

Antonio Cruciani

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Gran Sasso Science Institute

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

Current Position

Ph.D. Student, in Computer Science at Gran Sasso Science Institute. *L'Aquila, IT*
Expected graduation: *January 2025*. *Nov. 2020 – Jan. 2025*
Thesis: *Models and Algorithms for Temporal Betweenness Centrality and Dynamic Distributed Data Structures*.
Supervisor: [Francesco Pasquale](#) (University of Rome “Tor Vergata”)
co-Supervisor: [Pierluigi Crescenzi](#) (Gran Sasso Science Institute)

Education

M.S., in Computer Science, University of Rome “Tor Vergata”, *summa cum laude*. *Rome, IT*
Thesis: *Dynamic Random Graphs and unstructured P2P networks, analysis of two models inspired by the Bitcoin network*. *2017 – 2020*
Supervisor: [Francesco Pasquale](#) (University of Rome “Tor Vergata”)

B.S., in Computer Science, University of Rome “Tor Vergata”. *Rome, IT*
Thesis: *Efficient learning methods for playlist prediction*. *2011 – 2017*
Supervisor: [Giorgio Gambosi](#) (University of Rome “Tor Vergata”)

Academic Appointments

Visiting Researcher Fellow, Department of Computer Science and Engineering, IIT Madras. *Chennai, IN*
1st-Aug. – 31st-Oct. 2024
Supervisor: [John Augustine](#)

Visiting Researcher Fellow, Department of Computer Science and Engineering, IIT Madras. *Chennai, IN*
1st-Aug. 2023 – 27th-Feb. 2024
Supervisor: [John Augustine](#)

Visiting Researcher Fellow, Big Data Analytics Lab, Fondazione Ugo Bordoni *Rome, IT*
Supervisor: [Giambattista Amati](#) *Feb. – Nov. 2020*

Teaching Activities

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. Ntoutsi, 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_5C_8.

Preprints

- [8] A. Cruciani. *Fast Estimation of Percolation Centrality*. 2024. arXiv: [2408.02389](https://arxiv.org/abs/2408.02389) [cs.SI]. 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](https://arxiv.org/abs/2409.10235) [cs.DC]. URL: <https://arxiv.org/abs/2409.10235>.

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	Padua, IT Jul. 2024
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).	Turin, IT Sep. 2023
Proxying Betweenness Centrality Rankings in Temporal Networks. 21st International Symposium on Experimental Algorithms (SEA),	Barcelona, ES Jul. 2023
Dynamic graph models inspired by the Bitcoin network-formation process. 24th international Conference on Distributed Computing and Networking (ICDCN).	Kharagpur, IN Jan. 2023
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).	Clermont-Ferrand, FR Nov. 2022
About Graph Index Compression Techniques. Proceedings of the 10th Italian Information Retrieval Workshop (IIR-2019)	Padua, IT Sep. 2019
Iterative Compression technique for NP-Hard problems on Graphs. University of Rome Tor Vergata.	Rome, IT Jun. 2019

Schools

Bertinoro International Spring School	Bertinoro, IT Mar. 2022
European Summer School on Learning in Games, Markets, and Online Decision Making	Rome, IT Sep. 2021

Max Planck Advanced Course on the Foundations of Computer Science (Convex Optimization) (online)

*Saarbrücken, GE
Jul. - Aug. 2021*

Algorithmic Tools for Massive Network Analytics (online)

*Pisa, IT
May - Jun. 2021*

Max Planck Advanced Course on the Foundations of Computer Science (Market Design and Computational Fair Division) (online)

*Saarbrücken, GE
August 2020*

Algorithms and computational models for large-scale data analysis. University of Rome: “La Sapienza”. By Silvio Lattanzi (Google Research).

*Rome, IT
August 2019*

Academic Service

Sub-reviewer WSDM-SDM 2025

Sub-reviewer FUN 2020-2024

Sub-reviewer AAMAS 2023

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