

# Curriculum vitae

## Sergi Valverde

**ResearcherID:** J-3275-2012  
**Scopus Author ID:** 7006393703  
**ORCID ID:** 0000-0002-2150-9610

### Current professional situation

1) **Institution:** Consejo Superior de Investigaciones Científicas (CSIC)  
**Department./Section./Unit:** Institute of Evolutionary Biology (CSIC-UPF)  
**Address:** Psg. Marítim de la Barceloneta 37-49, 08003, Barcelona  
**Email:** [sergi.valverde@ibe.upf-csic.es](mailto:sergi.valverde@ibe.upf-csic.es)  
**Website:** <http://www.ibe.upf-csic.es/valverde>  
**Mobile:** +34 659 28 03 93  
**Speciality (UNESCO codes):** 22  
**Professional category:** CSIC Tenured Scientist  
**Dedication:** Full Time

2) **Institution:** Universitat Pompeu Fabra (UPF)  
**Department./Section./Unit:** Department of Experimental and Health Sciences  
**Email:** [sergi.valverde@upf.edu](mailto:sergi.valverde@upf.edu)  
**Address:** Dr. Aiguader 88, 08003, Barcelona  
**Professional category:** Visiting Professor  
**Dedication:** Part Time

### Research interests

Complex Systems, Network Science, Ecological Networks, Evolutionary Algorithms, Cultural Evolution, Evolution of Technology, Artificial Life, Scientific Visualisation.

### Curriculum Summary

Dr. Sergi Valverde is a CSIC Tenured Scientist and the Head of the Evolution of Technology Lab at the Institute of Evolutionary Biology (CSIC-UPF). He is also Visiting Professor at the degree of Biomedical Engineering of the Universitat Pompeu Fabra (UPF), Fellow of the European Center for Living Technology (ECLT) and long-time collaborator of the Complex Systems Lab. His original background is a Degree in Informatics Engineering that later extended to a PhD in Applied Physics by the Universitat Politècnica de Catalunya (UPC). Over several post-docs, he has focused on complex networks and mathematical biology, with an emphasis on the theoretical aspects of evolutionary theory (that he now teaches in his course "Evolutionary Algorithms" at the Degree of Biomedical Engineering).

The long-term research goal of his lab is to develop an evolutionary theory of technology and innovation. This research effort is substantiated by more than 15 years of expertise in the areas of complex systems and complex networks, with more than 60 peer-review publications in network science, ecological networks, collective intelligence and technological and cultural evolution. An active member of the scientific community, Sergi serves as board member of the Catalan Network For The Study Of Complex Systems (Complexitat) and was elected member of the Complex Systems Society (CSS) Council during the period 2016-2018. He was involved in the three major IST FET FP6 projects in Complex Systems (PACE, ECAgents and DELIS) and has coordinated 2 national projects granted by the Spanish Ministry of Economy and Competitiveness.

## Education

Degree	Institution	Date
Informatics Engineering	Universitat Politècnica Catalunya	13/07/1999
PhD Applied Physics	Universitat Politècnica Catalunya	19/01/2006

**Director of Thesis:** Ricard V. Solé

## Experience and job history / Former academic positions

Position	Institution	Date
Research Engineer	El Periodico de Catalunya	1996 - 1999
Research Engineer	Ubisoft Entertainment	1999 - 2004
Phd Student	Universitat Pompeu Fabra	2004 - 2006
Postdoctoral Researcher	Universitat Pompeu Fabra	2006 - 2007
Postdoctoral Researcher	Université Paul Sabatier	2007 - 2009
Visiting Professor	Universitat Pompeu Fabra	2008 - 2018
Tenured Scientist	CSIC	2018 - Current

## Languages (R = regular, B = good, C = correctly)

Language	Speaking	Reading	Writing
Spanish	C	C	C
Catalan	C	C	C
English	C	C	C

## **Research projects**

(national and/or international)

**Project title:** DYNAMICALLY EVOLVING, LARGE-SCALE INFORMATION SYSTEMS (DELIS)

**Funding organization:** Complex Systems Initiative, 6th Framework Program, European Union

**Participant organizations:** Universitaet Paderborn, University of London, Consorzio Universita Industria, Université Paris XI, Politechnika Wroclawska, Univerzita Karlova V Praze, Universitat Pompeu Fabra, Universitaet Karlsruhe, Max-Planck Gesellschaft Zur Foerderung Der Wissenschaft.

**Duration, from:** 01/01/2004 **until:** 31/12/2007

**Quantity of the subsidy:** 4.500.000,00 **euros**

**Responsible researcher:** FRIEDHELM MEYER AUF DER HEIDE

**Number of participant researchers:** 20

**Project title:** EMBODIED AND COMUNICATING AGENTS (ECAGENTS)

**Funding organization:** Complex Systems Initiative, 6th Framework Program, European Union

**Participant organizations:** Université Libre de Bruxelles, Institute for Advanced Studies, Collegium Budapest, Universitat Pompeu Fabra, University of Goteborg, Humboldt Universitat, Universita La Sapienza, University of Tokyo

**Duration, from:** 01/01/2004 **until:** 31/12/2007

**Quantity of the subsidy:** 4.300.000,00 **euros**

**Responsible researcher:** STEFANO NOLFI

**Number of participant researchers:** 20

**Project title:** PROGRAMMABLE ARTIFICIAL CELL EVOLUTION (PACE)

**Funding organization:** Complex Systems Initiative, 6th Framework Program, European Union

**Participant organizations:** Ruhr-Universitaet Bochum, Ca' Foscari University of Venice, University of Copenhagen, Chalmers University of Technology, Universitat Pompeu Fabra, University of Zurich, Vilnius University, ProtoLife s.r.l., University of Southern Denmark

**Duration, from:** 01/01/2004 **until:** 31/12/2007

**Responsible researcher:** STEFANO NOLFI

**Number of participant researchers:** 20

**Project title:** ORIGINS OF INNOVATION IN TINKERED NETWORKS

**Funding organization:** James McDonnell Foundation

**Participant organizations:** Universitat Pompeu Fabra

**Duration, from:** 01/01/2006 **until:** 31/12/2010

**Quantity of the subsidy:** 460.000 **euros**

**Responsible researcher:** RICARD V. SOLÉ

**Number of participant researchers:** 2

**Project title:** SOCIAL INSECT NESTS AS 3D NETWORKS: MORPHOGENESIS AND STRUCTURAL DESIGNS(MESOMORPH)

**Funding organization:** Agence Nationale de la Recherche, Biologie Systémique programme

**Participant organizations:** Université Paul Sabatier

**Duration, from:** 01/01/2007 **until:** 31/12/2009

**Quantity of the subsidy:** 500.000 **euros**

**Responsible researcher:** GUY THERAULAZ

**Number of participant researchers:** 8

**Project title:** FIS2009-12365 - Computación. Replicación y rotura de simetría en sistemas protocelulares

**Funding organization** Ministerio de Ciencia e Innovación

**Participant organizations:** Universitat Pompeu Fabra

**Duration, from:** 01/01/2010 **until:** 31/12/2013

**Quantity of the subsidy:** 89.540 euros

**Responsible researcher:** RICARD V. SOLÉ

**Number of participant researchers:** 7

**Project title:** FIS2013-44674-P - Detección de Tecnologías Emergentes en Redes de Innovación

**Funding organization** Ministerio de Economía y Competitividad

**Participant organizations:** Universitat Pompeu Fabra

**Duration, from:** 01/01/2013 **until:** 31/12/2016

**Quantity of the subsidy:** 12,000 euros

**Responsible researcher:** SERGI VALVERDE

**Number of participant researchers:** 1

**Project title:** FIS2016-77447-R - Predicción de Innovación Tecnológica en Redes de Culturómica

**Funding organization** Ministerio de Economía y Competitividad

**Participant organizations:** Universitat Pompeu Fabra

**Duration, from:** 30/12/2016 **until:** 01/12/2019

**Quantity of the subsidy:** 34,000 euros

**Responsible researcher:** SERGI VALVERDE

**Number of participant researchers:** 1

## **Publications**

Key (A: Article, R:Review, CL:Book Chapter, L: Book). The full listing of publication with citation counts is available in Google Scholar: <http://scholar.google.com/citations?user=hA2laXkAAAAJ&hl=en>

**Subject Areas:** Biochemistry, Genetics and Molecular Biology, Chemical Engineering, Computer Science, Agricultural and Biological Sciences, Engineering, Immunology and Microbiology, Physics and Astronomy, Materials Science, Medicine, Environmental Science, Earth and Planetary Sciences, Arts and Humanities, Mathematics, Multidisciplinary, Energy.

1. **Authors (by order of signature):** Solé, Ricard V.; Ferrer-Cancho, Ramon; Montoya, José M.; Valverde, Sergi

**Title:** «Selection, tinkering and emergence in complex networks»

**In:** *Complexity*

**Key:** A **Vol.:** 8 **Pages, initial:** 20 **final:** 33 **Date:** 2002

2. **Authors (by order of signature):** Solé, Ricard V.; Valverde, Sergi

**Title:** «Information transfer and phase transitions in a model of internet traffic»

**In:** *Physica A*

**Key:** A **Vol.:** 289 **Pages, initial:** 595 **final:** 605 **Date:** 2002

**Place of publication** Amsterdam

3. **Authors (by order of signature):** Valverde, Sergi; Ferrer-Cancho, Ramon; Solé, Ricard V.

**Title:** «Scale free networks from optimal design»

**In:** *Europhysics Letters*

**Key:** A **Vol.:** 60 **Pages, initial:** 512 **final:** 517 **Date:** 2002

**Publisher (if book):**

**Place of publication** Petit-Lancy

4. **Authors (by order of signature):** Valverde, Sergi; Solé, Ricard V.

**Title:** «Self-organized critical traffic in parallel computer networks»

**In:** *Physica. A*

**Key:** A **Vol.:** 312 **Pages, initial:** 636 **final:** 648 **Date:** 2002

**Place of publication** Amsterdam

5. **Authors (by order of signature):** Buhl, Jerome; Gautrais, Jacques; Solé, Ricard V.; Valverde, Sergi; Deneubourg, Jean-Louis; Theraulaz, Guy

**Title:** «Efficiency and robustness in ant networks of galleries»

**In:** *European Physical Journal: Special Topics*

**Key:** A **Vol.:** 42 **Pages, initial:** 123 **final:** 129 **Date:** 2004

**Place of publication** France

6. **Authors (by order of signature):** Solé, Ricard V.; Valverde, Sergi

**Title:** «Information theory of complex networks: on evolution and architectural constraints»

**In:** *Lecture Notes in Physics*

**Key:** A **Vol.:** 650 **Pages, initial:** 189 **final:** 207 **Date:** 2004

**Place of publication** Berlin

7. **Authors (by order of signature):** Valverde, Sergi; Solé, Ricard V.

**Title:** «Internet's critical path horizon»

**In:** *European Physical Journal: Special Topics*

**Key:** A **Vol.:** 38 **Pages, initial:** 245 **final:** 252 **Date:** 2004

**Place of publication** France

8. **Authors (by order of signature):** Valverde, Sergi; Solé, Ricard V.

**Title:** «Logarithmic growth dynamics in software networks »

**In:** *Europhysics Letters*

**Key:** A **Vol.:** 72 **Pages, initial:** 858 **final:** 864 **Date:** 2005

**Place of publication** Petit-Lancy

**9. Authors (by order of signature):** Buhl, Jerome; Gautrais, Jacques; Reeves, Nicolas; Solé, Ricard V.; Valverde, Sergi; Kuntz, Pascale; Theraulaz, Guy

**Title:** «Topological patterns in street networks of self-organized urban settlements»

**In:** *European Physical Journal: Special Topics*

**Key:** A **Vol.:** 49 **Pages, initial:** 513 **final:** 522 **Date:** 2006

**Place of publication** France

**10. Authors (by order of signature):** Solé, Ricard V.; Valverde, Sergi

**Title:** «Are network motifs the spandrels of cellular complexity?»

**In:** *Trends in ecology & evolution*

**Key:** A **Vol.:** 21 **Pages, initial:** 419 **final:** 422 **Date:** 2006

**Place of publication** Amsterdam

**11. Authors (by order of signature):** Valverde, Sergi; Theraulaz, Guy; Gautrais, Jacques; Fourcassié, Vincent; Solé, Ricard V.

**Title:** «Self-organization patterns in wasp and open source communities»

**In:** *IEEE Intelligent Systems*

**Key:** A **Vol.:** 21 **Pages, initial:** 36 **final:** 40 **Date:** 2006

**Place of publication** New York

**12. Authors (by order of signature):** Corominas-Murtra, Bernat; Valverde, Sergi; Rodriguez-Caso, Carlos; Solé, Ricard V.

**Title:** «K-scaffold subgraphs in complex networks »

**In:** *Europhysics Letters*

**Key:** A **Vol.:** 77 **Pages, initial:** 18004 **Date:** 2007

**Place of publication** Petit-Lancy

**13. Authors (by order of signature):** Solé, Ricard V.; Valverde, Sergi

**Title:** «Spontaneous emergence of modularity in cellular networks »

**In:** *Journal of the Royal Society interface*

**Key:** A **Vol.:** 5 **Pages, initial:** 129 **final:** 133 **Date:** 2007

**Place of publication** London

**14. Authors (by order of signature):** Valverde, Sergi; Solé, Ricard V.; Packard, Norman; Bedau, Mark

**Title:** «Topology and evolution of technology innovation networks»

**In:** *Physical Review. E, Statistical, Nonlinear, and Soft Matter Physics*

**Key:** A **Num:** 5 **Vol.:** 76 **Pages, initial:** 056118 **Date:** 2007

**Place of publication** United States

**15. Authors (by order of signature):** Valverde, Sergi; Solé, Ricard V.

**Title:** «Hierarchical small-worlds in software architecture»

**In:** *Dynamics of Continuous, Discrete and Impulsive Systems Series B: Applications and Algorithms*

**Key:** A **Vol.:** 14 **Pages, initial:** 1 **final:** 14 **Date:** 2007

**Place of publication** Canada

**16. Authors (by order of signature):** Valverde, Sergi; Solé, Ricard V.

**Title:** «Self-Organization versus hierarchy in open source social networks»

**In:** *Physical Review. E, Statistical, Nonlinear, and Soft Matter Physics*

**Key:** A **Num:** 4 **Vol.:** 76 **Pages, initial:** 046118 **Date:** 2007

**Place of publication** United States

**17. Authors (by order of signature):** Mestres, Jordi; Gregori-Puigjané, Elisabet; Valverde, Sergi; Solé, Ricard V.

**Title:** «Data completeness: The achilles hell of drug-target networks»

**In:** *Nature biotechnology*

**Key:** A **Vol.:** 26 **Pages, initial:** 983 **final:** 984 **Date:** 2008

**Place of publication** New York

**18. Authors (by order of signature):** Perna, Andrea; Jost, Christian; Coturier, Etienne; Valverde, Sergi; Douady, Stephane; Theraulaz, Guy

**Title:** «The structure of gallery networks in the nests of termite *Cubitermes* sp. revealed by X-ray tomography »

**In:** *Die Naturwissenschaften*

**Key:** A **Vol.:** 95 **Pages, initial:** 877 **final:** 884 **Date:** 2008

**Place of publication** Germany

**19. Authors (by order of signature):** Perna, Andrea; Jost, Christian; Valverde, Sergi; Gautrais, Jacques; Theraulaz, Guy; Kuntz, Pascale

**Title:** «The Topological Fortress of Termites»

**In:** *Lecture Notes in Computer Science / Artificial Intelligence*

**Key:** A **Vol.:** 5151 **Pages, initial:** 165 **final:** 173 **Date:** 2008

**Place of publication** Berlin

**20. Authors (by order of signature):** Perna, Andrea; Valverde, Sergi; Gautrais, Jacques; Jost, Christian; Solé, Ricard V.; Kuntz, Pascale; Theraulaz, Guy

**Title:** «Topological efficiency in three-dimensional gallery networks of termite nests»

**In:** *Physica. A*

**Key:** A **Vol.:** 387 **Pages, initial:** 6235 **final:** 6244 **Date:** 2008

**Place of publication** Amsterdam

**21. Authors (by order of signature):** Solé, Ricard V.; Rosas Casals, Marti; Corominas-Murtra, Bernat; Valverde, Sergi

**Title:** «Robustness of the European power grids under intentional attacks»

**In:** *Physical Review. E. Statistical Physics, Plasmas, Fluids, and Related Interdisciplinary Topics*

**Key:** A **Vol.:** 77 **Pages, initial:** 026102 **Date:** 2008

**Place of publication** New York

**22. Authors (by order of signature):** Valverde, Sergi

**Title:** «Crossover from endogenous to exogenous activity in open-source software development »

**In:** *Europhysics Letters*

**Key:** A **Num.:** 2 **Vol.:** 77 **Pages, initial:** 20002 **Date:** 2008

**Place of publication** Petit-Lancy

**23. Authors (by order of signature):** Challet, Damien; Valverde, Sergi

**Title:** «Fat Tails, Long Memory, Maturity and Ageing in Open-Source Software»

**In:** *PHYSCOMNET 2008 The 1st Workshop on Physics-Inspired Paradigms in Wireless Communications and Networks*

**Key:** CL **Date:** 2008

**24. Authors (by order of signature):** Corominas-Murtra, Bernat; Valverde, Sergi; Solé, Ricard V.

**Title:** «The ontogeny of scale-free syntax networks: phase transitions in early language»

**In:** *Advances in Complex Systems*

**Key:** A **Vol.:** 12 **Pages, initial:** 371 **final:** 392 **Date:** 2009

**Place of publication** New York

**25. Authors (by order of signature):** Mestres, Jordi; Gregori-Puigjané, Elisabet; Valverde, Sergi; Solé, Ricard V.

**Title:** «The topology of drug-target interaction networks: implicit dependence on drug properties and target families»

**In:** *Molecular BioSystems*

**Key:** A **Num.:** 9 **Vol.:** 5 **Pages, initial:** 1051 **final:** 1057 **Date:** 2009

**Place of publication** United Kingdom

25. **Authors (by order of signature):** Valverde, Sergi; Corominas-Murtra, Bernat; Perna, Andrea; Kuntz, Pascale; Theraulaz, Guy; Solé, Ricard V.

**Title:** «Percolation in insect nest networks: evidence for optimal wiring»

**In:** *Physical Review. E, Statistical, Nonlinear, and Soft Matter Physics*

**Key:** A **Num.:** 6 **Vol.:** 79 **Pages, initial:** 066106 **Date:** 2009

**Place of publication** United States

26. **Authors (by order of signature):** Valverde, Sergi; Solé, Ricard V.

**Title:** «Motifs in Graphs »

**In:** *Encyclopedia of Complexity and Systems Science*

**Key:** CL **DOI.:**10.1007/978-0-387-30440-3\_339 **Pages, initial:** 5692 **final:** 5702 **Date:** 2009

**Publisher (if book):** Springer New York

27. **Authors (by order of signature):** Valverde, Sergi

**Title:** *Evolution of Technology Innovation Networks en el libro de la Exposición Culturas del Cambio: Átomos Sociales y Vidas Electrónicas*

**Key:** CL **Date:** 2009

**Publisher (if book):** Centro de Arte Santa Monica

**Place of publication:** Barcelona

28. **Authors (by order of signature):** Solé, Ricard; Corominas Murtra, Bernat; Valverde, Sergi; Steels, Luc

**Title:** «Language networks: Their structure, function, and evolution»

**In:** *Complexity*

**Key:** A **Num.:** 6 **Vol.:** 15 **Pages, initial:** 20 **final:** 26 **Date:** 2010

**Place of publication** Hoboken

29. **Authors (by order of signature):** Corominas Murtra, Bernat; Valverde, Sergi; Solé, Ricard V.

**Title:** «Emergence of Scale-Free Syntax Networks»

**In:** *Evolution of Communication and Language in Embodied Agents*

**Key:** CL **Pages, initial:** 83 **final:** 101 **Date:** 2010

**Publisher (if book):** Springer

**Place of publication:** Berlin Heidelberg

30. **Authors (by order of signature):** Horta, Ricard; Rosas-Casals, Marti; Valverde, Sergi

**Title:** «Discerning Electricity Consumption Patterns from Urban Allometric Scaling»

**In:** *IEEE COMPENG 2010 PROCEEDINGS*

**Key:** CL **Pages, initial:** 49 **final:** 51 **Date:** 2010

**Publisher (if book):** IEEE

31. **Authors (by order of signature):** Flores, Cesar O.; Meyer, Justin R.; Valverde, Sergi; Farr, Lauren; Weitz, Joshua S.

**Title:** «Statistical structure of host-phage interactions»

**In:** *Proceedings of the National Academy of Sciences of the United States of America*

**Key:** A **Num.:** 28 **Vol.:** 108 **Pages, initial:** 288 **final:** 297 **Date:** 2011

**Place of publication** Washington

32. **Authors (by order of signature):** Solé, Ricard V.; Valverde, Sergi; Rodríguez-Caso, Carlos

**Title:** «Convergent evolutionary paths in biological and technological networks»

**In:** *Evolution*

**Key:** A **Num.:** 3 **Vol.:** 4 **Pages, initial:** 415 **final:** 426 **Date:** 2011

**Place of publication** Lawrence, Kansas.

33. **Authors (by order of signature):** Antó JM, Pinart M, Akdis M, Auffray C, Bachert C, Valverde, Sergi, [et.al.]

**Title:** «Understanding the complexity of IgE-related phenotypes from childhood to young adulthood: a Mechanisms of the Development of Allergy (MeDALL) seminar»

**In:** *The Journal of Allergy and Clinical Immunology*



**Key:** A **Num.:** 4 **Vol.:** 129 **Pages, initial:** 943 **final:** 954 **Date:** 2012  
**Place of publication** St. Louis

**34. Authors (by order of signature):** Flores, Cesar; Valverde, Sergi; Weitz, Joshua S.  
**Title:** «Multi-scale structure and geographics drivers of cross-infection within marine bacteria and phages»  
**In:** *The ISME Journal: Multidisciplinary Journal of Microbial Ecology*  
**Key:** A **Num.:** 3 **Vol.:** 7 **Pages, initial:** 520 **final:** 532 **Date:** 2012  
**Place of publication** United Kingdom

**35. Authors (by order of signature):** Solé, Ricard V.; Valverde, Sergi  
**Title:** «Before the endless forms: embodied model of transition from singles cells to aggregates »  
**In:** *PLoS ONE*  
**Key:** A **Num.:** 4 **Vol.:** 8 **Date:** 2012  
**Place of publication** United States

**36. Authors (by order of signature):** Solé, Ricard V.; Valverde, Sergi; Rosas-Calas, Marti; Kauffman, Stuart; Farmer, Doyne; Eldredge, Niles  
**Title:** «The evolutionary ecology of technological innovations»  
**In:** *Complexity*  
**Key:** A **Num.:** 4 **Vol.:** 18 **Pages, initial:** 15 **final:** 27 **Date:** 2012  
**Place of publication** Amsterdam

**37. Authors (by order of signature):** Valverde, Sergi; Solé, Ricard V.; Santiago, Elena  
**Title:** «Evolved modular epistasis in artificial organisms»  
**In:** *Proceedings of Artificial Life XII, MIT Press*  
**Key:** CL **Date:** 2012

**38. Authors (by order of signature):** Solé, Ricard V.; Valverde, Sergi  
**Title:** «Macroevolution in silico: scale, constraints and universals»  
**In:** *Palaeontology*  
**Key:** A **Num.:** 6 **Vol.:** 56 **Pages, initial:** 1327 **final:** 1340 **Date:** 2013  
**Place of publication** London

**39. Authors (by order of signature):** Valverde, Sergi; Solé, Ricard V.  
**Title:** «Networks and the City»  
**In:** *Architectural design*  
**Key:** A **Num.:** 4 **Vol.:** 83 **Pages, initial:** 112 **final:** 119 **Date:** 2013  
**Place of publication** London

**40. Authors (by order of signature):** Weitz JS, Poisot T, Meyer JR, Flores CO, Valverde S. Sullivan MB, Hochberg ME  
**Title:** «Phage-bacteria infection networks»  
**In:** *Trends in microbiology*  
**Key:** A **Num.:** 2 **Vol.:** 21 **Pages, initial:** 82 **final:** 91 **Date:** 2013  
**Place of publication:** Oxford

**41. Authors (by order of signature):** Solé, R.V., Valverde, S., Rodriguez-Caso, C, Sardanyes, J.  
**Title:** «Can a minimal replicating construct be identified as the embodiment of cancer?»  
**In:** *Bioessays*  
**Key:** A **Num.:** 36 **Vol.:** 5 **Pages, initial:** 503 **final:** 512 **Date:** 2014

**42. Authors (by order of signature):** Hillung, J., Cuevas, J.M., Valverde, S., Elena, S.F.  
**Title:** «Experimental evolution of an emerging plant virus in host genotypes that differ in their susceptibility to infection»  
**In:** *Evolution*  
**Key:** A **DOI:**10.1111/evo.12458 **Date:** 2014

43. **Authors (by order of signature):** Valverde, S.  
**Title:** «Evolution of patent citation networks»  
**In:** *Proceedings Workshop on Complexity in Engineering (COMPENG' 2014)*  
**Key:** A **Date:** 2014  
**Publisher (if book):** IEEE
44. **Authors (by order of signature):** Gautrais, J., Buhl, J., Valverde, S., Kuntz, P., Theraulaz, G.  
**Title:** «The role of colony size on tunnel branching morphogenesis in ant nests »  
**In:** *PLoS ONE*  
**Key:** A **Num.:** 10 **Vol.:** 9 **Pages, initial:** e109436 **Date:** 2014  
**Place of publication:** United States
45. **Authors (by order of signature):** Flores, C. O., Poisot, T., Valverde, S., Weitz, J. S.  
**Title:** «BiMat: a MATLAB package to facilitate the analysis of bipartite networks»  
**In:** *Methods in Ecology and Evolution*  
**Key:** A **Num.:** 107 **Vol.:** 12 **Date:** 2015
46. **Authors (by order of signature):** Valverde, S., Solé, R.V.  
**Title:** «Punctuated Equilibrium in the large scale evolution of programming languages »  
**In:** *Journal of the Royal Society Interface*  
**Key:** A **Num.:** 107 **Vol.:** 12 **Date:** 2015  
**Place of publication:** United Kingdom
47. **Authors (by order of signature):** Valverde, S., Ohse, S., Turalska, M., Garcia-Ojalvo, J., West B. J.  
**Title:** « Structural Determinants of Criticality in Biological Networks »  
**In:** *Frontiers in Fractal Physiology*  
**Key:** A **Num.:** 127 **Vol.:** 6 **Date:** 2015
48. **Authors (by order of signature):** Valverde, S., Solé, R.V.  
**Title:** «A Cultural Diffusion Model for the Rise and Fall of Programming Languages»  
**In:** *Journal of Human Biology*  
**Key:** A **Num.:** 3 **Vol.:** 87 **Pages, initial:** 224 **Date:** 2015  
**Place of publication:** United States
49. **Authors (by order of signature):** Solé, R.V., Amor, D. R., Valverde, S.  
**Title:** «On singularities and black holes in combination-driven models of technological innovation networks »  
**In:** PLOS One  
**Key:** A **Num.:** 1 **Vol.:** 11 **Pages, initial:** e0146180 **Date:** 2016
50. **Authors (by order of signature):** Valverde, S., Garcia-Ojalvo, J.  
**Title:** «Hacia una teoría unificada de la criticalidad biológica»  
**In:** Investigación y Ciencia  
**Key:** A **Num.:** 474 **Date:** 2016  
**Place of publication:** Spain
51. **Authors (by order of signature):** Duran-Nebreda, S., Bonforti, A., Montañez, R., Valverde, S., Solé, R. V.  
**Title:** «Emergence of proto-organisms from bistable stochastic differentiation and adhesion»  
**In:** *Journal of Royal Society Interface*  
**Key:** A **Num.:** 13 **Pages, Initial:** 20150108 **Date:** 2016
52. **Authors (by order of signature):** Valverde, S.  
**Title:** « Major Transitions in Information Technology »  
**In:** *Phil. Trans. Royal Soc. B*  
**Key:** A **Num.:** 1701 **Vol.:** 371 **Pages, initial:** 20150450 **Date:** 2016
53. **Authors (by order of signature):** Valverde, S., Elena, S. F., Solé, R. V.

**Title:** « Spatially-induced nestedness in a neutral model of phage-bacteria networks »  
**In:** *Virus Evolution* **Date:** 2017

54. **Authors (by order of signature):** Valverde, S.  
**Title:** « Breakdown of Modularity in Complex Networks »  
**In:** *Frontiers Fractal Physiology* **Date:** 2017

55. **Authors (by order of signature):** Valverde, S., Piñero, J., Corominas-Murtra, B., Montoya, J. M., Joppa, L., Solé, R. V.  
**Title:** « The architecture of mutualistic networks as an evolutionary spandrel »  
**In:** *Nature Ecology and Evolution*  
**Key:** A **Vol.:** 2 **Pages:** 94-99 **Date:** 2018

56. **Authors (by order of signature):** Corominas-Murtra, B., Sánchez-Fibla, M., Valverde, S., Solé, R. V.  
**Title:** « Chromatic Transitions in the Emergence of Syntax Networks »  
**In:** *Royal Society Open Science*  
**Key:** A **Num.:** 12 **Vol.:** 5 **Pages, Initial:** 181286 **Date:** 2018

57. **Authors (by order of signature):** Solé, R. V., Fontich, E., Vidiella, B., Duran-Nebreda, S., Montañez, R., Piñero, J., Valverde, S.  
**Title:** « The paradox of constant oceanic plastic debris: evidence for efficient microbial biodegradation? »  
**Under review in:** *Nature Communications* **Expected date:** 2019

58. **Authors (by order of signature):** Solé, R. V., Valverde, S.  
**Title:** « Evolving complex networks: how tinkering shapes structure »  
**Under review in:** *Philosophical Transactions of the Royal Society B* **Expected date:** 2019

59. **Authors (by order of signature):** Valverde, Sergi; Solé, Ricard V.  
**Title:** *Evolution of Technology*  
**Key:** L **Expected date:** 2020  
**Publisher:** Princeton University Press

## **Stays abroad**

(continuous stays exceeding one month)

**Institution:** Santa Fe Institute  
**Place:** Santa Fe **Country:** USA **Date:** 01/09/2006 - 20/11/2006  
**Duration (weeks):** 11  
**Key:** Research Collaboration

**Institution:** Université Paul Sabatier  
**Place:** Toulouse **Country:** France **Date:** 01/01/2007 - 01/06/2009  
**Duration (weeks):** 125  
**Subject:** Swarm Intelligence  
**Key:** Postdoc

**Institution:** Santa Fe Institute  
**Place:** Santa Fe **Country:** USA **Date:** 01/03/2007 - 17/05/2007  
**Duration (weeks):** 10  
**Key:** Research Collaboration

## **Talks & Presentations**

1. **Authors:** [Valverde, Sergi](#)

**Title:** Complexity in Computer Networks

**Congress:** The Global Internet: Measurement, modeling & Analysis

**Place of celebration:** Leiden **Date:** 2000

2. **Authors:** [Valverde, Sergi](#)

**Title:** Origins of Software Complexity

**Congress:** Software Complexity Workshop Conference (IST2004)

**Place of celebration:** Den Haag **Date:** 2004

3. **Authors:** [Valverde, Sergi](#)

**Title:** Universal Properties of Bipartite Software Graphs

**Congress:** Workshop on Software and Complex Systems, 9th IEEE Int. Conf. Eng. Compl. Comp. Syst.

**Place of celebration:** Florence **Date:** 2004

4. **Authors:** [Valverde, Sergi](#)

**Title:** Network Motifs in Computational Networks: A Case Study in Software Architecture

**Congress:** Nordic Workshop on Networks

**Place of celebration:** Copenhagen **Date:** 2004

5. **Authors:** [Valverde, Sergi](#)

**Title:** Information Theory of Class Graphs: On Evolution and Architectural Constraints

**Congress:** Workshop on Complexity and Self-Properties

**Place of celebration:** Brussels **Date:** 2005

6. **Authors:** [Valverde, Sergi](#)

**Title:** Xarxes tecnològiques: del Software a Internet

**Congress:** Curs Evolució de Xarxes Complexes

**Place of celebration:** Barcelona **Date:** 2005

7. **Authors:** [Valverde, Sergi](#)

**Title:** Noise and Reliable Computation: Von Neumann Revisited

**Congress:** Workshop on Evolution, Information and Computation: From Living to Non-Living Matter

**Place of celebration:** Venice **Date:** 2005

8. **Authors:** [Valverde, Sergi](#)

**Title:** Complejidad Tecnológica

**Congress:** Maratón científico: Sistemas Complejos, Virus, Hormigas y Cerebros

**Place of celebration:** Madrid **Date:** 2007

9. **Authors:** [Valverde, Sergi](#)

**Title:** Hierarchy and Emergence in Open-source Networks

**Congress:** DELIS Final Workshop and Review Meeting

**Place of celebration:** Barcelona **Date:** 2008

10. **Authors:** [Valverde, Sergi](#)

**Title:** Into the Turing's Nest

**Congress:** Selection, Tinkering and Emergence in Complex Networks (Santa Fe Business Meeting)

**Place of celebration:** Googleplex (California) **Date:** 2008

11. **Authors:** [Valverde, Sergi](#)

**Title:** Complex Networks: The Architecture of Life

**Congress:** 2a Edició Festival: Punto y Raya

**Place of celebration:** Barcelona **Date:** 2009

12. **Authors:** [Valverde, Sergi](#)

**Title:** Evolution of Technology Innovation Networks  
**Congress:** CHANGING CULTURES: CULTURES OF CHANGE, ATACD Project  
**Place of celebration:** Barcelona **Date:** 2009

13. **Authors:** Valverde, Sergi

**Title:** Percolation and Modularity in Insect Nest Networks  
**Congress:** Workshop on Principles of Innovation in Swarm-made Architectures  
**Place of celebration:** Venice **Date:** 2009

14. **Authors:** Valverde, Sergi

**Title:** Community Structure in a Patient-Phenotype Network  
**Congress:** MeDALL Kick-off meeting  
**Place of celebration:** Barcelona **Date:** 26/01/2011

15. **Authors:** Valverde, Sergi

**Title:** Networks of Innovation: from Patents to Open-source Software  
**Congress:** I Jornada Complexitat.CAT  
**Place of celebration:** Barcelona **Date:** 02/05/2011

16. **Authors:** Valverde, Sergi

**Title:** Hierarchy vs Self-organization in Open Source Networks  
**Congress:** European Conference Complex Systems 2011  
**Place of celebration:** Vienna **Date:** 15/09/2011

17. **Authors:** Valverde, Sergi

**Title:** Hierarchy vs Self-organization in Open Source Networks  
**Congress:** Reunión del nodo español FuturICT  
**Place of celebration:** Barcelona **Date:** 05/10/2011

18. **Authors:** Valverde, Sergi

**Congress:** SFI Workshop : Power Grids as Complex Networks  
**Place of celebration:** Santa Fe, New Mexico **Date:** 17/05/2012-19/05/2012

19. **Authors:** Valverde, Sergi

**Title:** Hierarchy vs Self-organisation in Complex Networks  
**Host:** Emergent Technologies & Design at the Architectural Association (AA)  
**Place of celebration:** London **Date:** 06/06/2012

20. **Authors:** Valverde, Sergi

**Title:** Networks of Innovation  
**Congress:** BioDesign Research Lab Lectures  
**Place of celebration:** Barcelona **Date:** 29/11/2012

21. **Authors:** Valverde, Sergi

**Title:** Evolution of Patent Citation Networks  
**Congress:** European Conference of Complex Systems (ECCS 2013)  
**Place of celebration:** Barcelona **Date:** 16/09/2013-20/09/2013  
**Web:** [http://barabasilab.neu.edu/success\\_eccs2013](http://barabasilab.neu.edu/success_eccs2013)

22. **Authors:** Valverde, Sergi

**Title:** Networks in Action: Communication, Computation and Evolution  
**Host:** UPF-DTIC Research Seminars  
**Place of celebration:** Barcelona **Date:** 12/06/2014.  
**Web:** [http://www.dtic.upf.edu/~afaridi/DTIC\\_Seminars/Abstracts.html#Jun12](http://www.dtic.upf.edu/~afaridi/DTIC_Seminars/Abstracts.html#Jun12)

23. **Authors:** Valverde, S.

**Title:** Evolution of Patent Citation Networks  
**Congress:** Workshop on Complexity in Engineering (COMPENG 2014)

**Place of celebration:** Barcelona **Date:** 16/06/2014-17/06/2014  
**Web:** <http://www.compeng2014.org>

24. **Authors:** [Valverde, Sergi](#)  
**Title:** Phage-bacteria Infection Networks: From Nestedness to Modularity  
**Congress:** Workshop on Virus Dynamics and Evolution  
**Place of celebration:** Barcelona **Date:** 4/07/2014  
**Web:** <http://www.crm.cat/en/Activities/Pages/ActivityFoldersAndPages/Curs%202013-2014/WKVirusDynamics/WKVirusDynamics.aspx>

25. **Authors:** [Valverde, Sergi](#)  
**Title:** Innovation as a Complex System: Technological evolution and Emergence of Computational Creativity  
**Congress:** Interactivos?14. Rethinking collective behaviour and action (Medialab-Prado)  
**Place of Celebration:** Madrid  
**Web:** <http://medialab-prado.es/article/lainnovacioncomounsistemacomplejoevoluciontecnologicayemergenciadelacreatividadcomputacional>

26. **Authors:** [Valverde, Sergi](#)  
**Title:** Major Transitions in Technological Evolution  
**Workshop:** Major Transitions in Natural, Synthetic and Artificial Evolution  
**Place of Celebration:** Santa Fe Institute (USA) **Date:** 09/12/2014  
**Web:** <http://www.santafe.edu/gevent/detail/science/1917/>

27. **Authors:** [Valverde, Sergi](#)  
**Title:** Modelling the Evolution of Programming Languages: Network Methods in Cultural Evolution  
**Host:** Complexity and Socio-Ecological Dynamics Research Group, Department of Humanities (UPF)  
**Place of Celebration:** Barcelona **Date:** 06/03/2015  
**Web:** <http://www.upf.edu/cases/actualitat/150306.html>

28. **Authors:** [Valverde, Sergi](#)  
**Title:** Complex Networks: The Architecture of Life  
**Congress:** II Jornades Breyting  
**Place of Celebration:** Vidres **Date:** 12/04/2015  
**Web:** <http://www.jornadesbreyting.com/project/xarxes-complexes-larquitectura-de-la-vida/>

29. **Authors:** [Valverde, Sergi](#)  
**Title:** Visualising the Evolution of Programming Languages  
**Congress:** 6th Leonardo Satellite Symposium at NetSci2015  
**Place of Celebration:** Zaragoza **Date:** June 1, 2015  
**Web:** <http://artshumanities.netsci2015.net>

30. **Authors:** Valverde, Sergi  
**Title:** Leyes Universales de los Ecosistemas Complejos  
**Congress:** V Jornada UX / UOC #juxuoc  
**Place of Celebration:** Sala Mobile World Capital, Barcelona **Date:** October 8, 2015.  
**Web:** <http://mosaic.uoc.edu/jornadaux/>

31. **Authors:** Valverde, Sergi  
**Title:** Mapping the Space of Programming Languages  
**Congress:** Innovation as search on a landscape of possibilities  
**Place of Celebration:** Santa Fe Institute, Santa Fe (NM) **Date:** October 15, 2015.  
**Web:** <http://www.santafe.edu/gevent/detail/science/2024/>

32. **Authors:** Valverde, Sergi  
**Title:** Major Transitions in Information Technology  
**Congress:** Netsci 2016  
**Place of Celebration:** Seoul, South Korea **Date:** May 30, 2016

33. **Authors:** Valverde, Sergi  
**Title:** Major Transitions in Information Technology  
**Place of Celebration:** Tempe, Arizona **Date:** April 19, 2017  
**Web:** <https://campus.asu.edu/content/major-transitions-information-technology>

34. **Authors:** Valverde, Sergi  
**Title:** Evolution of mutualistic networks by speciation-divergence dynamics  
**Congress:** CCS'17 (Conference on Complex Systems)  
**Place of Celebration:** Cancún, Mexico **Date:** April 19, 2017.  
**Web:** <http://ccs17.unam.mx>

36. **Authors:** Valverde, Sergi  
**Title:** 2001: A Vision of the Future Technology  
**Activity:** «2001: una odisea en el espacio»: una mirada desde la ciencia actual  
**Place of Celebration:** Centro de Cultura Contemporánea de Barcelona (CCCB), Barcelona  
**Año:** 2018  
**Web:** <http://www.cccb.org/es/actividades/ficha/2001-una-odisea-en-el-espacio-una-mirada-desde-la-ciencia-actual/230318>

## **Teaching experience**

2018 - 2019 Bachelor's (Degree) Programme in Biomedical Engineering (UPF)  
22123 - *Evolutionary Algorithms*  
22150 - *Modelling Complex Diseases*  
  
Computational Biomedical Engineering Master (UPF)  
32217 - *Complexity Science*  
<https://sites.google.com/site/complexsci/>  
  
*Master's Degree in Bioinformatics, University of Valencia*  
*Introduction to Complex Networks: Patterns & Models* (Invited Professor)

2016 - 2018 Bachelor's (Degree) Programme in Biomedical Engineering (UPF)  
22106 - *Mathematical Biomodelling I*  
22123 - *Evolutionary Algorithms*  
22150 - *Modelling Complex Diseases*  
22117 - *Principles of Biological Design*  
  
Computational Biomedical Engineering Master (UPF)  
32217 - *Complexity Science*  
<https://sites.google.com/site/complexsci/>  
  
*Master's Degree in Bioinformatics, University of Valencia*  
*Introduction to Complex Networks: Patterns & Models* (Invited Professor)

2015 - 2016 Bachelor's (Degree) Programme in Biomedical Engineering (UPF)  
22106 - *Mathematical Biomodelling I*  
22123 - *Evolutionary Algorithms*  
22107 - *Introduction to the University and Biomedical Engineering*  
22150 - *Modelling Complex Diseases*  
22117 - *Principles of Biological Design*  
  
Bachelor's (Degree) Programme in Human Biology, University Pompeu Fabra  
20332 - *Basic Sciences 1*  
  
*Master's Degree in Bioinformatics, University of Valencia*

*Introduction to Complex Networks: Patterns & Models* (Invited Professor)

- 2014 - 2015 Bachelor's (Degree) Programme in Biomedical Engineering (UPF)  
22106 - *Mathematical Biomodelling I*  
22123 - *Evolutionary Algorithms*  
22107 - *Introduction to the University and Biomedical Engineering*  
22117 - *Principles of Biological Design*
- Bachelor's (Degree) Programme in Human Biology, University Pompeu Fabra  
20332 - *Basic Sciences 1*
- Master's Degree in Bioinformatics, University of Valencia*  
*Introduction to Complex Networks: Patterns & Models* (Invited Professor)
- 2013 - 2014 Bachelor's (Degree) Programme in Biomedical Engineering (UPF)  
22106 - *Mathematical Biomodelling I*  
22123 - *Evolutionary Algorithms*  
22107 - *Introduction to the University and Biomedical Engineering*  
22117 - *Principles of Biological Design*
- Bachelor's (Degree) Programme in Human Biology, University Pompeu Fabra  
20332 - *Basic Sciences 1*
- 2012 - 2013 Bachelor's (Degree) Programme in Biomedical Engineering (UPF)  
22106 - *Mathematical Biomodelling I*  
22123 - *Evolutionary Algorithms*  
22107 - *Introduction to the University and Biomedical Engineering*  
22117 - *Principles of Biological Design*
- Bachelor's (Degree) Programme in Human Biology, University Pompeu Fabra  
20332 - *Basic Sciences 1*
- 2011 - 2012 Bachelor's (Degree) Programme in Biomedical Engineering (UPF)  
22107 - *Introduction to the University and Biomedical Engineering*  
22117 - *Principles of Biological Design*
- Bachelor's (Degree) Programme in Human Biology, University Pompeu Fabra  
20332 - *Basic Sciences 1*
- 2010 - 2011 Bachelor's (Degree) Programme in Human Biology, University Pompeu Fabra  
20332 - *Basic Sciences 1*
- 2009 - 2010 Bachelor's (Degree) Programme in Human Biology, University Pompeu Fabra  
20332 - *Basic Sciences 1*
- 2008 - 2009 Bachelor's (Degree) Programme in Human Biology, University Pompeu Fabra  
20332 - *Basic Sciences 1*

### **PhD Thesis supervision**

**Title:** Topological Complexity of the Electricity Transmission Network Implications in the Sustainability Paradigm

**Doctorate:** Rosas Casals, Martí

**University:** Universitat Politècnica de Catalunya

**Date:** 01/01/2009



**Title:** An Unified Approach to the Emergence of Complex Communication  
**Doctorate:** Corominas Murtra, Bernat  
**University:** Universitat Pompeu Fabra  
**Date:** 01/01/2011

### **Participation on committees**

**Title:** External evaluator for the European Project FOC (Forecasting Financial Crises)  
**Institution:** European Union  
**Date:** 01/01/2011-31/12/2012.

**Title:** Artificial Life. Program Committee of the 13th Artificial Life Conference  
**Institution:** The International Society for Artificial Life  
**Date:** 19/09/2012

**Title:** Artificial Life. Program Committee of the 14th Artificial Life Conference  
**Institution:** The International Society for Artificial Life  
**Date:** 30/07/2014

**Title:** ECAL 2015. Program Committee of the 13th European Conference on Artificial Life  
**Institution:** The International Society for Artificial Life  
**Date:** 20/07/2015

**Title:** Artificial Life. Program Committee of the 15th Artificial Life Conference  
**Institution:** The International Society for Artificial Life  
**Date:** 2016

**Title:** Artificial Life. Program Committee of the 15th Artificial Life Conference  
**Institution:** The International Society for Artificial Life  
**Date:** 2016

**Title:** Member of the CSS Council  
**Institution:** Complex Systems Society (CSS) <http://cssociety.org/about-us/council>  
**Date:** 2016 - 2018

### **Event organization**

**Title:** Workshop on Complexity in Energy Infrastructures: Models, Metrics, Metaphors (ECCS'11 Satellite Meeting)  
**Activity type:** Organizer  
**Date:** 15/09/2011

**Title:** Workshop on The Cultural Evolution of Technology: Evidence, Hypothesis and Theory (ECCS'15 Satellite Meeting)  
**Activity type:** Organizer  
**Date:** 30/09/2015  
**Website:** <http://www.ccs2015.org/satellite-the-cultural-evolution-of-technology-evidence-hypothesis-and-theory/>

**Title:** Workshop on The Cultural Evolution of Technology: Evidence, Hypothesis and Theory (ECCS'15 Satellite Meeting)  
**Activity type:** Organizer  
**Date:** 30/09/2015  
**Website:** <http://www.ccs2015.org/satellite-the-cultural-evolution-of-technology-evidence-hypothesis-and-theory/>

**Title:** Workshop on The Cultural Evolution of Technology: Evidence, Hypothesis and Theory (ECCS'15 Satellite Meeting)

**Activity type:** Organizer

**Date:** 30/09/2015

**Website:** <http://www.ccs2015.org/satellite-the-cultural-evolution-of-technology-evidence-hypothesis-and-theory/>

## **Software**

**Title:** Netlab

**Description:** Software for the analysis, modelling and visualisation of complex networks. This toolkit has been reused in many Complex Systems Lab publications during the last decade. Renderings produced with Netlab have been featured in popular media like New York Times Magazine (March 12th, 2006) and a special Nature issue on Ecological Complexity (vol. 442 no. 7100, July 20th 2006). See: <http://www.nature.com/nature/journal/v442/n7100/edsumm/e060720-01.html>

**Title:** Netlab Online

**Description:** A collection of online applications specifically developed for my courses on Complex Networks. Please check our website: <https://sites.google.com/site/introcomplexnetworks/>

**Title:** BiMat

**Description:** Open-source MATLAB library whose main function is the analysis of modularity and nestedness in bipartite ecological networks. BiMat has been developed in collaboration with Cesar Flores, Timothee Poisot and Joshua Weitz. Its main features include: modularity and nestedness calculation, diversity calculation using Shannon and Simpson's indexes, different null models for the creation of random bipartite networks, and statistics of the network. Please check our website: <http://bimat.github.io>

**Title:** Chimera

**Description:** Simulation platform for “programmable life systems” that combines evolutionary dynamics with realistic physical embodiment. Our system offers to possibility to design new functions on top of a realistic computational model that takes into account emergent properties. This tool can be adapted to simulate micro-fluidics experiments and testing hypothesis of tumour growth and angiogenesis.

**Title:** ProRally 2002

**Company:** Ubisoft Entertainment

**Description:** Racing videogame created by Ubisoft for the Playstation 2 and Nintendo Game Cube consoles. My role in these projects was to design and develop the physics engine and also to supervise the overall software architecture according to the best engineering practices.

**Title:** Red1 (El Periodico de Catalunya)

**Company:** Ediciones Primera Plana.

**Description:** Desktop publishing software used in the production of the newspaper 'El Periodico de Catalunya). Automatic machine translation used in the production of the catalan version of the newspaper.