

Alessandro ZOCCA

POSTDOCTORAL SCHOLAR

California Institute of Technology

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PERSONAL

PLACE AND DATE OF BIRTH: Bussolengo, Italy | 06 November 1988

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RESEARCH INTERESTS

Complex networks; Stochastic operations research; Interacting particle systems

My research is centered around the study of complex systems where randomness plays a crucial role. My work lies mostly in the area of applied probability, but has many deep ramifications in other areas, such as pure probability, statistical physics, graph theory, operations research, algorithm design, and combinatorics.

My long-term goal as a researcher is to analyze the randomness emerging in these complex systems with rigorous mathematical tools, as well as understand how such randomness can be mitigated or, on the opposite, leveraged to improve the system performances.

The main focus of my current research are stochastic models instrumental to understand and quantify the impact of a high penetration of renewable energy sources on power grids. More specifically, I work on rare-event analysis and stochastic optimization in relation to failures and cascading failures.

EDUCATION

Sep 2011 – Dec 2015 **Eindhoven University of Technology**, The Netherlands
PHD, *Mathematics*
Thesis: SPATIO-TEMPORAL DYNAMICS OF RANDOM-ACCESS NETWORKS:
AN INTERACTING PARTICLE APPROACH.
Advisors: Prof. Sem Borst, Prof. Johan van Leeuwen, Prof. Francesca Nardi

2010 – 2011 **University of Cambridge**, United Kingdom
MAST (PART III), *Mathematics*, **with merit**
Essay: RANDOM SPANNING TREES
Assessor: Prof. Geoffrey Grimmett

2007 – 2010 **University of Padova**, Italy
BSc, *Mathematics*, **110 cum laude**
Thesis: RANDOM FRAGMENTATION CHAINS
Supervisor: Prof. Paolo Dai Pra

ACADEMIC EMPLOYMENT

Sep 2017 – present **California Institute of Technology**, Pasadena, CA
Rigorous Systems Research Group (RSRG)
POSTDOCTORAL SCHOLAR
Mentors: Prof. Adam Wierman and Prof. Steven Low

Jan 2016 – Aug 2017 **Centrum Wiskunde & Informatica (CWI)**, Amsterdam
Stochastic group
POSTDOCTORAL SCHOLAR
Mentor: Prof. Bert Zwart

AWARDS

2017 NWO RUBICON PERSONAL GRANT

In April 2017 I have been awarded a Rubicon grant by the NWO (Netherlands Organization for Scientific Research) to work for 2 years at Caltech on the research project titled “Renewables and uncertainty in future power systems: Mathematical challenges and solutions”

2015 APPLIED PROBABILITY TRUST AWARD for the best PhD thesis in applied probability

OTHER CERTIFICATES

2014 Diploma (grade 9.0/10) by the LNMB (Dutch Network on the Mathematics of OR)

Courses taken: *Stochastic Models for Telecommunications Systems, Advanced Queuing Theory, Algorithmic Methods in Queuing Theory, Multi-class Queues and Stochastic Networks, Randomized Algorithms, Markov Decision Processes, Non-cooperative Games and OR-Games*

LIST OF PUBLICATIONS

In reverse chronological order (see also my [Google Scholar webpage](#)):

1. T. Nesti, A. Zocca, B. Zwart, **Emergent failures and cascades in power grids: A statistical physics perspective**, 2017. Submitted, preprint at [arXiv:1709.10166](#)
2. F.R. Nardi, A. Zocca **Tunneling behavior of Ising and Potts models on grid graphs**, 2017. Submitted, preprint at [arXiv:1708.09677](#)
3. T. Nesti, A. Zocca, B. Zwart, **Assessing safe operating regions in power grids under uncertainty**. In *Proceedings of the Energy-Open conference*, University of Twente, 2017
4. A. Zocca, **Low-temperature behavior of the multicomponent Widom-Rowlison model on finite square lattices**, 2017. Submitted, preprint at [arXiv:1701.09185](#)
5. A. Zocca, **Tunneling of the hard-core model on finite triangular lattices**, 2017. Submitted, preprint at [arXiv:1701.07004](#)
6. T. Nesti, A. Zocca, B. Zwart, **Line failure probability bounds for power grids**, 2016. Accepted for publications in *Proceedings of the Power & Energy Society General Meeting 2017*, preprint at [arXiv:1611.02338](#)
7. A. Zocca, B. Zwart, **Minimizing heat loss in DC networks using batteries**. In *Proceedings of the 54th Annual Allerton Conference on Communication, Control, and Computing (Allerton)*, Monticello, IL, USA, 2016, pp. 1306-1313

8. F.R. Nardi, A. Zocca, S.C. Borst, **Hitting times asymptotics for hard-core interactions on grids**. In *Journal of Statistical Physics*, Volume 162, Issue 2, 2016, pp. 522-576, open-access version available at [10.1007/s10955-015-1391-x](https://doi.org/10.1007/s10955-015-1391-x)
9. B. Bellalta, A. Checco, A. Zocca and J. Barcelo, **On the interactions between multiple overlapping WLANs using channel bonding**. In *IEEE Transactions on Vehicular Technology*, Volume 65, Issue 2, 2016, pp. 796-812.
10. A. Zocca, **Spatio-temporal dynamics of random-access networks: An interacting particle approach** (PhD thesis). October 2015, available online at the [TU/e repository](#)
11. A. Zocca, S.C. Borst and J.S.H. van Leeuwen, **Slow transitions and starvation in dense random-access networks**. *Stochastic Models*, Volume 31, Issue 3, July 2015, pp. 361-402
12. A. Zocca, S.C. Borst, J.S.H. van Leeuwen and F.R. Nardi, **Delay performance in random-access grid networks**. *Performance Evaluation*, Volume 70, Issue 10, October 2013, pp. 900-915
13. A. Zocca, S.C. Borst and J.S.H. van Leeuwen, **Mixing properties of CSMA networks on partite graphs**. In *Proceedings of VALUETOOLS 2012*, pp. 117-126

BOOK CONTRIBUTIONS

B. Bellalta, A. Zocca, C. Cano, A. Checco, J. Barcelo, A. Vinel. (2014) **Throughput analysis in CSMA/CA networks using continuous time Markov networks: a tutorial**. In *Wireless Networking for Moving Objects. Protocols, Architectures, Tools, Services and Applications*, Lecture Notes in Computer Science, Vol. 8611, pp. 115-133

SERVICE

- Reviewer** IEEE Transactions on Information Theory
 Mathematical Methods of Operations Research
 ACM ToMPECS
 ACM-SIAM Symposium on Discrete Algorithms (SODA 2017)
 IEEE Transactions on Network Science and Engineering (TNSE)
- Organizer** YEQT workshop “Winter school on energy systems” at Eurandom (2017)
 Eindhoven Stochastic Seminar and Colloquium (2014, 2015)
 “Markov Chains and Mixing Times” reading seminar at TU/e (2012)
- Teaching** Instructor for the course “Stochastic processes” at TU/e (2012-2014)
 Tutor for the course “Calculus” at TU/e (2012-2013)
 Trainer for high-school Mathematical Olympiads (2007-2010)
- Supervision** Daily supervisor of the PhD student Tommaso Nesti at CWI (2016-2017)
 Final bachelor projects for the minor “Finance and Risk” at TU/e (2012-2014)
 Modeling assignments of “Stochastic processes” at TU/e (2014)

INVITED RESEARCH VISITS

Sep 2017 Università degli studi di Firenze
Dec 2016 LAMA at Université Paris Est Créteil
Nov 2016 CMS at Caltech
Jul 2014 EPFL, Lausanne
May 2014 Hamilton Institute, Dublin

INVITED TALKS AND SEMINARS

Oct 2017 INFORMS General Meeting, Houston, Texas
Apr 2017 IMA and OR Society Conference on Mathematics of Operational Research
Aston University, Birmingham
Dec 2016 LAMA at Université Paris Est Créteil, Paris
Apr 2016 Workshop “Metastability in statistical mechanics and stochastic processes”
EURANDOM, Eindhoven
Nov 2015 University of Padova
Apr 2015 Mathematical Institute of Leiden University
Oct 2014 Berlin-Padova Young Researchers Meeting, Berlin
Jul 2014 EPFL, Lausanne
May 2014 Hamilton Institute, Dublin

OTHER INTERNATIONAL TALKS

- INFORMS Applied Probability Society Conference, Evanston (US), July 2017
- INFORMS Applied Probability Society Conference, Istanbul (Turkey), July 2015
- IFIP WG 7.3 Performance 2013, Vienna (Austria), September 2013
- INFORMS Applied Probability Society Conference, San José (Costa Rica), July 2013
- 6th International Conference on Performance Evaluation Methodologies and Tools (VALUETOOLS), Cargèse (France), October 2012

OTHER CONFERENCES, WINTER SCHOOLS, AND WORKSHOPS ATTENDED

- “Learning, Algorithm Design and Beyond Worst-Case Analysis” workshop, Simons Institute at Berkeley, November 2016
- Winter School “Mathematics of the Energy Transition”, Munich, February 2016
- Stochastic Networks conferences: June 2012 (Boston), June 2014 (Amsterdam), June 2016 (San Diego)
- Young European Queueing Theorists (YEQT) workshops (2011-2016)
- Young European Probabilists (YEP) workshops (2012, 2014, 2015)
- BMS School “Random Motions and Random Graphs”, Berlin, September 2011