

# Davide Rucci

PH.D. · GRAPH ALGORITHMS & DATA STRUCTURES

Pisa, Italy

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## About Me

I was born a programming enthusiast, then I discovered the theoretical magic of algorithms. Today, both these sides of me live in my ongoing Ph.D. experience together with my unconditional love for the art of teaching. I believe a good teacher can leave a lasting impact on the minds of their students, and I feel the need to spread knowledge and love for the topics that I, too, love.

I am also into all sorts of pop culture, pop music, Nintendo video games, and Apple hardware.

## Education

### Ph.D. in Computer Science

Pisa, Italy

UNIVERSITY OF PISA

Nov. 2020 - May 6<sup>th</sup> 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.
- Supervisors: prof. Roberto Grossi, 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 the 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 randomly generated datasets.
- Supervisors: prof. Roberto Grossi, Alessio conte.
- Curriculum: Data & Knowledge - Science and Technologies
- 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

### Danish Technical University (DTU)

Kongens Lyngby, Denmark

VISITING PH.D. STUDENT

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).

### University of Pisa

Pisa, Italy

TEACHING ASSISTANT (IN ITALIAN)

- 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)

## Publications

- [1] Brosse Caroline, Conte Alessio, Limouzy Vincent, Punzi Giulia, **Rucci Davide**. "Output-Sensitive Enumeration of Potential Maximal Cliques in Polynomial Space". **To appear** in: *Combinatorial Algorithms*. Ed. by Adele A. Rescigno and Ugo Vaccaro. Cham: Springer Nature Switzerland, 2024.

- [2] Conte Alessio, Grossi Roberto, Kobayashi Yasuaki, Kurita Kazuhiro, **Rucci Davide**, Uno Takeaki, Wasa Kunihiro. “Enumerating Graphlets with Amortized Time Complexity Independent of Graph Size”. **Submitted to: *Algorithmica*** (2024).
- [3] Conte Alessio, **Rucci Davide**. “Are k-cores meaningful for temporal graph analysis?” in: *Proceedings of the 39th ACM/SIGAPP Symposium on Applied Computing*. SAC '24. Avila, Spain, Association for Computing Machinery, 2024, pp. 1453–1460. ISBN: 9798400702433. DOI: 10.1145/3605098.3635959. URL: <https://doi.org/10.1145/3605098.3635959>.
- [4] Conte Alessio, Grossi Roberto, **Rucci Davide**. “CAGE: Cache-Aware Graphlet Enumeration” in: *String Processing and Information Retrieval*. Ed. by Franco Maria Nardini, Nadia Pisanti, and Rossano Venturini. Cham: Springer Nature Switzerland, 2023, pp. 129–142. ISBN: 978-3-031-43980-3.
- [5] Bernasconi Anna, Luccio Fabrizio, Pagli Linda, **Rucci Davide**. “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.

## Conference/Journal Committees

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2024	<b>Reviewer</b> , 35th Annual Symposium on Combinatorial Pattern Matching (CPM 2024)	<i>Fukuoka, Japan</i>
2024	<b>Reviewer</b> , 35th International Workshop on Combinatorial Algorithms (IWOCA 2024)	<i>Ischia, Italy</i>
2023	<b>Reviewer</b> , 50th EATCS International Colloquium on Automata, Languages and Programming (ICALP 2023)	<i>Paderborn, Germany</i>
2023	<b>Reviewer</b> , Discrete Applied Mathematics (DAM, Journal)	
2022	<b>Reviewer</b> , The Web Conference 2022 (TheWEBCONF 2022)	<i>Lyon, France</i>
2021	<b>Reviewer</b> , 32nd International Workshop on Combinatorial Algorithms (IWOCA 2021)	<i>Ottawa, Canada</i>
2021	<b>Reviewer</b> , Algorithmica (Journal)	
2021	<b>Reviewer</b> , 32nd International Symposium on Algorithms and Computation (ISAAC 2021)	<i>Fukuoka, Japan</i>
2020	<b>Organizing Committee</b> , 4th International Workshop on Enumeration Problems and Applications (WEPA 2020)	<i>Pisa, Italy</i>

## Research Projects

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### AHeAD (PRIN)

*Italy*

PROJECT MEMBER

2023

- Efficient Algorithms for HARnessing networked Data, Italian MUR Project no. 20174LF3T8\_005. Coordinator: prof. Francesco Giuseppe Italiano

## Talks

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### ACM SAC – The 39<sup>th</sup> ACM/SIGAPP Symposium On Applied Computing

*Ávila, Spain*

PAPER AUTHOR

*Apr. 2024*

- Presentation of the paper [3].

### SPIRE – The 30<sup>th</sup> International Symposium on String Processing and Information Retrieval

*Pisa, Italy*

PAPER AUTHOR

*Sep. 2023*

- Presentation of the paper [4].

### UniPi Orienta (Informatica)

*Pisa, Italy*

UNIVERSITY OF PISA

*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*

UNIVERSITY OF PISA

*May 2021*

- Brief introduction to algorithm design techniques through sequence sorting examples. Computational complexity and why it is important still nowadays.

## Honors & Awards

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### RESEARCH

- 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*

## Skills

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**Programming** C++, C, JAVA, Python, JavaScript, OCaml, LaTeX

**Languages** English (CEFR C1), Italian (Native), Spanish (CEFR A2)