

Rocco Ascone

Curriculum Vitae

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Education and Work Experience

- From 04/2026 **Postdoc**, member of the Natural Computation (CANA) reasearch group, at LIS laboratory, Aix Marseille Université, France.
Advisor: Prof. Kévin Perrot, project ALARICE.
- 11/2022-03/2026 **Ph.D. student**, Earth sciences, Fluid-dynamics and Mathematics program, Department of Mathematics, Informatics and Geosciences, University of Trieste, Italy.
Thesis: Complexity, Computability, and Cryptography with Reaction Systems.
Supervisors: Prof. Luca Manzoni and Dr. Giulia Bernardini.
Mark: Excellent cum laude.
- 2020–2022 **M.Sc. in Advanced Mathematics**, University of Trieste, Italy, joint program with SISSA (Scuola Internazionale Superiore di Studi Avanzati).
Thesis: An Application of Persistent Homology to Musical Analysis.
Supervisor: Prof. Mattia Mecchia.
Mark: 110/110 cum laude.
- 2017–2020 **B.Sc. in Mathematics**, University of Trieste, Italy.
Supervisor: Prof. Mattia Mecchia.
Mark: 110/110 cum laude.
- 2017–2023 **Bachelor of Music in Violin**, G. Tartini Conservatory of Music, Trieste, Italy.

Awards

- June 2024 **Best paper award at CMC 2024**, 25th Conference on Membrane Computing, Nice (France), for the paper “Chemical Pure Reaction Automata in Maximally Parallel Manner”.

Teaching

- 09/2025 **Lecturer**, *Linear Algebra Pre-Course* (12 hrs, 30 students), Master’s Degree Programme in Data Science and Scientific Computing.
Department of Mathematics, Informatics and Geosciences. University of Trieste.
- Fall 2024 **Teaching Assistant**, *Computabilità, Complessità e Logica* (50 hrs, 100 students), second year of the B.Sc. in Artificial Intelligence and Data Analytics.
Department of Mathematics, Informatics and Geosciences. University of Trieste.
- Fall 2024 **Teaching Assistant**, *Algebra Lineare ed Elementi di Geometria* (50 hrs, 100 students), first year of the B.Sc. in Artificial Intelligence and Data Analytics.
Department of Mathematics, Informatics and Geosciences. University of Trieste.

- Fall 2023 **Teaching Assistant**, *Geometria 1* (50 hrs, 80 students), first year of the B.Sc. in Physics and Mathematics.
Department of Physics. University of Trieste.
- 09/2023 **Lecturer**, *Linear Algebra Pre-Course* (12 hrs, 30 students), Master's Degree Programme in Data Science and Scientific Computing.
Department of Mathematics, Informatics and Geosciences. University of Trieste.
- Fall 2022 **Teaching Assistant**, *Geometria 1* (50 hrs, 80 students), first year of the B.Sc. in Physics and Mathematics.
Department of Physics. University of Trieste.

Master thesis supervision

- Sept. 2025 **Co-supervisor**, *Master student*: Francesco Leiter, *Supervisor*: Prof. Luca Manzoni, *Title*: Invariants in Chemical Pure Reaction Automata.

Conferences, Workshops, Seminars

- Dec. 2025 **Seminar**, "*Complexity, Computability, and Cryptography with Reaction Systems*", at Adolfo Ibáñez University, Santiago, Chile.
- Sept. 2025 **Partecipant**, *ACANCOS International PHD school 2025*, Nice, France (online participation).
- July 2025 **Partecipant**, *Workshop "25 Years of Compressed Self-Indexes" (at SEA 2025)*, Venice, Italy.
- July 2025 **Speaker** (poster), *The Genetic and Evolutionary Computation Conference (GECCO 2025)*, Malaga, Spain.
- June 2025 **Participant**, *Summer School on String Algorithms*, Milan, Italy.
- Mar. 2025 **Participant**, *Workshop Data Structures in Bioinformatics (DSB 2025)*, Pisa, Italy.
- Jan. 2025 **Speaker**, *21st Brainstorming Week on Membrane Computing*, Seville, Spain.
- Sept. 2024 **Speaker**, *19th Workshop on Compression, Text, and Algorithms (WCTA 2024)*, Puerto Vallarta, México (online participation).
- Sept. 2024 **Participant**, *4th International Workshop on Reaction Systems*, Pisa, Italy.
- Sept. 2024 **Speaker**, *24th International Workshop on Algorithms in Bioinformatics (WABI 2024)*, London, UK.
- July 2024 **Seminar**, "*Complexity of the dynamics of resource-bounded reaction systems*", online seminar for LIS, Aix-Marseille Université, invited by Antonio E. Porreca.
- June 2024 **Speaker**, *25th Conference on Membrane Computing (CMC 2024)*, Nice, France.
- Feb. 2024 **Participant**, *Sequences in London (workshop)*, London, UK.
- Jan. 2024 **Participant**, *20th Brainstorming Week on Membrane Computing*, Seville, Spain.
- Sept. 2023 **Participant**, *29th International Workshop on Cellular Automata and Discrete Complex Systems (AUTOMATA 2023)*, Trieste, Italy.

Visiting

- 2025 **Guest**, *Adolfo Ibáñez University, Santiago de Chile*, 23 Sep. 2025 - 21 Dec. 2025, under the project ACANCOS - Application-Driven Challenges for Automata Networks and Complex Systems, HORIZON-TMA-MSCA-SE action.
Topics: study of majority networks and cellular automata.
- 2024-2025 **Guest**, *University of Pisa*, 6-9 May 2024, 3-7 Mar. 2025, visiting Prof. Nadia Pisanti and Prof. Roberto Grossi.
Topics: conditional lower bounds on pattern matching of degenerate strings [7].
- 2024 **Guest**, *King's College London*, 7 Feb., visiting Prof. Grigorios Loukides.
Topics: discussion on data mining and jumbled pattern matching.

Refereeing Duties

- Journals Theoretical Computer Science, Natural Computing, Journal of Membrane Computing, Algorithms for Molecular Biology.
- Conferences Scandinavian Symposium on Algorithm Theory (SWAT 2026), Symposium on Experimental Algorithms (SEA 2025), Symposium on Combinatorial Pattern Matching (CPM 2024, CPM 2025), Symposium on String Processing and Information Retrieval (SPIRE 2024), Workshop on Algorithms in Bioinformatics (WABI 2024).

Software

- Tonnetz** Python code used in my master's thesis to classify musical pieces.
- RS_fp** Python notebook to visualize a proof in [5] regarding fixed points of a particular class of reaction systems.
- evobrs** Python code to evolve reaction systems in order to obtain non linear Boolean functions [6].

Peer-Reviewed Conference Publications

- [1] R. Ascone, L. Mariot, L. Manzoni, G. Pietropolli. *Evolving Cryptographic Boolean Functions with Reaction Systems*. In: The Genetic and Evolutionary Computation Conference (**GECCO 2025**). DOI: 10.1145/3712255.3726685
- [2] R. Ascone, G. Bernardini, A. Conte, M. Equi, E. Gabory, R. Grossi, N. Pisanti. *A unifying taxonomy of pattern matching in degenerate strings and founder graphs*. In: 24th International Workshop on Algorithms in Bioinformatics (**WABI 2024**). DOI: 10.4230/LIPIcs.WABI.2024.14
- [3] R. Ascone, G. Bernardini, F. Leiter, L. Manzoni. *Chemical Pure Reaction Automata in Maximally Parallel Manner*. In: 25th Conference on Membrane Computing (**CMC 2024**).

Peer-Reviewed Journal Publications

- [1] R. Ascone, G. Bernardini, L. Manzoni, G. Pietropoli. *A novel bio-inspired encoding for evolving cryptographic Boolean functions*. In: **Swarm and Evolutionary Computation**, 2026. DOI: 10.1016/j.swevo.2026.102287.
- [2] R. Ascone, G. Bernardini, A. Conte, M. Equi, E. Gabory, R. Grossi, N. Pisanti. *Pattern matching with Elastic-Degenerate strings and Elastic-Founder graphs*. In: **Algorithms for Molecular Biology**, 2026. DOI: 10.1186/s13015-025-00289-3
- [3] R. Ascone, G. Bernardini, L. Manzoni. *Cycles and Global Attractors of Reactantless and Inhibitorless Reaction Systems*. In: **Theoretical Computer Science**, 2025. DOI: 10.1016/j.tcs.2025.115300
- [4] R. Ascone, G. Bernardini, F. Leiter, L. Manzoni. *Chemical pure reaction automata in maximally parallel manner*. In: **Journal of Membrane Computing**, 2025. DOI: 10.1007/s41965-024-00176-7.
- [5] R. Ascone, G. Bernardini, E. Formenti, F. Leiter, L. Manzoni. *Pure Reaction Automata*. In: **Natural Computing**, 2024. DOI: 10.1007/s11047-024-09980-7
- [6] R. Ascone, G. Bernardini, L. Manzoni. *Fixed points and attractors of additive reaction systems*. In: **Natural Computing**, 2024. DOI: 10.1007/s11047-024-09977-2
- [7] R. Ascone, G. Bernardini, L. Manzoni. *Fixed points and attractors of reactantless and inhibitorless reaction systems*. In: **Theoretical Computer Science**, 2024. DOI: 10.1016/j.tcs.2023.114322