Dr. Antonios Garas

Curriculum Vitae

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Address: Chair of Systems Design,
Department of Management, Technology & Economics
ETH Zürich
Weinbergstrasse 56/58, Zürich
CH-8092, Switzerland
Phone: +41 44 632 88 02
Email: agaras@ethz.ch
www: http://www.sg.ethz.ch/team/people/agaras

Brief Summary

I am a senior researcher at the Chair of Systems Design in ETH Zurich. My current research is about structural properties, stability, and efficiency of complex networks. More precisely, I study how dynamical processes evolving on a complex system are related to fundamental properties of the system's underlying network topology. Using data-driven modeling and state of the art data-mining techniques, I am exploring applications of these subjects to various fields with emphasis on Economics, Physics and Sociology.

I have (co)authored 30 papers and book chapters, and I have prepared an edited book volume on *Interconnected Networks. A list of these publications appears on pages 4–6.*

Education and Qualifications

2005 - 2009 **Aristotle University of Thessaloniki - Greece**
Ph.D. in Physics (Hons)

2003 - 2005 **Aristotle University of Thessaloniki - Greece**
Master's degree in Computational Physics (Hons)

1998 - 2003 **Aristotle University of Thessaloniki - Greece**
Diploma in Physics (Major: High Energy Physics)

Current Position

2010 - Present **ETH Zurich - Switzerland**
Senior post-doctoral researcher at the Chair of Systems Design (Prof. Dr. Dr. Frank Schweitzer)

Previous Positions / Fellowships

2005 - 2006 **University of Palermo - Italy**
Visiting Fellow at the Observatory of Complex Systems (Prof. R. N. Mantegna)

Career Breaks

2009 - 2010 Military Service – Obligatory for all Greek males (promoted to the rank of Corporal)

Schools and Training

2008 The 4th PhD European Complexity School
Jerusalem – Israel.

2006 GIACS Summer School on Applications of Complex Systems to Social Sciences
Kazimierz Dolny – Poland

2006 International Workshop on Grid Technology for Financial Modeling and Simulation
Palermo – Italy

2002 School on Computing Techniques in Physics: "Parallelization of Algorithms in Physics"
Trest – Czech Republic

2002 Deutsches Elektronen-Synchrotron (DESY) Summer Student Program.
Member of the HERA-B Group, Zeuthen – Germany

Scholarships and Awards

EPEAEK II award	For the highest GPA (10/10) for the 2nd semester of my studies at the Master's program on Computational Physics
EPEAEK II award	For the highest GPA (10/10) for the 3rd semester of my studies at the Master's program on Computational Physics
EPEAEK II award	For the highest GPA (10/10) for the 4th semester of my studies at the Master's program on Computational Physics

Teaching Experience

2006 - 2009 **Aristotle University of Thessaloniki, Physics Department**
Graduate Course: *Computational Solid State Physics*.
I was heavily involved in the design of the course syllabus, and in the exercises preparation. I taught this course together with Prof. P. Argyrakis for three semesters.

1999 - 2000 **Aristotle University of Thessaloniki, Physics Department**
Teaching Assistant for three semesters at the computer laboratory class for undergraduate students

1999 - 2003 **Aristotle University of Thessaloniki, Department of Physics - Informatics Lab**
Regular tutorials on the use of operating systems and computer networks for freshman students.

Co-supervision of Graduate Students:

- Giona Casiraghi, PhD student, ETH Zürich **since 2015**
- Yan Zhang, PhD student, ETH Zürich **since 2014**
- Rebekka Burkholz, PhD student, ETH Zürich **since 2013**
- Nicolas Wider, PhD student, ETH Zürich **since 2013**
- Mario Vincenzo Tomasello, PhD student, ETH Zürich **2011-2015**
- Rene Pfitzner, PhD student, ETH Zürich **2011-2014**
- Manran Zhu, Master student, ETH Zürich **2015**
- Daniel Längle, Master student, ETH Zürich **2013**

PhD committees:

- Phd committee of Antoine Bellwald, PhD student at the University of Lausanne

IT Experience

2011 - 2012 **ETH Zurich, Chair of Systems Design**
Head of the IT group, IT spokesperson and system administrator

2001 - 2005 **Aristotle University of Thessaloniki - Computational Physics Lab**
System administration in the Computational Physics Lab of the Department of Physics

1999 - 2003 **Aristotle University of Thessaloniki, Department of Physics - Informatics Lab**
System maintenance and administration
Introduction of freshman students to Unix and Windows OS

Languages

- Greek (Native)
- English (Fluent)

Skills and Expertise

- Programming experience in C, C++, and *Mathematica*
- Experience in data analysis using the *R* statistical software
- Experience in installation, administration, and teaching of the Unix/Linux and MS Windows operating systems
- Experience in building, and managing computer clusters for scientific computations
- LaTeX class, and template design
- Ability to use most of the general commercial packages (word processing, spreadsheets, mathematics, and image processing applications)

Projects

I participated in various national and international collaboration projects, and I have extensive experience in proposal writing and project management.

Current Projects

2012 - Present MULTIPLEX – *Foundational Research on MULTIlevel comPLEX networks and systems*
European Union grand by the 7th Framework Programme. Large-scale integrating project (IP) in FET Proactive ICT Call 8. (Contract 317532)

Past Projects

2013 *OTC Derivatives and Systemic Risk in Financial Networks*
Funding source Swiss National Science Foundation (Grant CR12I1-127000/1)

2012 *R&D Network Life Cycles*
Funding source Swiss National Science Foundation (Grant 100014_126865)

2010 - 2012 CyberEmotions – *Collective Emotions in Cyberspace*
European Union grant by the 7th Framework Programme, Theme 3: Science of complex systems for socially intelligent ICT (Contract 231323)

2005 - 2008 PENED – *Structure and dynamics of the Internet and the World Wide Web – Tolerance, immunization and search techniques*
Contract with the Research Committee of the Aristotle University of Thessaloniki

2005 - 2006 *Dinamica dell' order book in mercati finanziari*
Contract with the C.N.R. – Istituto Nazionale per la Fisica della Materia

2007 DAC Hellenic Aid – *Implementation of Computer Clusters for the needs of Collaboration between the Aristotle University of Thessaloniki and the University of Tirana*

2006 DYSONET – *Human behaviour through dynamics of complex social networks: An interdisciplinary approach*
European Union grand by the 6th Framework Programme. STREP under the NEST/Pathfinder initiative

Project Reviewing

I participated as external reviewer in the evaluation phase of projects submitted to the following calls:

- Ministry of Education, Lifelong Learning and Religious Affairs (GR)
  - COOPERATION 2011
  - THALES
- Ministry of Education, Research, Youth and Sport (RO)
  - National Plan for Research, Development and Innovation 2007-2013, PN II

Academic Service

Conferences and Workshops

– Program Committee of the TDN13 (Temporal and Dynamic Networks: From Data to Models) Satellite workshop at NetSci13 Copenhagen, Denmark (June, 2013)

Journal Referee

– Nature Communications
– Physical Review Letters
– Scientific Reports
– PLoS ONE
– Physical Review E
– Europhysics Letters (EPL)
– European Physical Journal B (EPJ-B)
– Physics Letters A
– Journal of Physics A: Mathematical and Theoretical
– International Journal of Modern Physics C
– Advances in Complex Systems
– The European Journal of Finance
– Evolutionary and Institutional Economic Review
– Empirical Economics
– Journal of Economic Interaction and Coordination
– Social Network Analysis and Mining
– Advances in Bioinformatics
– EPJ Data Science

Membership of Associations

– Member of the Deutsche Physikalische Gesellschaft (DPG)
– Member of the American Association for the Advancement of Science (AAAS)
– Member of the Complex Systems Society (CSS)

Publications

Refereed research papers

15. Garas, A. (2015). Reaction-Diffusion Processes on Interconnected Scale-Free Networks. *Physical Review E* **92**, 020801(R).
14. Garcia, D., A. Garas, and F. Schweitzer (2015). The language-dependent relationship between word happiness and frequency. *Proceedings of the National Academy of Sciences* **112**.(23), E2983.
13. Nanumyan, V., A. Garas, and F. Schweitzer (2015). The Network of Counterparty Risk: Analysing Correlations in OTC Derivatives. *PLoS ONE* **10**.(9), e0136638.
12. Sarigöl, E., R. Pfitzner, I. Scholtes, A. Garas, and F. Schweitzer (2014). Predicting Scientific Success Based on Coauthorship Networks. *EPJ Data Science* **3**, 9.

11. Scholtes, I., N. Wider, R. Pfitzner, A. Garas, C. J. Tessone, and F. Schweitzer (2014). Causality-driven slow-down and speed-up of diffusion in non-Markovian temporal networks. *Nature communications* **5**, 5024.
10. Pfitzner, R., I. Scholtes, A. Garas, C. J. Tessone, and F. Schweitzer (2013). Betweenness Preference: Quantifying Correlations in the Topological Dynamics of Temporal Networks. *Physical Review Letters* **110**, 198701.
9. Tessone, C. J., A. Garas, B. Guerra, and F. Schweitzer (2013). How Big Is Too Big? Critical Shocks for Systemic Failure Cascades. *Journal of Statistical Physics* **151**, 765–783.
8. Garas, A., D. Garcia, M. Skowron, and F. Schweitzer (2012). Emotional persistence in online chatting communities. *Scientific Reports* **2**, 402.
7. Garas, A., F. Schweitzer, and S. Havlin (2012). A k-shell decomposition method for weighted networks. *New Journal of Physics* **14**, 083030.
6. Garcia, D., A. Garas, and F. Schweitzer (2012). Positive words carry less information than negative words. *EPJ Data Science* **1**, 3.
5. Garas, A., P. Argyrakis, C. Rozenblat, M. Tomassini, and S. Havlin (2010). Worldwide spreading of economic crisis. *New Journal of Physics* **12**, 113043.
4. Garas, A. and P. Argyrakis (2009). Filtering of complex systems using overlapping tree networks. *EPL (Europhysics Letters)* **86**, 28005.
3. Garas, A. and P. Argyrakis (2008). A network approach for the scientific collaboration in the European Framework Programs. *EPL (Europhysics Letters)* **84**, 68005.
2. Garas, A., P. Argyrakis, and S. Havlin (2008). The structural role of weak and strong links in a financial market network. *The European Physical Journal B* **63**, 265–271.
1. Garas, A. and P. Argyrakis (2007). Correlation study of the Athens Stock Exchange. *Physica A: Statistical Mechanics and its Applications* **380**, 399–410.

Papers in conference proceedings

1. Pfitzner, R., A. Garas, and F. Schweitzer (2012). Emotional Divergence Influences Information Spreading in Twitter. *Sixth International AAAI Conference on Weblogs and Social Media*, 543–546.

Submitted papers

12. Burkholz, R., A. Garas, and F. Schweitzer (2015). How Damage Diversification Can Reduce Systemic Risk. *arXiv:1503.00925*
*Physical Review E (***revised and resubmitted***).*
11. Burkholz, R., M. V. Leduc, A. Garas, and F. Schweitzer (2015). Systemic risk in multiplex networks with asymmetric coupling and threshold feedback. *arXiv:1506.06664*
*(***Accepted** for Publication in *Physica D: Nonlinear Phenomena).*
10. Garas, A. and A. Lapatinas (2015). The complex-network based relation between migration and FDI in the OECD. *Under review in: IZA Journal of Migration*.
9. Garas, A. and A. Lapatinas (2015). The role of networks in multi-characteristics competition and market share inequality. *Under review in: Journal of Economic Behavior & Organization*.
8. Garcia, D., D. Tanase, A. Garas, and F. Schweitzer (2015). Emotions and activity profiles of influential users in product reviews communities. *Preprint available upon request*.
7. Scholl, T., A. Garas, and F. Schweitzer (2015). The spatial component of R&D networks. *arXiv:1509.08291*
*Under review in: Journal of Evolutionary Economics (***revised and resubmitted***).*
6. Scholtes, I., N. Wider, and A. Garas (2015). Higher-Order Aggregate Networks in the Analysis of Temporal Networks: Path structures and centralities. *arXiv:1508.06467*
*(***Accepted** for Publication in *The European Physical Journal B).*
5. Wider, N., A. Garas, I. Scholtes, and F. Schweitzer (2015). An ensemble perspective on multilayer networks. *arXiv:1507.00169*.

4. Zhang, Y., A. Garas, and F. Schweitzer (2015). The value of peripheral nodes in controlling multilayer networks. *arXiv:1506.02963*
*Physical Review E (***revised and resubmitted***).*
3. Garas, A., C. Rozenblat, and F. Schweitzer (2014). Nested mutualism, balanced development and the prosperity of cities. *Preprint available upon request*.
2. Garas, A., M. V. Tomasello, and F. Schweitzer (2014). Selection rules in alliance formation: strategic decisions or abundance of choice? *arXiv:1403.3298*.
1. Tomasello, M. V., M. Napoletano, A. Garas, and F. Schweitzer (2013). The Rise and Fall of R&D Networks. *arXiv:1304.3623*
*Under review in: Industrial and Corporate Change (***revised and resubmitted***).*

Unpublished working papers

1. Garas, A. and F. Schweitzer (2014). Centrality-based career paths and success in complex networks. *In preparation*.

Books

1. Garas, A., ed. (2014). *Interconnected Networks. To appear in Springer's "Complexity" series.* Springer.

Book chapters

1. Garcia, D., A. Garas, and F. Schweitzer (2014). "Modelling collective emotions in online social systems". In: *Collective Emotions: Perspectives from Psychology, Philosophy, and Sociology*. Ed. by C. von Scheve and M. Salmela. Oxford University Press. Chap. 26, pp.389–406.

Highlights and press coverage

– My work about the "Worldwide spreading of economic crisis" was selected for the *New Journal of Physics Best of 2010* collection. It was also widely covered by many blogs and newspapers.

– My work about the "Emotional persistence in online chatting communities" was featured by *Nature News (Online chat behaviours tend to follow social norms)*, by *Science (ScienceShot: Has the Internet Turned Us Into Jerks?)*, by *Focus online (Studie: Auch in anonymen Chats wird kaum gepöbelt)*, and by many other blogs and newspapers. In terms of attention it's *Altmetric score* currently places it in the 98 percentile (ranked 967-th) of the 73,650 tracked articles of a similar age in all journals.

– My work "Positive words carry less information than negative words" is one of the most viewed articles on SpringerOpen (achieved the highly accessed badge), and it was also widely covered by many blogs and newspapers.

Talks

– *Exploring the controllable space of multi-layered networks*.
Satellite Workshop "Physics of multilayered interconnected networks II", NetSci.
Zaragoza, Spain. June 1, 2015

– (**Invited talk**) *Complex networks and applications to social & economic systems*.
MCM15 Seminar, University of Macedonia.
Thessaloniki, Greece. May 14, 2015

– (**Invited talk**) *Alliance formation in R&D networks, and the role of geography*. University of Ioannina Seminar.
Ioannina, Greece. May 13, 2015

– *How Damage Diversification Can Reduce Systemic Risk*.
Conference on Information Transmission in Networks.
Harvard University, Cambridge MA , United States. May 1-3, 2015

- (**Invited Seminar**) *The importance of non-Markovianinty in temporal networks*.
  Seminars in Systems and Control.
  UCL Louvain Belgium. Dec. 9, 2014
- *Predicting Scientific Success Based on Coauthorship Networks*.
  European Conference on Complex Systems (ECCS14).
  Lucca, Italy. Sept. 22-26, 2014
- *Centrality-based career paths, success, and social influence*.
  Quantifying Success Workshop.
  Lucca, Italy. Sept. 24, 2014
- *Cities and economic activities: a mutualistic dependence*.
  CitiNet: Smart Cities, Complex System Science and Participatory Sensing.
  Lucca, Italy. Sept. 25, 2014
- (**Invited talk**) *Reaction-diff models for conflicting information in multilayered networks*.
  Infrastructures Complexity of Interacting Networks and Systems (COINETS Workshop).
  Lucca, Italy. Sept. 22-26, 2014
- *Weighting the weights: k-shell decomposition and applications to weighted economic networks*.
  International School and Conference on Network Science (NetSci 2014).
  Berkeley, California CA, USA. June 5, 2014
- (**Invited talk**) *Alliance formation in R&D networks, and the role of geography*.
  COST IS1104 workshop "The Geography of Financial Networks".
  Aix-Marseille University, Aix en Provence, France. May 2, 2014
- *Betweenness Preference: Quantifying Correlations in the Topological Dynamics of Temporal Networks*.
  European Conference on Complex Systems (ECCS13).
  Barcelona, Spain.Sept. 17, 2013
- *What do we lose when we aggregate temporal networks?*
  The International Conference on Networks (NetSci), satellite workshop "Temporal and Dynamic Networks: From Data to Models".
  Copenhagen, Denmark. June 3, 2013
- *The role of emotions in on-line communication*.
  Deutsche Physikalische Gesellschaft (DPG) Annual Conference.
  Berlin, Germany. March 25, 2012 - March 30, 2012
- k*-shells on weighted networks*.
  Deutsche Physikalische Gesellschaft (DPG) Annual Conference.
  Berlin, Germany. March 25, 2012 - March 30, 2012
- *A novel approach in the filtering of information from complex systems: The overlapping Tree Network* .
  Deutsche Physikalische Gesellschaft (DPG) Annual Conference.
  Dresden, Germany. March 26, 2009.