

ANTONIO CRUCIANI

Aalto University (Espoo, Finland)

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

Fields of Research Expertise

Distributed Computing, Graph Mining, Randomized Algorithms, Temporal Graphs, Data Mining.

Current Position

Postdoctoral Researcher, Aalto University, Computer Science. Research Group of Prof. [Jukka Suomela](#).

Espoo, FI
Mar. 2025 – Present

Education

Ph.D. in Computer Science, Gran Sasso Science Institute (GSSI).
Thesis: *Models and Algorithms for Temporal Betweenness Centrality and Dynamic Distributed Data Structures*. **Grade:** Excellent.
Supervisors: [Francesco Pasquale](#) (University of Rome “Tor Vergata”), [Pierluigi Crescenzi](#) (GSSI)
Reviewers: [Christian Scheideler](#) (UPB), [Fabio Vandin](#) (UNIPD).

L’Aquila, IT
Mar. 2025

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

Rome, IT
2020

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

Rome, IT
2017

Visiting Research Periods

Visiting Researcher Fellow, Department of Computer Science and Engineering, University of Padua.
Host Professor: [Leonardo Pellegrina](#)

Padova, IT
February 2026

Visiting Researcher Fellow, KTH Royal Institute of Technology.
Host Professor: [Aristides Gionis](#)

Stockholm, SE
June 2025

Visiting Researcher Fellow, Department of Computer Science University of Hamburg.
Host Researcher: [Thorsten Götte](#)

Hamburg, GE
January 2025

Visiting Researcher Fellow, Department of Computer Science and Engineering, IIT Madras.
Host Professor: [John Augustine](#)

Chennai, IN
1st-Aug. – 31st-Oct. 2024

Visiting Researcher Fellow, Department of Computer Science and Engineering, University of Padua.
Host Professor: [Leonardo Pellegrina](#)

Padova, IT
July 2024

Visiting Researcher Fellow, Department of Computer Science and Engineering, IIT Madras.
Host Professor: [John Augustine](#)

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

Visiting Researcher Fellow, Big Data Analytics Lab, Fondazione Ugo Bordoni
Host Researcher: [Giambattista Amati](#)

Rome, IT
Feb. – Nov. 2020

Teaching Experience

Invited Teacher, *CS-E4565 - Combinatorics of Computation D.* (MSc), Aalto University (lecture delivery and guided problem solving, office hours, grading).
Topics: probabilistic method, theory of concentration, expander graphs.

Finland, FI
April - May. 2026

Invited Teacher, *CS-E4565 - Combinatorics of Computation D.* (MSc), Aalto University (lecture delivery, guided problem solving, office hours, grading). **Topics:** introduction on probability, the probabilistic method, and derandomization across four sessions.

Finland, FI
April - May. 2025

Teaching Assistant, Computability and Computational Complexity Theory (BSc), University of Rome “Tor Vergata”. (lecture delivery and guided problem solving)
Topics: computability and computational complexity.

Rome, IT
Oct. 2018 – Jun. 2019

Teaching Assistant, Computer Programming in C (BSc), University of Rome “Tor Vergata”. Led exercise sessions focused on problem solving and programming practice, supported students during in-class exercises, and graded weekly homework assignments.

Rome, IT
Oct. 2017 – Jun. 2018

Professional Experience

Software Developer, WeDot Rome.

Rome, IT
Oct. 2015 – Jun. 2016

Software Developer, New System.

Falerone, IT
Jun. – Sep. 2010

Languages

- English (fluent)
- Italian (mother tongue)

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

Publications

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

Conference Proceedings

- [1] **A. Cruciani**, A. Das, A. Raevskaya, and J. Suomela. “Brief Announcement: It does not matter how you define locally checkable labelings”. In: *Proceedings of the ACM Symposium on Principles of Distributed Computing, PODC 2026, Egham, London, United Kingdom, July 6-10, 2026 (TO APPEAR)*. ACM, 2026. Acceptance rate = 22%.
- [2] **A. Cruciani**, A. Das, M. Equi, H. Lievonon, D. Luong-Le, A. Modanese, and J. Suomela. “Brief Announcement: Is a LOCAL algorithm computable?”. In: *Proceedings of the ACM Symposium on Principles of Distributed Computing, PODC 2026, Egham, London, United Kingdom, July 6-10, 2026 (TO APPEAR)*. ACM, 2026. Acceptance rate = 22%.
- [3] **A. Cruciani**. “Maintaining a Bounded Degree Expander in Dynamic Peer-to-Peer Networks”. In: *Structural Information and Communication Complexity - 33th International Colloquium, SIROCCO 2026, Durham, United Kingdom (TO APPEAR)*. Lecture Notes in Computer Science. 2026. Acceptance rate = 43%.

- [4] **A. Cruciani** and L. Pellegrina. “Fast Percolation Centrality Approximation with Importance Sampling”. In: *IEEE International Conference on Data Mining, ICDM 2025, Washington DC, USA, November 12-15, 2025*. IEEE, 2025, pp. 1125–1134. DOI: [10.1109/ICDM65498.2025.00121](https://doi.org/10.1109/ICDM65498.2025.00121). URL: <https://doi.org/10.1109/ICDM65498.2025.00121>. Acceptance rate = 8.9%.
- [5] J. Augustine, **A. Cruciani**, and I. A. Gillani. “Brief Announcement: Highly Dynamic and Fully Distributed Data Structures”. In: *39th International Symposium on Distributed Computing (DISC 2025)*. Ed. by D. R. Kowalski. Vol. 356. Leibniz International Proceedings in Informatics (LIPIcs). Dagstuhl, Germany: Schloss Dagstuhl – Leibniz-Zentrum für Informatik, 2025, 47:1–47:7. ISBN: 978-3-95977-402-4. DOI: [10.4230/LIPIcs.DISC.2025.47](https://drops.dagstuhl.de/entities/document/10.4230/LIPIcs.DISC.2025.47). URL: <https://drops.dagstuhl.de/entities/document/10.4230/LIPIcs.DISC.2025.47>. Acceptance rate = 30.5%.
- [6] 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”. In: *39th International Symposium on Distributed Computing (DISC 2025)*. Ed. by D. R. Kowalski. Vol. 356. Leibniz International Proceedings in Informatics (LIPIcs). Dagstuhl, Germany: Schloss Dagstuhl – Leibniz-Zentrum für Informatik, 2025, 11:1–11:22. ISBN: 978-3-95977-402-4. DOI: [10.4230/LIPIcs.DISC.2025.11](https://drops.dagstuhl.de/entities/document/10.4230/LIPIcs.DISC.2025.11). URL: <https://drops.dagstuhl.de/entities/document/10.4230/LIPIcs.DISC.2025.11>. Acceptance rate = 30.5%.
- [7] **A. Cruciani**. “Brief Announcement: Maintaining a Bounded Degree Expander in Dynamic Peer-To-Peer Networks”. In: *39th International Symposium on Distributed Computing (DISC 2025)*. Ed. by D. R. Kowalski. Vol. 356. Leibniz International Proceedings in Informatics (LIPIcs). Dagstuhl, Germany: Schloss Dagstuhl – Leibniz-Zentrum für Informatik, 2025, 53:1–53:7. ISBN: 978-3-95977-402-4. DOI: [10.4230/LIPIcs.DISC.2025.53](https://drops.dagstuhl.de/entities/document/10.4230/LIPIcs.DISC.2025.53). URL: <https://drops.dagstuhl.de/entities/document/10.4230/LIPIcs.DISC.2025.53>. Acceptance rate = 30.5%.
- [8] **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_8. Acceptance rate = 24%.
- [9] 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. Acceptance rate = 24%.
- [10] 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>. Acceptance rate = 50%.
- [11] **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>. Acceptance rate = 34%.
- [12] **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.

- [13] 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>.
- [14] **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>.

Preprints

- [15] J. Augustine, **A. Cruciani**, and I. A. Gillani. *Highly Dynamic and Fully Distributed Data Structures*. 2025. arXiv: [2409.10235](https://arxiv.org/abs/2409.10235) [cs.DC]. URL: <https://arxiv.org/abs/2409.10235>.
- [16] **A. Cruciani**, A. Das, A. Raevskaya, and J. Suomela. *It does not matter how you define locally checkable labelings*. 2026. arXiv: [2602.18188](https://arxiv.org/abs/2602.18188) [cs.DC]. URL: <https://arxiv.org/abs/2602.18188>.
- [17] **A. Cruciani**, A. Das, M. Equi, H. Lievonon, D. Luong-Le, A. Modanese, and J. Suomela. *Is a LOCAL algorithm computable?* 2026. arXiv: [2602.21022](https://arxiv.org/abs/2602.21022) [cs.DC]. URL: <https://arxiv.org/abs/2602.21022>.
- [18] M. T. E. Abedesselam, **A. Cruciani**, F. Giacomelli, L. Kiffer, and F. Pasquale. *How Bitcoin Forms Its Network: Peer-Table Sampling and Structural Properties*. 2026.

PhD Thesis

- [19] **A. Cruciani**. *Highly Dynamic and Fully Distributed Data Structures*. 2025. URL: <https://iris.gssi.it/handle/20.500.12571/34764>.

Presentations at Conferences & Workshops

o 2025:

- Fast Percolation Centrality Approximation with Importance Sampling (ICDM, Washington DC, USA);
- Maintaining a Bounded Degree Expander in Dynamic Peer-To-Peer Networks (DISC, Berlin, DE);
- Maintaining Distributed Data Structures in Dynamic Peer-to-Peer Networks (DISC, Berlin, DE);
- Maintaining Distributed Data Structures in Dynamic Peer-to-Peer Networks (Joint Estonian-Latvian Theory Days, Riga, LV);
- Fast Percolation Centrality Approximation with Importance Sampling (Helsinki Algorithms & Theory Days, Helsinki, FI).

o 2024:

- Approximating Distance-based metrics through sampling (IIT Madras, Chennai, IN);
- Maintaining Distributed Data Structures in Dynamic Peer-to-Peer Networks (Online, Aalto University, Espoo, FI);
- Maintaining Distributed Data Structures in Dynamic Peer-to-Peer Networks (IIT Madras, Chennai, IN);
- On the Temporal Betweenness Centrality (IIT Madras, Chennai, IN);
- MANTRA: Temporal Betweenness Centrality Approximation through Sampling (ECML-PKDD, Vilnius, LT);
- Computing Distance-based metrics on Very Large Graphs (UNIPD, Padova, IT).

o 2023:

- PROPAGATE: A Seed Propagation Framework to Compute Distance-Based Metrics on Very Large Graphs (ECML-PKDD, Turin, IT);
- Proxying Betweenness Centrality Rankings in Temporal Networks (SEA, Barcelona, ES);
- Dynamic graph models inspired by the Bitcoin network-formation process (ICDCN, Kharagpur, IN).

- **2022:**
 - Dynamic graph models for the Bitcoin P2P network: simulation analysis for expansion and flooding time (SSS, Clermont-Ferrand, FR).
- **2019:**
 - About Graph Index Compression Techniques (IIR, Padova, IT);
 - Iterative Compression technique for NP-Hard problems on Graphs (University of Rome Tor Vergata, Rome, IT).

Additional Training

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

PC-Member SSS 2026
 Reviewer ICALP-PODC 2026
 Reviewer STACS-PODC-WSDM-SDM-SEA-ISAAC-FSTTCS-ICANN 2025
 Reviewer FUN 2020-2024
 Reviewer AAMAS 2023

Journals

Reviewer: The Review of Socionetwork Strategies

Workshops

Organizer: Helsinki Theory Days 2026

Supervision

Bachelor Students: Giacomo Rivetti (2025, co-supervised with Francesco Pasquale)

Software Packages

- [PROPAGATE](#), an efficient algorithm for approximating various distance-based metrics (i.e., average distance, effective diameter, diameter and connectivity rate).
- [DREG](#), a dynamic expander graph generator.
- [TSBPROXY](#), a suite of efficient proxies for the temporal betweenness centrality rankings.
- [MANTRA](#), an efficient framework for approximating the temporal betweenness centrality using sampling.
- [FEPIC](#), an efficient approximation algorithm for the (doubly normalized) percolation centrality.

- PERCIS, a fast approximation algorithm for the percolation centrality that uses importance sampling.

Contact References

- John Augustine, IIT Madras: augustine@cse.iitm.ac.in
- Jukka Suomela, Aalto University: jukka.suomela@aalto.fi
- Francesco Pasquale, University of Rome Tor Vergata: pasquale@mat.uniroma2.it
- Leonardo Pellegrina, University of Padua: leonardo.pellegrina@unipd.it
- Giambattista Amati, Fondazione Ugo Bordoni: gba@fub.it
- Thorsten Götte, Hamburg University: thorsten.goette@uni-hamburg.de