

CURRICULUM VITAE - EMILIO CRUCIANI

UNIVERSITÀ DEGLI STUDI DI MILANO

selezione pubblica per n. 2 posto/i di Ricercatore a tempo determinato ai sensi dell'art.24, comma 3, lettera b) della Legge 240/2010 per il settore concorsuale 01/B1 - Informatica , settore scientifico-disciplinare INF/01 – Informatica presso il Dipartimento di Informatica “Giovanni degli Antoni”, (avviso bando pubblicato sulla G.U. n. 7 del 27/01/2023) Codice concorso 5205

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Ph.D. in Computer Science

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PROFILE

I am currently investigating how simple randomized distributed algorithms can solve global tasks such as consensus and community detection. I am interested in the analysis of simple dynamical/stochastic processes on complex networks and in the design and implementation of scalable algorithms for massive datasets.

EDUCATION

- **11/2016-12/2019: Ph.D. in Computer Science @ Gran Sasso Science Institute (L'Aquila, IT)**
Thesis: "Simple Randomized Distributed Algorithms for Graph Clustering"; Supervisors: Luca Becchetti & Emanuele Natale
- **10/2014-10/2016: M.Sc. in Engineering in Computer Science @ Sapienza University (Rome, IT)**
Thesis: "Fully Decentralized Dynamics for Graph Clustering"; Supervisor: Luca Becchetti
- **10/2009-10/2014: B.Sc. in Computer and Systems Engineering @ Sapienza University (Rome, IT)**
Thesis: "ReST vs SOAP: A Theoretical and Experimental Performance Comparison of Web Services"; Project: FP7 "Cybersecurity on SCADA: risk prediction, analysis and reaction tools for Critical Infrastructures" (CockpitCI); Supervisor: Francesco Delli Priscoli

ACADEMIC CAREER

- **13/2021-now: Postdoctoral Researcher @ University of Salzburg (Salzburg, AT)**
Group: Big Data Algorithms Group; Host: Sebastian Forster; Projects: FWF "Distributed Algorithms for Fundamental Graph Problems" (DiAloG); ERC Starting Grant "Dynamic Algorithms Against Strong Adversaries" (DynASoAr); Topics: Analysis of stochastic processes on networks; design and analysis of dynamic algorithms
- **11/2020-02/2021: Postdoctoral Researcher @ University of Salzburg (Salzburg, AT)**
Group: Efficient Algorithms Group; Host: Robert Elsässer; Project: H2020 "HPC and Big Data Technologies for Global Systems" (HiDALGO); Topics: Analysis of stochastic processes on networks
- **11/2019-10/2020: Postdoctoral Researcher @ INRIA Sophia Antipolis & I3S Lab (Sophia Antipolis, FR)**
Group: COATI Team; Host: Emanuele Natale; Topics: Analysis of stochastic processes on networks; design and implementation of algorithms for network alignment (brain network data)
- **09/2017-12/2017: Research Intern @ Max-Planck-Institute for Informatics (Saarbrücken, DE)**
Group: D1 Algorithms & Complexity; Host: Emanuele Natale; Topics: Analysis of stochastic processes on networks

WORK EXPERIENCE

- **03/2018-05-2018: Open Source Contributor**
Project: JGraphT; Topics: Implementation and testing of Java classes for random graph generation, now part of the release (~1'000 LOC)

AWARDS

- **09/2021: Facebook Research Award 2021:** Agent-based user interaction simulation to find and fix integrity and privacy issues

Project: "Testing non-testable programs using association rules"; with A. Bertolino, B. Miranda, R. Verdecchia

- **12/2020: Prix d'excellence d'Université Côte d'Azur**

Award for scientific/artistic contribution at the highest national and international level

- **10/2019: Facebook Research Award 2019:** Testing and Verification

Project: "Static Prediction of Test Flakiness"; with A. Bertolino, B. Miranda, R. Verdecchia

- **05/2019: ACM SIGSOFT Distinguished Paper Award (ICSE 2019)**

Paper: "Scalable Approaches for Test Suite Reduction"; with A. Bertolino, B. Miranda, R. Verdecchia

- **04/2019: Computers Ph.D. Travel Award:** MDPI Computers Open Access Journal (ICSE 2019)

- **03/2019: Travel Support:** Eurandom (YEP XV)

- **01/2019: Travel Support:** AAAI (AAAI 2019)

- **07/2018: Travel Support:** IFAAMAS (AAMAS 2018)

- **03/2017: Laureato Eccellente:** Sapienza University of Rome

Award for students with outstanding academic performance (university)

- **10/2016: Percorso di Eccellenza:** Sapienza University of Rome (DIAG)

Award for students with outstanding academic performance (department)

FUNDED PROJECTS

- **09/2021: Facebook Research:** Agent-based user interaction simulation to find and fix integrity and privacy issues

Role: Co-PI; Co-PIs: A. Bertolino, B. Miranda, R. Verdecchia; Project: "Testing non-testable programs using association rules"; Funding: 94'500 USD

- **10/2019: Facebook Research:** Testing and Verification

Role: Co-PI; Co-PIs: A. Bertolino, B. Miranda, R. Verdecchia; Project: "Static Prediction of Test Flakiness"; Funding: 47'250 USD

RESEARCH GROUPS

- **09/2021-now: Testing non-testable programs using association rules** (Co-PI, project funded by Facebook Research)

Co-PIs: B. Miranda, A. Bertolino, R. Verdecchia

- **10/2019-now: Static Prediction of Test Flakiness** (Co-PI, project funded by Facebook Research)

Co-PIs: B. Miranda, A. Bertolino, R. Verdecchia

- **03/2022-now: Big Data Algorithms Group** (member)

PI: Sebastian Forster

- **11/2020-now: Efficient Algorithms Group** (member)

PI: Robert Elsässer

- **11/2019-10/2020: COATI Team** (member)

Team leader: David Coudert

VISITING

- **04/2022: DIAG @ University of Rome**

Host: Luca Becchetti; Topics: Stochastic Processes on Networks; Publications: AAMAS 2023

- **10/2020: CS @ University of Salzburg**

Host: Robert Elsässer; Topics: Stochastic Processes on Networks

- 07/2017;07-2018;07/2019: **SEDC Lab @ ISTI-CNR**

Host: Antonia Bertolino; Topics: Regression Testing, Test Flakiness, Test Suite Reduction, Test Case Prioritization, Information Retrieval, Data Mining, Big Data; Publications: AST 2022, IEEE Access (2021), MSR 2020, ICSE 2019, ICSE 2018

- 06/2019: **DIEM @ University of Salerno**

Host: Diodato Ferraioli; Topics: Social Networks, Computational Social Choice, Voting, Algorithmic Game Theory

- 09/2017-12/2017: **D1 @ MPII**

Hosts: Kurt Mehlhorn & Emanuele Natale; Topics: Stochastic Processes on Networks; Publications: AAMAS 2018, AAAI 2019

TEACHING EXPERIENCE

- 2022/2023 (Summer Term): **Instructor @ University of Salzburg (Computer Science Department)**

Course: Introduction to Big Data Algorithms (3h per week)

THESIS SUPERVISION

- 2019-2020: Arno Gobbin, Master Degree in Data Science at Polytech Nice Sophia

Thesis: "Computational Complexity of Puzzles and Games"; co-supervised by E. Natale

ACADEMIC SERVICE

- **Program Committee Member**: IJCAI 2023, AAMAS 2023, IJCAI 2022, AAMAS 2022, IJCAI 2021, AAMAS 2021, ICAS 2019
- **External Reviewer (Conferences)**: ICALP 2023, SDM 2023, DISC 2022, MFCS 2022, TACAS 2022, ICALP 2021, SODA 2021, ESA 2020, ICALP 2020, AAMAS 2020, IJCAI 2019, SPAA 2019, OPODIS 2017
- **External Reviewer (Journals)**: MDPI Entropy (2022), Journal of Stochastic Processes and their Applications (2022), MDPI Mathematics (2022), Journal of Systems and Software (2021), Applied Network Science (2020), ACM Transaction on Parallel Computing (2019), Journal of Logical and Algebraic Methods in Programming (2019)
- **Student Volunteer**: ICSE 2019, AAAI 2019, AAMAS 2018, ICPE 2017

SKILLS

- **Natural languages**: Italian (native), English (full professional proficiency)
- **Programming**: python (proficient), java (proficient)

CONFERENCES, SCHOOLS, WORKSHOPS

- 2023: **SODA** (34th ACM-SIAM Symposium on Discrete Algorithms)
- 2022: **AlgPIE** (2nd IGAFIT Workshop for Algorithms Postdocs in Europe), **IMPMS** (3rd Italian Meeting on Probability and Mathematical Statistics)
- 2021: **ICDCN** (22nd International Conference on Distributed Computing and Networking)
- 2020: **IJCAI** (29th International Joint Conference on Artificial Intelligence)
- 2019: **FB TAV** (3rd Facebook Testing and Verification Symposium), **ADFOCS** (20th Max Planck Advanced Course on the Foundations of Computer Science), **SIROCCO** (26th International Colloquium on Structural Information and Communication Complexity), **IMPMS** (2nd Italian Meeting on Probability and Mathematical Statistics), **ICSE** (41st International Conference on Software Engineering), **YEP XV** (Information Diffusion on Random Networks Workshop), **AAAI** (33rd AAAI Conference on Artificial Intelligence)
- 2018: **KmT** (5th Kolmogorov meets Turing Workshop), **ISIDCN** (International School on Informatics and Dynamics in Complex Networks), **ICTCS** (19th Italian Conference on Theoretical Computer Science), **AAMAS** (17th International Conference on Autonomous Agents and Multi-Agent Systems), **SEA** (17th International Symposium on Experimental Algorithms), **ICSE** (40th International Conference on Software Engineering), **KWRGRP** (2nd King's Workshop on Random Graphs and Random Processes), **COST Action CA16228** (Workshop on Algorithmic Game Theory)

- **2017: Ph.D. course @ DIAG** (Distributed Models, MapReduce, and Large Scale Algorithms), **COST Action CA15140** (Improving Applicability of Nature-Inspired Optimization by Joining Theory and Practice), **ASW** (2nd Algorithmic Summer Workshop), **ICPE** (8th International Conference on Performance Engineering)

TALKS

Invited talks

- **CoBCoM** (Computational Brain Connectivity Mapping): "Network Alignment and Similarity Reveal Atlas-based Topological Differences in Structural Connectomes." Jun 2021 (Virtual)
- **CASSINI Junior Workshop**: "Collective Intelligence: A Personal Point of View." Jun 2020 (Virtual)
- **Google Journal Club**: "Scalable Approaches for Test Suite Reduction." Sep 2019 (Virtual)

Contributed talks at conferences and workshops

- **AlgPIE 2022** (Random processes): "Biased Opinion Dynamics: When the Devil Is in the Details." Aug 2022 (Będlewo, PL)
- **IMPMS 2022** (Opinion dynamics in biased communication models): "Biased Opinion Dynamics: When the Devil Is in the Details." Jun 2022 (Bologna, IT)
- **ICDCN 2021** (Reliability): "Phase Transitions of the k-Majority Dynamics in a Biased Communication Model." Jan 2021 (Virtual)
- **IJCAI 2020** (Agent-based and Multi-agent Systems): "Biased Opinion Dynamics: When the Devil Is in the Details." Jan 2021 (Virtual)
- **IMPMS 2019** (Probabilistic Algorithms and Games on Networks): "On the Emergent Behavior of the 2-Choices Dynamics." Jun 2019 (Vietri Sul Mare, IT)
- **ICSE 2019** (Test Selection and Prioritization): "Scalable Approaches for Test Suite Reduction." May 2019 (Montréal, CA)
- **YEP XV** (Information Diffusion on Random Networks): "Distributed Community Detection via Metastability of the 2-Choices Dynamics." Mar 2019 (Eindhoven, NL)
- **AAAI 2019** (MultiAgent Systems): "Distributed Community Detection via Metastability of the 2-Choices Dynamics." Jan 2019 (Honolulu, US)
- **IDCN 2018**: "Phase Transition of the 2-Choices Dynamics on Core-Periphery Networks." Oct 2018 (Catania, IT)
- **ICTCS 2019** (Games and Distributed Algorithms): "On the Emergent Behavior of the 2-Choices Dynamics." Sep 2018 (Urbino, IT)
- **AAMAS 2018** (Agent-Based Simulation): "Phase Transition of the 2-Choices Dynamics on Core-Periphery Networks." Jul 2018 (Stockholm, SE)
- **ICSE 2018** (Regression Testing): "FAST Approaches to Scalable Similarity-based Test Case Prioritization." May 2018 (Gothenburg, SE)

Seminars

- **DIAG Seminar @ Sapienza University**: "Software Testing Meets Big Data: Scalable Approaches for Large Test Suites." Apr 2022 (Rome, IT)
- **Seminario di Logica e Informatica Teorica @ Roma Tre University**: "Step-by-Step Community Detection in Volume-Regular Graphs." Apr 2021 (Virtual)
- **Efficient Algorithms Group Seminar @ University of Salzburg**: "Welcome Seminar." Oct 2020 (Salzburg, AT)
- **COATI Group Seminar @ INRIA Sophia Antipolis**: "Biased Opinion Dynamics: When the Devil Is in the Details." Oct 2020 (Sophia Antipolis, FR)
- **Ph.D. Thesis Defense @ Gran Sasso Science Institute**: "Simple Randomized Distributed Algorithms for Graph Clustering." Dec 2019 (L'Aquila, IT)
- **INRIA Seminar @ INRIA Sophia Antipolis**: "Simple Randomized Distributed Algorithms for Graph Clustering." Dec 2019 (Sophia Antipolis, FR)
- **DIEM Seminar @ University of Salerno**: "On the Emergent Behavior of the 2-Choices Dynamics." Jun 2019 (Salerno, IT)
- **CS Group Seminar @ Gran Sasso Science Institute**: "FAST Approaches to Scalable Similarity-Based Test Case Prioritization." Jun 2018 (L'Aquila, IT)
- **CS Group Seminar @ Gran Sasso Science Institute**: "Phase Transition of the 2-Choices Dynamics on Core-Periphery Networks." Feb 2018 (L'Aquila, IT)

- **AG1 Mittagssseminar @ Max-Planck-Institute for Informatics:** "Some New Results for Opinion Dynamics on Social Networks." Nov 2017 (Saarbrücken, DE)

PUBLICATIONS

Journals

- E. C., H. A. Mimun, M. Quattropani, S. Rizzo. "Phase Transition of the k-Majority Dynamics in Biased Communication Models." **Distributed Computing** (to appear, 2023).
- F. Corò, E. C., G. D'Angelo, S. Ponziani. "Exploiting Social Influence to Control Elections Based on Scoring Rules." **Information and Computation** 289, Part A, 104940 (2022). DOI: <https://doi.org/10.1016/j.ic.2022.104940>
- A. Anagnostopoulos, L. Becchetti, E. C., F. Pasquale, S. Rizzo. "Biased Opinion Dynamics: When the Devil Is in the Details." **Information Sciences** 593, pp. 49-63 (2022). DOI: <https://doi.org/10.1016/j.ins.2022.01.072>
- M. Abouei Mehrizi, F. Corò, E. C., G. D'Angelo. "Election control through social influence with voters' uncertainty." **Journal of Combinatorial Optimization** 44, pp. 635-669 (2022). DOI: <https://link.springer.com/article/10.1007/s10878-022-00852-3>
- M. Frigo, E. C., D. Coudert, R. Deriche, E. Natale, S. Deslauriers-Gauthier. "Network alignment and similarity reveal atlas-based topological differences in structural connectomes." **Network Neuroscience** 5 (3), pp. 711-733 (2021). DOI: https://doi.org/10.1162/netn_a_00199
- R. Verdecchia, E. C., B. Miranda, A. Bertolino. "Know Your Neighbor: Fast Static Prediction of Test Flakiness." **IEEE Access** 9, pp. 76119-76134 (2021). DOI: <https://ieeexplore.ieee.org/document/9437181>
- E. C., E. Natale, A. Nusser, G. Scornavacca. "Phase Transition of the 2-Choices Dynamics on Core-Periphery Networks." **Distributed Computing** 34 (3), pp. 207-225 (2021). DOI: <https://link.springer.com/article/10.1007/s00446-021-00396-5>
- L. Becchetti, E. C., F. Pasquale, S. Rizzo. "Step-by-Step Community Detection in Volume-Regular Graphs." **Theoretical Computer Science** 847, pp. 49-67 (2020). DOI: <https://www.sciencedirect.com/science/article/abs/pii/S030439752030548X>
- E. C., E. Natale, G. Scornavacca. "On the Metastability of Quadratic Majority Dynamics and Its Biological Implications." Extended abstract. **Bulletin of the EATCS** 125 (2018). DOI: <http://bulletin.eatcs.org/index.php/beatcs/article/view/535>
- E. C., E. Natale, A. Nusser, G. Scornavacca. "Phase Transition of the 2-Choices Dynamics on Core-Periphery Networks." Extended abstract. **Bulletin of the EATCS** 125 (2018). DOI: <http://bulletin.eatcs.org/index.php/beatcs/article/view/542>

Conferences

- L. Becchetti, V. Bonifaci, E. C., F. Pasquale. "Extended Abstract: On a Voter Model with Context-Dependent Opinion Adoption." Extended Abstract. In Proc. of the 22nd International Conference on Autonomous Agents and Multiagent Systems, (to appear, **AAMAS 2023**).
- Antonia Bertolino, E. C., Breno Miranda, Roberto Verdecchia. "Testing non-testable programs using association rules." In Proc. of the 3rd ACM/IEEE International Conference on Automation of Software Test, pp. 87-91 (**AST 2022**). DOI: <https://ieeexplore.ieee.org/document/9796449>
- E. C., H. A. Mimun, M. Quattropani, S. Rizzo. "Phase Transitions of the k-Majority Dynamics in a Biased Communication Model." In Proc. of the 22nd International Conference on Distributed Computing and Networking, pp.146-155 (**ICDCN 2021**). DOI: <https://dl.acm.org/doi/10.1145/3427796.3427811>
- E. C., H. A. Mimun, M. Quattropani, S. Rizzo. "Brief Announcement: Phase Transitions of the k-Majority Dynamics in a Biased Communication Model." Brief Announcement. In Proc. of the 34th International Symposium on Distributed Computing, pp. 42:1-42:3 (**DISC 2020**). DOI: <https://doi.org/10.4230/LIPIcs.DISC.2020.42>
- M. Abouei Mehrizi, F. Corò, E. C., G. D'Angelo. "Election Control through Social Influence with Unknown Preferences." In Proc. of the 26th International Computing and Combinatorics Conference, pp. 397-410 (**COCOON 2020**). DOI: https://link.springer.com/chapter/10.1007/978-3-030-58150-3_32
- A. Anagnostopoulos, L. Becchetti, E. C., F. Pasquale, S. Rizzo. "Biased Opinion Dynamics: When the Devil Is in the Details." In Proc. of the 29th International Joint Conference on Artificial Intelligence, pp. 53-59 (**IJCAI 2020**). DOI: <https://www.ijcai.org/proceedings/2020/8>
- F. Corò, R. Verdecchia, E. C., B. Miranda, A. Bertolino. "JTeC: A Large Collection of Java Test Classes for Test Code Analysis and Processing." Tool/Dataset. In Proc. of the 17th International Conference on Mining

Software Repositories - Data Showcase, pp. 578-582 (**MSR 2020**). DOI: <https://dl.acm.org/doi/10.1145/3379597.3387484>

- L. Becchetti, E. C., F. Pasquale, S. Rizzo. "Step-by-Step Community Detection in Volume-Regular Graphs." In Proc. of the 30th International Symposium on Algorithms and Computation, pp. 20:1-20:23 (**ISAAC 2019**). DOI: <https://doi.org/10.4230/LIPIcs.ISAAC.2019.20>
- M. Abouei Mehrizi, F. Corò, E. C., G. D'Angelo, S. Ponziani. "Models and Algorithms for Election Control through Influence Maximization." Short communication. In Proc. of the 20th Italian Conference on Theoretical Computer Science, pp. 97-103 (**ICTCS 2019**). DOI: <http://ceur-ws.org/Vol-2504/paper12.pdf>
- F. Corò, E. C., G. D'Angelo, S. Ponziani. "Exploiting Social Influence to Control Elections Based on Scoring Rules." In Proc. of the 28th International Joint Conference on Artificial Intelligence, pp. 201-207 (**IJCAI 2019**). DOI: <https://www.ijcai.org/proceedings/2019/29>
- F. Corò, E. C., G. D'Angelo, S. Ponziani. "Vote For Me! Election Control via Social Influence in Arbitrary Scoring Rule Voting Systems." Extended abstract. In Proc. of the 18th International Conference on Autonomous Agents and Multi-Agent Systems, pp. 1895-1897 (**AAMAS 2019**). DOI: <https://dl.acm.org/doi/10.5555/3306127.3331955>
- E. C., B. Miranda, R. Verdecchia, A. Bertolino. "Scalable Approaches for Test Suite Reduction." In Proc. of the 41st International Conference on Software Engineering, pp. 419-429 (**ICSE 2019**). **ACM SIGSOFT Distinguished Paper Award**. DOI: <https://ieeexplore.ieee.org/document/8812048>
- E. C., E. Natale, G. Scornavacca. "Distributed Community Detection via Metastability of the 2-Choices Dynamics." In Proc. of the 33rd AAAI Conference on Artificial Intelligence, pp. 6046-6053 (**AAAI 2019**). DOI: <https://ojs.aaai.org/index.php/AAAI/article/view/4560>
- E. C., E. Natale, A. Nusser, G. Scornavacca. "On the Emergent Behavior of the 2-Choices Dynamics." Short communication. In Proc. of the 19th Italian Conference on Theoretical Computer Science, pp. 60-64 (**ICTCS 2018**). DOI: <http://ceur-ws.org/Vol-2243/paper4.pdf>
- E. C., E. Natale, A. Nusser, G. Scornavacca. "Phase Transition of the 2-Choices Dynamics on Core-Periphery Networks." In Proc. of the 17th International Conference on Autonomous Agents and Multi-Agent Systems, pp. 777-785 (**AAMAS 2018**). DOI: <https://dl.acm.org/doi/10.5555/3237383.3237499>
- B. Miranda, E. C., R. Verdecchia, A. Bertolino. "FAST Approaches to Scalable Similarity-based Test Case Prioritization." In Proc. of the 40th International Conference on Software Engineering, pp. 222-232 (**ICSE 2018**). DOI: https://doi.org/10.1162/netn_a_00199