
- Teaching Artificial Intelligence (co-taught, 3 CFU / 24 h, BSc and MSc in Computer Science, 2025/2026 and 2026/2027) and, as Adjunct Lecturer at the Department of Biomedical and Biotechnological Sciences, Principles of Computer Science (module of Principles of Bioinformatics, 2 CFU / 19 h, BSc in Biotechnology, 2024/2025 and 2025/2026)

Independent Researcher **Jan 2024 – Dec 2024**

Research collaboration with the Complex Intelligent Systems (CIS) Research Group, University of Catania

- Completed and defended the PhD thesis (June 2024)
- Continued research on autonomous navigation and multi-agent systems with the CIS group
- Organizing committee and speaker, Metaheuristics Summer School (MESS 2024); PC member, ECAI 2024; TPC member, ICCI 2024

Syracuse Academy

- Guest lecture "Exploring Artificial Intelligence: From Concepts to Applications" (Nov 2024)

Department of Mathematics and Computer Science, University of Catania **Oct 2020 - Jan 2024**

PhD Fellow at Complex Intelligent Systems (CIS) Research Group

- Conducted research on Swarm Intelligence, Collective Behaviours and Optimization Algorithms
- Developed agent-based models
- Authored and reviewed papers published in international scientific journals (Springer, IEEE, Elsevier, MDPI)
- Organized and presented at several international conferences, workshops and schools
- Delivered lectures in several courses, focusing on AI, computational models and scientific methodologies (ACO in Heuristics and Metaheuristics, MSc in Computer Science; Natural Computation seminar, MSc in Computer Science; Scientific Methodology tutorial, MSc in Dentistry)
- Research Collaboration: Prof. Angelo Cangelosi (University of Manchester) and Dr. Marta Romeo (Heriot-Watt University) about modeling trust in multi-agent systems

ONLUS Mediterraneo Sicilia Europa **Sep 2018 - May 2019**

Mathematics and Physics Tutor

- Provided personalized support to students for completing homework
- Created customized learning programs and objectives

Campus Athena **Sep 2014 - Jul 2017**

Mathematics and Physics Tutor

- Assisted students with homework and offered emotional support to boost their abilities
- Developed and taught a preparatory course for medical entrance exams

EDUCATION

PhD in Computer Science, University of Catania **Catania, June 2024**

Master's degree in physics, University of Catania **Catania, Mar 2020**

Bachelor's degree in physics, University of Catania **Catania, Nov 2013**

LANGUAGES

Italian: native

English: professional working proficiency

CONFERENCES, WORKSHOPS, SUMMER SCHOOLS

- **Speaker**
 - International Conference on Optimization and Learning (OLA 2025), 23 - 25 Apr 2025, Dubai, UAE
 - Metaheuristics Summer School (MESS 2024), 15 - 18 Jul 2024, Catania, Italy
 - 18th Social Simulation Conference (SSC 2023), 8 - 10 Sept 2023, Glasgow, United Kingdom
 - 10th International Conference on Bioinspired Optimization Methods and Their Applications (BIOMA 2022), 17 - 18 Nov 2022, Maribor, Slovenia
 - 9th International Conference on Bioinspired Optimization Methods and Their Applications (BIOMA 2020), 19 - 20 Nov 2020, Brussels, Belgium (Online)
 - 7th International Conference on Soft Computing & Machine Intelligence (ISCMI 2020), 14 - 15 Nov 2020, Stockholm, Sweden (Online)
 - XIV International Workshop on Artificial Life and Evolutionary Computation (WIVACE 2019), 18 - 20 Sept 2019, Rende, Italy
- **Chair / Organizing Committee**
 - Organizing Committee – Metaheuristics Summer School (MESS 2026), 6 – 10 Jul 2026, Catania, Italy
 - Chair – Workshop on Big Optimization (WBO 2025), 31 Jul – 1 Aug 2025, Catania, Italy
 - Track Chair – Decision Science Alliance International Summer Conference (DSA ISC 2025), 19 – 20 Jun 2025, Catania, Italy
 - TPC Member – 5th International Conference on Computational Intelligence (ICCI 2024), 24 - 26 December 2024, Surat, India
 - PC Member – 27th European Conference on Artificial Intelligence (ECAI 2024), 19 - 24 Oct 2024, Santiago de Compostela, Spain
 - Organizing Committee – Metaheuristics Summer School (MESS 2024), 15 - 18 Jul 2024, Catania, Italy
 - Organizing Committee – International Conference on Optimization and Learning (OLA 2022), 18 - 20 Jul 2022, Siracusa, Italy
 - Organizing Committee and Speaker – 14th Metaheuristics International Conference (MIC 2022), 11 - 14 Jul 2022, Siracusa, Italy
 - Organizing Committee – International Conference on Optimization and Learning (OLA 2021), 20 - 21 Jun 2021, Catania, Italy (Online)
 - Organizing Committee – Metaheuristics Summer School (MESS 2020+1), 15 - 18 Jun 2021, Catania, Italy (Online)
- **Seminar**
 - "From Ants to Crowds: harnessing competition for optimization", 13 Jan 2023, ETH Zurich, Switzerland (Online)
- **Reviewer**
 - ECAI 2024, DSA ISC 2025, LION 2026

PUBLICATIONS

Submitted and Under Review

- Crespi, C., Cutello, V., Pavone, M., Pirvan, T.N. Adaptive Exploration Strategies for Autonomous Agents in Unknown and Dynamic Environments. In: Expert Systems With Applications (Elsevier)
- Cangelosi, A., Crespi, C., Pavone, M., Romeo, M. ACO-Based Trust Modeling for Decentralized Agent Coordination. In: Engineering Applications of Artificial Intelligence (Elsevier)
- Crespi, C., Cutello, V., Mezzina, A., Pavone, M. Neural Map Prediction with Synchronization-Aware Replanning for Energy-Constrained Multi-Agent Exploration. In: Knowledge-Based Systems (Elsevier)
- Crespi, C., Cutello, V., Pavone, M. Mapping ACO Mechanisms to Collective Behaviour: A Minimal Interpretative Framework. In: Transactions on Emerging Topics in Computational Intelligence (IEEE)
- Boccheri, A., Mezzina, A., Crespi, C., Pavone, M. Toward Energy-Conscious Intelligent Systems: Decision-Driven Context Selection for CPU-Only Multi-Hop RAG Pipelines. In: Soft Computing

International Journal

- Pavone, M., Brancaforte, M., Cassia, M., Mezzina, A., Crespi, C. When Information Does Not Deliver: The Service-Capacity Cost of Rigid Roles in Energy-Constrained Multi-Agent Foraging. In: Computers (MDPI) (accepted: in press)
- Crespi, C., Cutello, V., Pavone, M., & Zito, F. (2024). An agent framework to explore pathfinding strategies in maze navigation problem. *Le Matematiche*, 79(2), 555-583. <https://doi.org/10.4418/2024.79.2.17>
- Cavallaro, C., Crespi, C., Cutello, V., Pavone, M., Zito, F. Group Dynamics in Memory-Enhanced Ant Colonies: The Influence of Colony Division on a Maze Navigation Problem. *Algorithms* 2024, 17, 63. <https://doi.org/10.3390/a17020063>

- Crespi, C., Scollo, R.A., Fargetta, G., Pavone, M. A sensitivity analysis of parameters in an agent-based model for crowd simulations. *Applied Soft Computing*, Volume 146, 2023, 110684, ISSN 1568-4946. <https://doi.org/10.1016/j.asoc.2023.110684>

Refereed Conference

- Mezzina, A., Crespi, C., Cutello, V., Pavone, M. (2026). An Autonomous Navigation Framework for Item Retrieval in Unknown Environments. In: *Lecture Notes in Computer Science – 20th International Conference on Learning and Intelligent Optimization (LION 20)*. Springer, Cham. (accepted, in press)
- Crespi, C., Pavone, M. (2026). Exploring Parameter Sensitivity and Grouping Strategies in Ant Colony Optimization for Weighted Networks. In: *Lecture Notes in Computer Science – 16th Metaheuristics International Conference (MIC 2026)*, Ischia, Italy. Springer, Cham. (accepted, in press)
- Crespi, C., Cutello, V., Di Natale, A., Pavone, M. (2026). Energy-Aware Navigation in Maze-Like Environments: Balancing Exploration and Recharge Strategies in Autonomous Agents. In: *Decision Sciences (DSA ISC 2025)*, LNCS, vol. 16405, pp. 33–47. Springer. https://doi.org/10.1007/978-3-032-21811-7_3
- Cangelosi, A., Crespi, C., Pavone, M., Romeo, M. (2026). Modeling Trust Dynamics on a Multi-Agent System. In: *Communications in Computer and Information Science – International Conference on Optimization and Learning (OLA 2025)*, vol 2808, pp. 215–226. Springer, Cham. https://doi.org/10.1007/978-3-032-13589-6_16
- Crespi, C., Pavone, M. (2024). Does a Group's Size Affect the Behavior of a Crowd? An Analysis Based on an Agent Model. In: *Elsenbroich, C., Verhagen, H. (eds) Advances in Social Simulation. ESSA 2023. Springer Proceedings in Complexity*. Springer, Cham. https://doi.org/10.1007/978-3-031-57785-7_31
- Crespi, C., Fargetta, G., Pavone, M., Scollo, R.A. (2023). An Agent-Based Model for Crowd Simulation. In: *De Stefano, C., Fontanella, F., Vanneschi, L. (eds) Artificial Life and Evolutionary Computation. WIVACE 2022. Communications in Computer and Information Science*, vol 1780. Springer, Cham. https://doi.org/10.1007/978-3-031-31183-3_2
- Crespi, C., Scollo, R.A., Fargetta, G., Pavone, M. (2023). How a Different Ant Behavior Affects on the Performance of the Whole Colony. In: *Di Gaspero, L., Festa, P., Nakib, A., Pavone, M. (eds) Metaheuristics. MIC 2022. Lecture Notes in Computer Science*, vol 13838. Springer, Cham. https://doi.org/10.1007/978-3-031-26504-4_14
- Crespi, C., Fargetta, G., Pavone, M., Scollo, R.A. (2022). An Agent-Based Model to Investigate Different Behaviours in a Crowd Simulation. In: *Mernik, M., Eftimov, T., Črepinšek, M. (eds) Bioinspired Optimization Methods and Their Applications. BIOMA 2022. Lecture Notes in Computer Science*, vol 13627. Springer, Cham. https://doi.org/10.1007/978-3-031-21094-5_1
- Crespi, C., Fargetta, G., Pavone, M., Scollo, R.A., Scrimali, L. (2020). A Game Theory Approach for Crowd Evacuation Modelling. In: *Filipič, B., Minisci, E., Vasile, M. (eds) Bioinspired Optimization Methods and Their Applications. BIOMA 2020. Lecture Notes in Computer Science*, vol 12438. Springer, Cham. https://doi.org/10.1007/978-3-030-63710-1_18
- Crespi, C., Scollo, R.A., Pavone, M. "Effects of Different Dynamics in an Ant Colony Optimization Algorithm", 2020 7th International Conference on Soft Computing & Machine Intelligence (ISCMI), Stockholm, Sweden, 2020, pp. 8-11. <https://doi.org/10.1109/ISCMI51676.2020.9311553>

Refereed Abstract / Extended Abstract

- Crespi, C., Spampinato, A.G., Scollo, R.A., Pavone, M. ACOLABS: An Ant Colony for Labyrinth Solving. In: *XIV International Workshop on Artificial Life and Evolutionary Computation (WIVACE 2019)*.
- Crespi, C., Fargetta, G., Pavone, M., Scollo, R.A. An agent-based model for crowd simulation. In: *XVI International Workshop on Artificial Life and Evolutionary Computation (WIVACE 2022)*.
- Cavallaro, A., Crespi, C., Cutello, V., Pavone, M., Zito, F. Structural Health Monitoring by Combining Metaheuristics and Machine Learning Techniques. (ITAL-IA 2022)

Volume Editor

- Blum, C., Cavallaro, C., Crespi, C., Talbi, E. G. (2026). *International Workshop on Big Optimization 2025*. <https://doi.org/10.1007/978-3-032-15455-2>

Reviewer

- *Applied Soft Computing, Artificial Life*