

Davide Rucci

PH.D. · POSTDOC RESEARCHER · GRAPHS, DECENTRALIZED ALGORITHMS & DATA STRUCTURES

Pisa, Italy

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Education

Ph.D. in Computer Science

Pisa, Italy

UNIVERSITY OF PISA

Nov. 2020 - May 6th 2024

- **Thesis:** *Real-World Graph Analysis: Techniques for Static, Dynamic and Temporal Communities*. We pursue the goal of extracting knowledge from different kinds of graphs, including static, dynamic, and temporal graphs, with a particular focus on their community substructures. To tackle this task we used combinatorial algorithms that can list all the communities in a graph according to different formalizations, such as k -graphlets, and k -cores. We then extended these concepts to the analysis of real-world graphs across diverse domains, ranging from social networks to autonomous systems modeled as temporal graphs.
- **Scientific Supervisors:** prof. Roberto Grossi, dott. Alessio Conte.
- Grade: Ottimo (*Excellent*)

M.S. in Computer Science

Pisa, Italy

UNIVERSITY OF PISA

Sep. 2017 - Oct. 2020

- **Thesis:** *Listing Large Cliques in Real-World Graphs*. Our goal was to specialize the version of an algorithm by Eppstein et al. to find cliques of at least k vertices, motivated by the fact that larger cliques often carry more significant information about communities rather than the small ones. We designed new fast methods to further reduce the number of recursive calls made by the algorithm, practically expanding the pool of affordable graphs to process. We plugged our strategy into the existing implementation of the algorithm by D. Strash and we do extensive testing both on real and synthetic datasets.
- **Scientific Supervisors:** prof. Roberto Grossi, dott. Alessio Conte.
- Curriculum: Data & Knowledge - Science and Technologies (obtained a *supplement diploma*).
- Grade: 110/110 *cum laude*.

B.S. in Computer Science

Pisa, Italy

UNIVERSITY OF PISA

Sep. 2014 - Oct. 2017

- **Thesis:** *The Minimal Representative Selection Problem: Applications, Optimal Algorithms, and Efficient Heuristics*.
- Supervisor: prof. Anna Bernasconi.
- Grade: 110/110 *cum laude*

Experience

Postdoc Research Fellow

Pisa, Italy

ISTITUTO DI SCIENZA E TECNOLOGIE DELL'INFORMAZIONE (ISTI) "A. FAEDO" – CNR (NATIONAL RESEARCH COUNCIL)

July 2024 - Present

Main topic: Decentralized combinatorial graph algorithms. *Reference:* protocol n. 211603, protocol date: 2024-06-20. [link](#).

Teaching Assistant

Pisa, Italy

UNIVERSITY OF PISA

- Class of "Fondamenti di Informatica" (C++ Programming), Bachelor degree in Electronical Engineering. (Sep. 2025 - Dec. 2025)
- Class of "Laboratorio I" (JavaScript Programming Lab), Bachelor degree in CS. (Sep. 2023 - Dec. 2023)
- Class of "Fondamenti di Informatica", Bachelor degree in CS. (Sep. 2021 - Dec. 2021 and Sep. 2022 - Dec. 2022)
- Class of "Sistemi Operativi e Laboratorio" (OS C Programming Lab), Bachelor degree in CS. (Feb. 2021 - Jun. 2021)
- Class of "Algoritmica e Laboratorio" (C Programming Lab), Bachelor degree in CS. (Feb. 2020 - Jul. 2020)
- Class of "Algoritmica e Laboratorio" (C Programming Lab and theory recap), Bachelor degree in CS. (Feb. 2019 - Jun. 2019)

Visiting Ph.D. Student

Kongens Lyngby, Denmark

DANISH TECHNICAL UNIVERSITY (DTU)

May 2023 - Jul. 2023

Worked on the C++ implementation of a new algorithm for obtaining a $(1 + \epsilon)$ approximation of the densest subgraph in a graph G through dynamic graph orientation (available in my PhD Thesis [7, Chapter 6]).

Bertinoro International Spring School (BISS 2022)

Bertinoro, Italy

SPRING PH.D. SCHOOL

March 2022

Spring School on **Machine Learning models**, Social Network opinions and conflicts (problems and algorithms), and Cloud serverless architectures through microelements.

Research Publications

- [1] G. Aghakhanyan, A. Barucci, M. A. Pascali, M. Assante, and G. Bagnacci. “NAVIGATOR: A regional multimodal imaging biobank initiative powered by AI tools for precision medicine in oncology” in: *European Journal of Radiology* 191 (2025), p. 112327. ISSN: 0720-048X. DOI: <https://doi.org/10.1016/j.ejrad.2025.112327>. URL: <https://www.sciencedirect.com/science/article/pii/S0720048X25004139>.
- [2] A. Conte, R. Grossi, Y. Kobayashi, K. Kurita, **D. Rucci**, T. Uno, and K. Wasa. “Enumerating Graphlets with Amortized Time Complexity Independent of Graph Size” in: *Algorithmica* 87.9 (Sept. 2025), pp. 1247–1273. ISSN: 1432-0541. DOI: 10.1007/s00453-025-01312-0. URL: <https://doi.org/10.1007/s00453-025-01312-0>.
- [3] **D. Rucci**, E. Carlini, P. Dazzi, H. Kavalionak, and M. Mordacchini. “Decentralized and Self-adaptive Core Maintenance on Temporal Graphs”. **To appear** in: *Social Networks Analysis and Mining*. Cham: Springer Nature Switzerland, 2025.
- [4] **D. Rucci**, D. Sampietro, E. Carlini, M. Mordacchini, and P. Dazzi. “Rusty-Cracker: A Multi-core Connected Components Library in Rust” in: *Proceedings of the 34th International Symposium on High-Performance Parallel and Distributed Computing*. HPDC '25. University of Notre Dame Conference Facilities, Notre Dame, IN, USA: Association for Computing Machinery, 2025. ISBN: 979-8-4007-1869-4. DOI: 10.1145/3731545.3744334. URL: <https://doi.org/10.1145/3731545.3744334>.
- [5] C. Brosse, A. Conte, V. Limouzy, G. Punzi, and **D. Rucci**. “Output-Sensitive Enumeration of Potential Maximal Cliques in Polynomial Space” in: *Combinatorial Algorithms: 35th International Workshop, IWOCA 2024, Ischia, Italy, July 1–3, 2024, Proceedings*. Ischia, Italy: Springer-Verlag, 2024, pp. 382–395. ISBN: 978-3-031-63020-0. DOI: 10.1007/978-3-031-63021-7_29. URL: https://doi.org/10.1007/978-3-031-63021-7_29.
- [6] A. Conte, and **D. Rucci**. “Are k-cores meaningful for temporal graph analysis?” in: *Proceedings of the 39th ACM/SIGAPP Symposium on Applied Computing*. SAC '24. Ávila, Spain, Association for Computing Machinery, 2024, pp. 1453–1460. ISBN: 979-8-4007-0243-3. DOI: 10.1145/3605098.3635959. URL: <https://doi.org/10.1145/3605098.3635959>.
- [7] **D. Rucci**. “Real-World Graph Analysis: Techniques for Static, Dynamic, and Temporal Communities”. PhD thesis. Pisa, Italy: University of Pisa, May 2024. URL: <https://doi.org/10.48550/arXiv.2405.10824>.
- [8] A. Conte, R. Grossi, and **D. Rucci**. “CAGE: Cache-Aware Graphlet Enumeration” in: *String Processing and Information Retrieval*. Ed. by F. M. Nardini, N. Pisanti, and R. Venturini. Cham: Springer Nature Switzerland, 2023, pp. 129–142. ISBN: 978-3-031-43980-3. DOI: 10.1007/978-3-031-43980-3_11.
- [9] A. Bernasconi, F. Luccio, L. Pagli, and **D. Rucci**. “Literal selection in switching lattice design” in: *Advanced Boolean Techniques: Selected Papers from the 13th International Workshop on Boolean Problems*. Springer International Publishing, 2020, pp. 159–175. DOI: 10.1007/978-3-030-20323-8_7.

Committee Membership & Reviewing Activity

2025	Reviewer , <i>Transactions on Information Systems (TOIS)</i> (Journal)	
2025	Reviewer , <i>The International Journal of Networked and Distributed Computing (IJNDC)</i> (Journal)	
2026	Program Committee , 48th European Conference on Information Retrieval (ECIR 2026)	<i>Delft, NL</i>
2026	Program Committee , The ACM Web Conference (WWW 2026)	<i>Dubai, UAE</i>
2025	Program Committee , Workshop of IEEE PERCOM (PerConAI 2026)	<i>Pisa, Italy</i>
2025	Program Committee , Workshop of IEEE PERCOM (PerConAI 2025)	<i>Washington DC, USA</i>
2025	Program Committee , 34th ACM International Conference on Information and Knowledge Management (CIKM 2025)	<i>Seoul, Korea</i>
2025	Program Committee (Reproducibility) , 47th European Conference on Information Retrieval (ECIR 2025)	<i>Lucca, Italy</i>
2024	Reviewer , 35th Annual Symposium on Combinatorial Pattern Matching (CPM 2024)	<i>Fukuoka, Japan</i>
2024	Reviewer , 35th International Workshop on Combinatorial Algorithms (IWOCA 2024)	<i>Ischia, Italy</i>
2023	Reviewer , 50th EATCS International Colloquium on Automata, Languages and Programming (ICALP 2023)	
2023	Reviewer , <i>Discrete Applied Mathematics (DAM)</i> (Journal)	
2022	Reviewer , The Web Conference 2022 (TheWEBCONF 2022)	<i>Lyon, France</i>
2021	Reviewer , 32nd International Workshop on Combinatorial Algorithms (IWOCA 2021)	<i>Ottawa, Canada</i>
2021	Reviewer , <i>Algorithmica</i> (Journal)	
2021	Reviewer , 32nd International Symposium on Algorithms and Computation (ISAAC 2021)	<i>Fukuoka, Japan</i>
2020	Organizing Committee , 4th Int. Workshop on Enumeration Problems and Applications (WEPA 2020)	<i>Pisa, Italy</i>

Talks & Presentations

ASONAM 2025 – The 17th International Conference on Advances in Social Networks Analysis and Mining

Niagara Falls, ON, Canada

PRESENTATION OF THE PAPER [3].

Aug. 2025

FRAME 2025 – 5th Workshop on Flexible Resource and Application Management on the Edge

Notre Dame, IN, USA

PRESENTATION OF THE PAPER [4].

Jul. 2025

DAYistributed 2025 – A half-day event on ideas, research, and perspectives in Distributed / Decentralized Computing

Pisa, Italy

PRESENTATION OF MY RESEARCH DIRECTIONS.

May 2025

ACM SAC 2024 – The 39th ACM/SIGAPP Symposium On Applied Computing

Ávila, Spain

PRESENTATION OF THE PAPER [6].

Apr. 2024

SPIRE 2023 – The 30th Int. Symposium on String Processing and Information Retrieval

Pisa, Italy

PRESENTATION OF THE PAPER [8]

Sep. 2023

UniPi Orienta (Informatica)

Pisa, Italy

PRESENTATION

Mar. 2022

Pitch on Sorting Algorithms to give the students a glance of the theoretical analysis of algorithms and why it is important (*Open Days* 2022).

Incontra Informatica

Pisa, Italy

PRESENTATION

May 2021

Brief introduction to algorithm design techniques and computational complexity through sequence sorting examples.

Honors, Awards & Project Memberships

RESEARCH

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| 2020 | Ph.D. Scholarship , Full Scholarship for the Ph.D. programme in Computer Science, funded by the Department of Computer Science, University of Pisa, from November 2020 to January 2024. | University of Pisa,
Italy |
| 2022 | Project Member , AHeAD – Efficient Algorithms for HARnessing networked Data (PRIN 2017), Italian MUR Project no. 20174LF3T8_005. Coordinator: prof. Francesco Giuseppe Italiano | University of Pisa,
Italy |

Skills

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| Coding | Version Control (<i>git, github</i>), RUST, C++ (<i>OpenMP</i>), C (<i>System Programming</i>), JAVA, Python (<i>NetworkX, Matplotlib, Seaborn, Pandas, Plotly</i>), JavaScript (<i>jQuery, bootstrap</i>), LaTeX, OCaml, HTML, CSS, MySQL |
| Languages | Italian (Native), English (CEFR C1), Spanish (CEFR A2) |