

Antonio Cruciani

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Aalto University

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<https://antonio-cruciani.github.io/>

Current Position

Postdoctoral Researcher, in Computer Science at Aalto University. Working with Jukka Suomela.

Espoo, FI
Mar. 2025 – Now

Education

Ph.D. Student, in Computer Science at Gran Sasso Science Institute.
Thesis: *Models and Algorithms for Temporal Betweenness Centrality and Dynamic Distributed Data Structures*.

L'Aquila, IT
Nov. 2020 – Mar. 2025

Grade: Excellent.

Supervisor: [Francesco Pasquale](#) (University of Rome “Tor Vergata”)

co-Supervisor: [Pierluigi Crescenzi](#) (Gran Sasso Science Institute)

Reviewers: Christian Scheideler, Fabio Vandin.

M.S., in Computer Science, University of Rome “Tor Vergata”, *summa cum laude*.
Thesis: *Dynamic Random Graphs and unstructured P2P networks, analysis of two models inspired by the Bitcoin network*.

Rome, IT
2017 – 2020

Supervisor: [Francesco Pasquale](#) (University of Rome “Tor Vergata”)

B.S., in Computer Science, University of Rome “Tor Vergata”.

Thesis: *Efficient learning methods for playlist prediction*.

Rome, IT
2011 – 2017

Supervisor: [Giorgio Gambosi](#) (University of Rome “Tor Vergata”)

Academic Appointments

Visiting Researcher Fellow, KTH.

Host: [Aristides Gionis](#)

Stockholm, SE
June 2025

Visiting Researcher Fellow, Department of Computer Science University of Hamburg.

Host: [Thorsten Götte](#)

Hamburg, GE
January 2025

Visiting Researcher Fellow, Department of Computer Science and Engineering, IIT Madras.

Supervisor: [John Augustine](#)

Chennai, IN
1st-Aug. – 31st-Oct. 2024

Visiting Researcher Fellow, Department of Computer Science and Engineering, University of Padua.

Host: [Leonardo Pellegrina](#)

Padova, IT
July 2024

Visiting Researcher Fellow, Department of Computer Science and Engineering, IIT Madras.

Supervisor: [John Augustine](#)

Chennai, IN
1st-Aug. 2023 – 27th-Feb. 2024

Visiting Researcher Fellow, Big Data Analytics Lab, Fondazione Ugo Bordoni

Supervisor: [Giambattista Amati](#)

Rome, IT
Feb. – Nov. 2020

Teaching Activities

Teacher, Course: CS-E4565 - Combinatorics of Computation D. , Aalto University.

*Finland, FI
April - May. 2025*

Teaching Assistant, Computability and Computational Complexity Theory, University of Rome “Tor Vergata”.

*Rome, IT
Oct. 2018 – Jun. 2019*

Teaching Assistant, Computer Programming, University of Rome “Tor Vergata”.

*Rome, IT
Oct. 2015 – Jun. 2019*

Work

Software Developer, WeDot Rome.

*Rome, IT
Oct. 2015 – Jun. 2016*

Software Developer, New System.

*Falerone, IT
Jun. – Sep. 2010*

Languages

◦ Italian **Mother tongue**

◦ English **Fluent** (C2 CEFR)

Programming Skills

- Basic: OWL, SPARQL, FORTRAN, COBOL, LISP
- Intermediate: GO, MATLAB, JAVASCRIPT, R, ASP.NET, PHP
- Advanced: PYTHON, JULIA, JAVA, C, C++, C#, SQL
- Frameworks: Apache Spark

Research Interests

- Graph Mining
- Distributed Computing
- Temporal Graphs
- Randomized Algorithms
- Random Graphs
- Approximation Algorithms
- Statistical Learning
- Evolving Graphs

Publications

In case of theoretical computer science conferences, authors are sorted alphabetically, otherwise by contribution.

Conference Proceedings

- [1] A. Cruciani, D. Pasquini, G. Amati, and P. Vocca. “About Graph Index Compression Techniques”. In: *Proceedings of the 10th Italian Information Retrieval Workshop, Padova, Italy, September 16-18, 2019*. Ed. by M. Agosti, E. D. Buccio, M. Melucci, S. Mizzaro, G. Pasi, and F. Silvestri. Vol. 2441. CEUR Workshop Proceedings. CEUR-WS.org, 2019, pp. 21–24. URL: <https://ceur-ws.org/Vol-2441/paper23.pdf>.
- [2] G. Amati, S. Angelini, A. Cruciani, G. Fusco, G. Gaudino, D. Pasquini, and P. Vocca. “Topic Modeling by Community Detection Algorithms”. In: *OASIS@HT 2021: Proceedings of the 2021 Workshop on Open Challenges in Online Social Networks, Virtual Event, Ireland, 30 August 2021*. Ed. by B. Guidi, A. Michienzi, and L. Ricci. ACM, 2021, pp. 15–20. DOI: [10.1145/3472720.3483622](https://doi.org/10.1145/3472720.3483622). URL: <https://doi.org/10.1145/3472720.3483622>.

- [3] A. Cruciani and F. Pasquale. “Brief Announcement: Dynamic Graph Models for the Bitcoin P2P Network: Simulation Analysis for Expansion and Flooding Time”. In: *Stabilization, Safety, and Security of Distributed Systems - 24th International Symposium, SSS 2022, Clermont-Ferrand, France, November 15-17, 2022, Proceedings*. Ed. by S. Devismes, F. Petit, K. Altisen, G. A. D. Luna, and A. F. Anta. Vol. 13751. Lecture Notes in Computer Science. Springer, 2022, pp. 335–340. DOI: [10.1007/978-3-031-21017-4_23](https://doi.org/10.1007/978-3-031-21017-4_23). URL: https://doi.org/10.1007/978-3-031-21017-4_23.
- [4] R. Becker, P. Crescenzi, A. Cruciani, and B. Kodric. “Proxying Betweenness Centrality Rankings in Temporal Networks”. In: *21st International Symposium on Experimental Algorithms, SEA 2023, July 24-26, 2023, Barcelona, Spain*. Ed. by L. Georgiadis. Vol. 265. LIPIcs. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2023, 6:1–6:22. DOI: [10.4230/LIPICS.SEA.2023.6](https://doi.org/10.4230/LIPICS.SEA.2023.6). URL: <https://doi.org/10.4230/LIPICS.SEA.2023.6>.
- [5] G. Amati, A. Cruciani, D. Pasquini, P. Vocca, and S. Angelini. “propagate: A Seed Propagation Framework to Compute Distance-Based Metrics on Very Large Graphs”. In: *Machine Learning and Knowledge Discovery in Databases: Research Track - European Conference, ECML PKDD 2023, Turin, Italy, September 18-22, 2023, Proceedings, Part III*. Ed. by D. Koutra, C. Plant, M. G. Rodriguez, E. Baralis, and F. Bonchi. Vol. 14171. Lecture Notes in Computer Science. Springer, 2023, pp. 671–688. DOI: [10.1007/978-3-031-43418-1_40](https://doi.org/10.1007/978-3-031-43418-1_40). URL: https://doi.org/10.1007/978-3-031-43418-1_40.
- [6] A. Cruciani and F. Pasquale. “Dynamic graph models inspired by the Bitcoin network-formation process”. In: *24th International Conference on Distributed Computing and Networking, ICDCN 2023, Kharagpur, India, January 4-7, 2023*. ACM, 2023, pp. 125–134. DOI: [10.1145/3571306.3571398](https://doi.org/10.1145/3571306.3571398). URL: <https://doi.org/10.1145/3571306.3571398>.
- [7] A. Cruciani. “MANTRA: Temporal Betweenness Centrality Approximation Through Sampling”. In: *Machine Learning and Knowledge Discovery in Databases. Research Track - European Conference, ECML PKDD 2024, Vilnius, Lithuania, September 9-13, 2024, Proceedings, Part I*. Ed. by A. Bifet, J. Davis, T. Krilavicius, M. Kull, E. Ntoutsis, and I. Zliobaite. Vol. 14941. Lecture Notes in Computer Science. Springer, 2024, pp. 125–143. DOI: [10.1007/978-3-031-70341-6_8](https://doi.org/10.1007/978-3-031-70341-6_8). URL: https://doi.org/10.1007/978-3-031-70341-6_8.

Preprints

- [8] A. Cruciani. *Fast Estimation of Percolation Centrality*. 2024. arXiv: [2408.02389 \[cs.SI\]](https://arxiv.org/abs/2408.02389). URL: <https://arxiv.org/abs/2408.02389>.
- [9] J. Augustine, A. Cruciani, and I. A. Gillani. *Maintaining Distributed Data Structures in Dynamic Peer-to-Peer Networks*. 2024. arXiv: [2409.10235 \[cs.DC\]](https://arxiv.org/abs/2409.10235). URL: <https://arxiv.org/abs/2409.10235>.
- [10] A. Balliu, C. Coupette, A. Cruciani, F. d’Amore, M. Equi, H. Lievonen, A. Modanese, D. Olivetti, and J. Suomela. *New Limits on Distributed Quantum Advantage: Dequantizing Linear Programs*. 2025. arXiv: [2506.07574 \[cs.DC\]](https://arxiv.org/abs/2506.07574). URL: <https://arxiv.org/abs/2506.07574>.
- [11] A. Cruciani. *Maintaining a Bounded Degree Expander in Dynamic Peer-to-Peer Networks*. 2025. arXiv: [2506.17757 \[cs.DC\]](https://arxiv.org/abs/2506.17757). URL: <https://arxiv.org/abs/2506.17757>.

Talks

Approximating Distance-based metrics through sampling. IIT Madras.	Chennai, IN Oct. 2024
Maintaining Distributed Data Structures in Dynamic Peer-to-Peer Networks. Aalto University.	Online Oct. 2024
Maintaining Distributed Data Structures in Dynamic Peer-to-Peer Networks. IIT Madras	Chennai, IN Oct. 2024
On the Temporal Betweenness Centrality. IIT Madras.	Chennai, IN Oct. 2024
MANTRA: Temporal Betweenness Centrality Approximation through Sampling. European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD).	Vilnius, LT Sep. 2024

Computing Distance-based metrics on Very Large Graphs. University of Padua	<i>Padua, IT Jul. 2024</i>
PROPAGATE: A Seed Propagation Framework to Compute Distance-Based Metrics on Very Large Graphs. European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD).	<i>Turin, IT Sep. 2023</i>
Proxying Betweenness Centrality Rankings in Temporal Networks. 21st International Symposium on Experimental Algorithms (SEA),	<i>Barcelona, ES Jul. 2023</i>
Dynamic graph models inspired by the Bitcoin network-formation process. 24th international Conference on Distributed Computing and Networking (ICDCN).	<i>Kharagpur, IN Jan. 2023</i>
Dynamic graph models for the Bitcoin P2P network: simulation analysis for expansion and flooding time. 24th International Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS).	<i>Clermont-Ferrand, FR Nov. 2022</i>
About Graph Index Compression Techniques. Proceedings of the 10th Italian Information Retrieval Workshop (IIR-2019)	<i>Padua, IT Sep. 2019</i>
Iterative Compression technique for NP-Hard problems on Graphs. University of Rome Tor Vergata.	<i>Rome, IT Jun. 2019</i>

Schools

Bertinoro International Spring School	<i>Bertinoro, IT Mar. 2022</i>
European Summer School on Learning in Games, Markets, and Online Decision Making	<i>Rome, IT Sep. 2021</i>
Max Planck Advanced Course on the Foundations of Computer Science (Convex Optimization) (online)	<i>Saarbrücken, GE Jul. - Aug. 2021</i>
Algorithmic Tools for Massive Network Analytics (online)	<i>Pisa, IT May - Jun. 2021</i>
Max Planck Advanced Course on the Foundations of Computer Science (Market Design and Computational Fair Division) (online)	<i>Saarbrücken, GE August 2020</i>
Algorithms and computational models for large-scale data analysis. University of Rome: "La Sapienza". By Silvio Lattanzi (Google Research).	<i>Rome, IT August 2019</i>

Academic Service

Conferences

Reviewer ICANN 2025
Sub-reviewer PODC-WSDM-SDM-SEA-ISAAC 2025
Sub-reviewer FUN 2020-2024
Sub-reviewer AAMAS 2023

Journals

Reviewer: The Review of Socionetwork Strategies

Teaching

Course: CS-E4565 - Combinatorics of Computation D. Covered the first two weeks of the course: Introduction to probability, the probabilistic method and derandomization.

Software Packages

- PROPAGATE, an efficient algorithm for approximating various distance-based metrics (i.e., average distance, effective diameter, diameter and connectivity rate).
<https://github.com/BigDataLaboratory/MHSE>
- DREG, a dynamic expander graph generator.
<https://github.com/Antonio-Cruciani/DREG-DynamicRandomExpanderGenerator>
- TSBPROXY, a suite of efficient proxies for the temporal betweenness centrality rankings.
<https://github.com/Antonio-Cruciani/TSBProxy>
- MANTRA, an efficient framework for approximating the temporal betweenness centrality using sampling.
<https://github.com/Antonio-Cruciani/MANTRA>
- FEPIC, an efficient approximation algorithm for the percolation centrality.
https://github.com/Antonio-Cruciani/percolation_centrality