



Paolo Cazzaniga

Department of Human and Social Sciences, University of Bergamo, Italy

☎ (+39) 0352052933 | ✉ paolo.cazzaniga@unibg.it

Work experience

June 2021 - Present Day: Associate Professor at the University of Bergamo, Department of Human and Social Sciences

February 2011 - May 2021: Assistant Professor at the University of Bergamo, Department of Human and Social Sciences

January 2013 - December 2014: Research Associate at the Institute for Systems Analysis and Computer Science (IASI) - CNR, Rome, Italy

May 2010 - January 2011: Post-doc at the University of Milano – Bicocca. Research project: “Stochastic and hybrid simulation and analysis of mathematical models of biological systems”

December 2009 - February 2010: Research collaboration at the University of Milano – Bicocca. Research project: “Development of a stochastic simulator for the GPU”

Education and training

2010: PhD in Computer Science at the University of Milano – Bicocca. Dissertation title: “Stochastic algorithms for biochemical processes”. Supervisor Prof. Giancarlo Mauri

September 2005 - September 2006: Pre-doctoral scholarship at the University of Milano – Bicocca. Project title: “Biomolecular algorithms for computationally complex problems”

2005: Master degree in Informatics at the University of Milano – Bicocca. Dissertation title: “Storage devices in membrane systems”. Supervisor Prof. Giancarlo Mauri

Awards

2019: Best paper award at the IEEE International Conference on Computational Intelligence in Bioinformatics and Computational Biology (CIBCB 2019), Certosa di Pontignano, Siena, Italy. Paper entitled “ProCell: Investigating cell proliferation with Swarm Intelligence”

2018: Awarded by the Italian Ministry of Education, Universities and Research (MIUR) with the “Fondo per il finanziamento delle attività base di ricerca” (FFABR) project

2016: NVIDIA Academic GPU grant. Awarded with a NVIDIA GPU Titan X donated by the NVIDIA Corporation

Scientific activity

My research is located in the multidisciplinary field of Systems Biology. My activities range from the definition of mathematical models of complex (biological) systems to the simulation of their temporal dynamics by means of deterministic, stochastic or hybrid algorithms. I also define and apply different methodologies for the analysis of the emergent behavior of the systems under investigation (e.g., parameter sweep analysis, parameter identifiability, sensitivity analysis).

My research effort also concerns the definition, implementation (for CPUs and GPUs) and application of Artificial Intelligence methods to problems in the fields of Bioinformatics, Systems Biology and Biomedicine, like, for instance, inferring the full haplotype of

a cell starting from read sequencing data, estimating the unknown information of a complex system (e.g., molecular concentrations and kinetic constants in the case of biological systems), enhancing the appearance and visual quality of biomedical images. I have already successfully applied different methods, such as Particle Swarm Optimization, Genetic Algorithms and Deep Neural Networks, to these problems.

Currently, I am actively collaborating with:

- Prof. Pietro Liò, University of Cambridge, concerning the development of evolutionary computation methods for genotype assembly;
- Prof. Daniela Besozzi and Giancarlo Mauri, University of Milano-Bicocca, concerning the definition of computational methods for Systems Biology;
- Prof. Marco S. Nobile, Ca' Foscari University of Venezia, concerning the definition and enhancement of optimization strategies for complex problems;
- Prof. Pier Giuseppe Pelicci, European Institute of Oncology, concerning the modeling of cell proliferation in human acute myeloid leukemia;
- Prof. Maria Pia Longhese, University of Milano-Bicocca, concerning the application of hybrid fuzzy logic based modeling and simulation approaches to study complex biological systems;
- Dr. Renata Tisi, University of Milano-Bicocca, concerning the analysis of calcium homeostasis and the computational investigation of signaling pathways in yeast *S. cerevisiae*;
- Prof. Hitoshi Iba, University of Tokyo, concerning the automatic inference and parameterization of synthetic biochemical networks.

Research interests

- Artificial Intelligence, Machine Learning, Computational Intelligence
- Systems Biology, Computational Biology, Bioinformatics
- Mathematical modeling and simulation of complex biological systems
- High Performance Computing
- Biomedical image analysis

Selected publications

1. M.S. Nobile, P. Cazzaniga, D. Ramazzotti. **Investigating the performance of multi-objective optimization when learning Bayesian Networks**, Neurocomputing, 461, 281-291, 2021
2. M.S. Nobile, F. Fontana, L. Manzoni, P. Cazzaniga, G. Mauri, G.A.A. Saracino, D. Besozzi, F. Gelain. **HyperBeta: characterizing the structural dynamics of proteins and self-assembling peptides**, Scientific reports, vol. 11, 7783, 2021
3. L. Rundo, A. Tangherloni, P. Cazzaniga, M. Mistri, S. Galimberti, R. Woitek, E. Sala, G. Mauri, M.S. Nobile. **A CUDA-powered method for the feature extraction and unsupervised analysis of medical images**, The Journal of Supercomputing, 77:8, 8514-8531, 2021
4. S. Spolaor, M. Scheve, M. Firat, P. Cazzaniga, D. Besozzi, M.S. Nobile. **Screening for combination cancer therapies with dynamic fuzzy modeling and multi-objective optimization**, Frontiers in Genetics, 12:617935, 2021
5. M.S. Nobile, E. Nisoli, T. Vlachou, S. Spolaor, P. Cazzaniga, G. Mauri, P.G. Pelicci, D. Besozzi. **cuProCell: GPU-accelerated analysis of cell proliferation with flow cytometry data**, IEEE Journal of Biomedical and Health Informatics, vol. 24:11, pp. 3173-3181, 2020

6. L. Rundo, A. Tangherloni, D.R. Tyson, R. Betta, C. Militello, S. Spolaor, M.S. Nobile, D. Besozzi, A.L.R. Lubbock, V. Quaranta, G. Mauri, C.F. Lopez, P. Cazzaniga. **ACDC: Automated cell detection and counting for time-lapse fluorescence microscopy**, Applied Sciences, vol. 10:18, pp. 6187, 2020
7. S. Spolaor, M.S. Nobile, G. Mauri, P. Cazzaniga, D. Besozzi. **Coupling Mechanistic Approaches and Fuzzy Logic to Model and Simulate Complex Systems**, IEEE Transactions on Fuzzy Systems, 28(8), pp. 1748-1759, 2020
8. M.S. Nobile, G. Votta, R. Palorini, S. Spolaor, H. De Vitto, P. Cazzaniga, F. Ricciardiello, G. Mauri, L. Alberghina, F. Chiaradonna, D. Besozzi. **Fuzzy modeling and global optimization to predict novel therapeutic targets in cancer cells**, Bioinformatics, 36(7), pp. 2181-2188, 2020
9. L. Rundo, C. Han, Y. Nagano, J. Zhang, R. Hataya, C. Militello, A. Tangherloni, M.S. Nobile, C. Ferretti, D. Besozzi, M.C. Gilardi, S. Vitabile, G. Mauri, H. Nakayama, P. Cazzaniga. **USE-Net: incorporating Squeeze-and-Excitation blocks into U-Net for prostate zonal segmentation of multi-institutional MRI datasets**, Neurocomputing, vol. 365, pp. 31-43, 2019
10. A. Tangherloni, S. Spolaor, P. Cazzaniga, D. Besozzi, L. Rundo, G. Mauri, M.S. Nobile. **Biochemical parameter estimation vs. benchmark functions: A comparative study of optimization performance and representation design**, Applied Soft Computing, 81, p. 105494, 2019
11. M.S. Nobile, T. Vlachou, S. Spolaor, D. Bossi, P. Cazzaniga, L. Lanfranccone, G. Mauri, P.G. Pelicci, D. Besozzi. **Modeling cell proliferation in human acute myeloid leukemia xenografts**. Bioinformatics, 35(18), pp. 3378-3386, 2019
12. L. Rundo, A. Tangherloni, M.S. Nobile, C. Militello, D. Besozzi, G. Mauri, P. Cazzaniga. **MedGA: a novel evolutionary method for image enhancement in medical imaging systems**. Expert Systems with Applications, 119, pp. 387-399, 2019
13. M.S. Nobile, P. Cazzaniga, D. Besozzi, R. Colombo, G. Mauri, G. Pasi. **Fuzzy Self-Tuning PSO: A settings-free algorithm for global optimization**. Swarm and Evolutionary Computation, 30, pp. 70-85, 2018
14. L.A. Harris, M.S. Nobile, J.C. Pino, A.L.R. Lubbock, D. Besozzi, G. Mauri, P. Cazzaniga*, C.F. Lopez. **GPU-powered model analysis with PySB/cupSODA**. Bioinformatics, 33(21), pp. 3492-3494, 2017

Teaching activity

Doctoral courses

2021 - present day: “Statistics and computational tools for the analysis of quantitative data”
Ph.D. Program in Human capital formation and labour market relations, University of Bergamo
Role: course co-organizer and lecturer, together with Prof. Andrea Greco, University of Bergamo

2018 - present day: Ph.D. course on “Fundamentals of Biostatistics” (2 ECTS)
Ph.D. Program in Biology and Biotechnology, University of Milano-Bicocca, Italy
Role: course co-organizer and lecturer, together with Prof. Prof. Daniela Besozzi, University of Milano-Bicocca, Italy, and Dr. Marco S. Nobile, TU/e - Eindhoven University of Technology, The Netherlands

25-29 July 2019: Ph.D. course on “Introduction to Machine Learning” (1 ECTS)
Ph.D. Program in Public Health, University of Milano-Bicocca, Italy
Role: course co-organizer and lecturer, together with Prof. Daniela Besozzi, University of Milano-Bicocca, Italy, and Dr. Marco S. Nobile, TU/e - Eindhoven University of Technology, The Netherlands

Academic assignments

2015 - present day: Information and Communication Technologies (ICT)
Special needs teacher courses, University of Bergamo, Italy

2011 - present day: Fundamentals of Informatics (6 ECTS)
Bachelor of Educational Studies, University of Bergamo, Italy

2015 - present day: Statistical methods for the Human Sciences (6 ECTS)

Bachelor of Educational Studies, University of Bergamo, Italy

2017 - present day: IT for the Communication (6 ECTS)

Bachelor of Communication Sciences, University of Bergamo, Italy

2019 - present day: Fundamentals of Informatics and Statistics (6 ECTS)

Bachelor of Psychological Studies, University of Bergamo, Italy

Academic assistance

2009: Algorithms for Bioinformatics

Master degree in Biotechnology, University of Milano, Italy

2008 - 2009: Perl and Java programming

Bachelor in Computer Science, University of Milano-Bicocca, Italy

International schools (doctoral and post-doc level)

4-6 October 2017: Member of the organizing committee of the “2nd SYSBIO.IT School on Computational Systems Biology and Bioinformatics”, University of Milano-Bicocca, Milano, Italy

7-9 June 2016: Lecturer and member of the organizing committee of the “1st SYSBIO.IT School on Computational Systems Biology: An introduction to dynamic modeling, simulation and analysis of biological systems”, University of Milano-Bicocca, Milano, Italy

Ancillary activities

Administrative assignments

2024 - present day: Department Representative for Didactics Activities

2022 - 2024: Department Representative for Research Activities

2013 - 2021: Contact person for the definition of the study plans for the students of the Bachelor of Educational Studies, Department of Human and Social Sciences, University of Bergamo, Italy

2015 - present day: Chair of the committee for the evaluation of the scientific production of the Department of Human and Social Sciences, University of Bergamo, Italy

2016 - present day: Member of the council of the Centre of educational technologies and communications of the University of Bergamo, Italy

2018 - 2021: Member of the Joint Committee Teachers-Students of the Department of Human and Social Sciences, University of Bergamo, Italy

May 2017 - October 2018: Member of the council of the Department of Human and Social Sciences, University of Bergamo, Italy

Selection boards

Member of the evaluation committee of several post-doctoral positions and research scholarships at the Department of Human and Social Sciences of the University of Bergamo

Conferences/Talks

- Speaker at the 7th International Workshop on Membrane Computing, Leiden, The Netherlands, 2006. Title of the talk: “Tau leaping stochastic simulation method in P systems”
- Speaker at IEEE Congress on Evolutionary Computation, Beijing, China, 2014. Title of the talk: “A memetic hybrid method for the Molecular Distance Geometry Problem with incomplete information”

- Speaker at IEEE World Congress on Computational Intelligence, Vancouver, Canada, 2016. Title of the talk: “GPU-powered and settings free parameter estimation of biochemical systems
- Speaker at the 13th International Conference on Computational Intelligence methods for Bioinformatics and Biostatistics, Stirling, UK, 2016. Title of the talk: “COSYS: Computational Systems Biology infrastructure”
- Speaker at IEEE International Conference on Computational Intelligence in Bioinformatics and Computational Biology, Chiang Mai, Thailand, 2016. Title of the talk: “GPU-powered Bat Algorithm for the parameter estimation of biochemical kinetic values”
- Speaker at BITS 2017 - 14th Annual Meeting of the Bioinformatics Italian Society, Cagliari, Italy, 2017. Title of the talk: “LASSIE: a GPU-based large-scale simulator of biological systems”
- Speaker at the 26th Euromicro International Conference on Parallel, distributed and network-based Processing, Cambridge, UK, 2018. Title of the talk: “GPU-powered Multi-Swarm Parameter Estimation of Biological Systems: A Master-Slave Approach”

Principal investigator of research projects

April 2021 - Today: Project “MaLeCoB2: Machine learning for the investigation of complex biological systems 2.0” - CINECA Italian SuperComputing Resource Allocation (ISCRA)

June 2020 - March 2021: Project “MaLeComB: Machine learning for the investigation of complex biological systems” - CINECA Italian SuperComputing Resource Allocation (ISCRA)

December 2017 - September 2018: Project “FISCo 2.0: Fine-grain and spatial simulations of complex biological systems” - CINECA Italian SuperComputing Resource Allocation (ISCRA)

April 2017 - October 2017: Project “SPASMO: Spatial Analysis and Simulation of large-scale Models” - CINECA Interdisciplinary Laboratory for Advanced Simulation (LISA)

February 2017 - November 2017: Project “FISCo: Fine-grain and spatial simulations of complex biological systems” - CINECA Italian SuperComputing Resource Allocation (ISCRA)

Research projects

January 2020 - Today: Member of the IEEE CIS Task Force on advanced representation in biological and medical search and optimization

January 2013 - Today: Member of the ISBE/SYSBIO.IT Centre of Systems Biology (www.sysbio.it)

2015 - 2016: Project “FiCoS: Fine and coarse-grain simulations of complex biological systems” - Italian SuperComputing Resource Allocation (ISCRA)

2014 - 2015: Project “PACoS: Massive parallel analysis of complex biological systems” - CINECA LISA 2014 (Production Projects)

April 2013 - March 2014: Project “BioComPLX: a tool for the analysis and reverse engineering of complex biological systems” - IsC10_BioPLX, CINECA ISCRA (Class C Projects)

February 2007 - February 2009: Member of the Italian PRIN (Programma di Ricerca Scientifica di Rilevante Interesse Nazionale) project: “Sistemi e calcoli per la descrizione e l’analisi di processi biologici: estensioni quantitative, studio dell’espressività e simulazione (Bisca)”. Coordinator: Prof. Pierpaolo Degano, University of Pisa

May 2006 - May 2007: Integrated Action Italy-Spain - Italian Ministry of Education, Universities and Research

November 2004 - November 2006: Member of the Italian PRIN (Programma di Ricerca Scientifica di Rilevante Interesse Nazionale) project: “Systems Biology: modellazione, linguaggi e analisi (SYBILLA)”. Coordinator: Prof. Corrado Priami, University of Trento

Public engagement projects

December 2019 - Today: Member of the project “Restiamo Umani” funded by the University of Bergamo. Coordinator: Prof. Cristiana Ottaviano

May 2018 - December 2018: Member of the project “Le radici culturali della violenza: per una comunità di adulti responsabili” funded by the University of Bergamo. Coordinator: Prof. Cristiana Ottaviano

Organising Committee

1. **General Chair** of the **16th International Conference on Computational Intelligence methods for Bioinformatics and Biostatistics (CIBB 2019)**, September 4-6, 2019, Bergamo, Italy
2. **Chair** of the Organising Committee of the **2nd SYSBIO.IT School on Computational Systems Biology**, October 4-6, 2017, Milan, Italy
3. **Chair** of the Organising Committee of the special session: **Parallel and distributed high-performance computing solutions in Systems Biology**, hosted by the 26th Euromicro International Conference on Parallel, distributed and network-based Processing, March 21-23, 2018, Cambridge, UK
4. Member of the Organising Committee of the special session: **Modeling and simulation methods for Systems Biology and Systems Medicine**, hosted by CIBB 2017 - 14th International Conference on Computational Intelligence Methods for Bioinformatics and Biostatistics, September 7-9, 2017, Cagliari, Italy
5. **Chair** of the Organising Committee of the special session: **Parallel and Distributed High Performance Computing Solutions for Computational Intelligence Methods**, hosted by the IEEE International Conference on Computational Intelligence in Bioinformatics and Computational Biology (CIBCB 2016), October 5-7, 2016, Chiang Mai, Thailand
6. **Chair** of the Organising Committee of the special session: **Modeling and simulation methods for Systems Biology and Systems Medicine**, hosted by CIBB 2016 - 13th International Conference on Computational Intelligence Methods for Bioinformatics and Biostatistics, September 1-3, 2016, Stirling, UK
7. Member of the Organising Committee of **AAIM 2016 - 11th International Conference on Algorithmic Aspects in Information and Management**, July 18-20, 2016, Bergamo, Italy
8. Member of the Organising Committee of the **1st SYSBIO.IT School on Computational Systems Biology**, June 8-10, 2016, Milan, Italy
9. Member of the Organising Committee of **BITS 2015 - Twelfth Annual Meeting of the Bioinformatics Italian Society**, June 3-5, 2015, Milan, Italy
10. Member of the Organising Committee of **DLT 2011 - Developments in Language Theory** - University of Milano-Bicocca

Program Committee

1. Member of the Program Committee of **ECTA 2022 - 14th International Conference on Evolutionary Computation Theory and Applications**, October 24-26 2022, Valletta, Malta
2. Member of the Program Committee of **BIOTECHNO 2022 - 14th International Conference on Bioinformatics, Biocomputational Systems and Biotechnologies**, May 22-26 2022, Venice, Italy
3. Member of the Program Committee of **ECTA 2021 - 13th International Conference on Evolutionary Computation Theory and Applications**, October 25-27 2021, Online Event
4. Member of the Program Committee of **ECTA 2020 - 12th International Conference on Evolutionary Computation Theory and Applications**, November 2-4 2020, Online Event

5. Member of the Program Committee of **ECTA 2019 - 11th International Conference on Evolutionary Computation Theory and Applications**, September 17-19, 2019, Vienna, Austria
6. **Chair** of the Program Committee of the special session: **Parallel and distributed high-performance computing solutions in Systems Biology**, hosted by the 26th Euromicro International Conference on Parallel, distributed and network-based Processing, March 21-23, 2018, Cambridge, UK
7. Member of the Program Committee of the special session: **Modeling and simulation methods for Systems Biology and Systems Medicine**, hosted by CIBB 2017 - 14th International Conference on Computational Intelligence Methods for Bioinformatics and Biostatistics, September 7-9, 2017, Cagliari, Italy
8. **Chair** of the Program Committee of the special session: **Parallel and Distributed High Performance Computing Solutions for Computational Intelligence Methods**, hosted by the IEEE International Conference on Computational Intelligence in Bioinformatics and Computational Biology (CIBCB 2016), October 5-7, 2016, Chiang Mai, Thailand
9. **Chair** of the Program Committee of the special session: **Modeling and simulation methods for Systems Biology and Systems Medicine**, hosted by CIBB 2016 - 13th International Conference on Computational Intelligence Methods for Bioinformatics and Biostatistics, September 1-3, 2016, Stirling, UK
10. Member of the Program Committee of **ACM-SAC 2017 Conference Track on Bioinformatics**, Marrakech, Morocco, March 27-31, 2017
11. Member of the Program Committee of **ACM-SAC 2016 Conference Track on Computational Biology and Bioinformatics**, Pisa, Italy, April 3-8, 2016
12. Member of the Program Committee of **ICANNGA 2013 - 11th International Conference on Adaptive and Natural Computing Algorithms**, Lausanne, Switzerland

Editorial board

October 2021 - Today: Review Editor in Computational Genomics, **Frontiers in Genetics** journal

September 2021 - Today: Guest Associate Editor in Integrative Bioinformatics, **Frontiers in Bioinformatics** journal

April 2021 - Today: Topic Editor of **Symmetry** journal by MDPI

December 2016 - January 2019: Member of the editorial board of **Neurocomputing** journal, Elsevier

Editors in chief: Prof. Zidong Wang and Prof. Steven Hoi

Guest Editor

- **Computational Intelligence Methods for Bioinformatics and Biostatistics.** 16th International Meeting, CIBB 2019, Bergamo, Italy, September 4-6, 2019 Revised Selected Papers, Editors: P. Cazzaniga, D. Besozzi, I. Merelli, L. Manzoni, **Lecture Notes in Bioinformatics, Springer**
- **Computational Intelligence Methods for Bioinformatics and Biostatistics.** Editors: P. Cazzaniga, M. Raposo, D. Besozzi, I. Merelli, A. Staiano, A. Ciaramella, R. Rizzo, L. Manzoni, **BMC Bioinformatics Supplement**

Languages

- Italian: mother tongue
- English: proficient
- Spanish: elementary

December 12, 2025

