

Giulia Bertagnolli

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Experience

Department of Mathematics (DIMA), Università degli Studi di Genova, Italy

RESEARCHER (RTD-A) SECS-S/01

Development of statistical methodologies for (digital) health data. Funds by PNC DHEAL-COM.

Genoa, Italy

Feb 2021 - currently

Department of Economics, Free University of Bozen-Bolzano, Italy

EXTERNAL LECTURER SECS-S/01

Bolzano, Italy

Oct 2023 - Sept 2024

Department of Mathematics, University of Trento

RESEARCH FELLOW

My research activity focuses on statistical methods for structured data, e.g. graphs and networks, distance and functional data. I am highly interested in the geometry of these data and, in general, of statistical models (information geometry).

Trento, Italy

Dec 2021 - Jan 2024

Fondazione Bruno Kessler

INTERN AT THE CoMuNe LAB

Research activity for the MSc thesis

Trento, Italy

Dec 2018 - Oct 2018

TIM JOL SKIL Lab, Fondazione Bruno Kessler

DATA SCIENTIST INTERN

Data Science on telecommunication data (CDRs), from the pre-processing to the analysis of communication patterns. See *Candeago, L. et al. EPJ Data Sci. 8 (1), 19.*

Trento, Italy

May 2016 - Oct 2016

Education

University of Trento & CoMuNe Lab, ICT, Fondazione Bruno Kessler

PHD IN MATHEMATICS, SUMMA CUM LAUDE

- Thesis title: *Modelling the process-driven geometry of complex networks*
- Main supervisor: Dr. Manlio De Domenico
- Co-supervisor: Prof. Claudio Agostinelli

Trento, Italy

2019 - Dec. 2021

University of Trento

MASTER OF SCIENCE IN IN MATHEMATICS FOR LIFE SCIENCES

- Thesis title: *Complex Networks and Statistical Data Depths*
- Supervisors: Dr. Manlio De Domenico, Prof. Claudio Agostinelli

Trento, Italy

2016 - 2018

Bologna Business School, Alma Mater Studiorum - Università di Bologna

1ST LEVEL MASTER IN DATA SCIENCE

- With a scholarship from the Boston Consulting Group awarded on merit.

Bologna, Italy

2015 - 2016

University of Trento

BACHELOR IN MATHEMATICS

- Thesis Title: *Common Principal Component Analysis with Applications*
- Supervisor: Prof. Pierluigi Novi Inverardi

Trento, Italy

2010 - 2014

Liceo Bertrand Russell

DIPLOMA DI LICEO LINGUISTICO

- 4th exchange student in Germany (Grünberg, district Giessen, Hessen)

Cles (TN), Italy

2005 - 2010

Publications

Giulia Bertagnolli and Claudio agostinelli. Ranks, centers and dispersion measures for networked and metric data. *Journal of Machine Learning Research* (*To be submitted soon*).

Giulia Bertagnolli. A family of diffusion distances for single- and multi-layer complex networks: The package *diffudist*. *Journal of Statistical Software* (*submitted*).

Lorenzo Fellin, **Giulia Bertagnolli**, Valerio Mazzoni, Gianfranco Anfora, and 3 more. Detection and characterization of incidental vibrations from *Drosophila suzukii* in infested fruits. *Journal of Pest Science* (2024). doi:10.1007/s10340-023-01711-8

Gaia Colombani, **Giulia Bertagnolli**, Oriol Artime. Efficient network exploration by means of resetting self-avoiding random walkers. *J. Phys Complexity* (2023). doi:10.1088/2632-072X/acff33

Arsham Ghavasieh, **Giulia Bertagnolli**, Manlio De Domenico. Dismantling the information flow in complex interconnected systems. *Phys. Rev. Research* 5, 013084 (2023). doi:10.1103/PhysRevResearch.5.013084

Giulia Bertagnolli and Manlio De Domenico. Functional rich clubs emerging from the diffusion geometry of complex networks. *Phys. Rev. Research* 4, 033185 (2022). doi:10.1103/PhysRevResearch.4.033185

Giulia Bertagnolli, Riccardo Gallotti and Manlio De Domenico (2021). Quantifying efficient information exchange in real network flows. *Commun. Phys.* 4, 125 (2021). doi:10.1038/s42005-021-00612-5

Giulia Bertagnolli and Manlio De Domenico. Diffusion geometry of multiplex and interdependent systems. *Phys. Rev. E* 103, 042301 (2021). doi:10.1103/PhysRevE.103.042301

Riccardo Gallotti, **Giulia Bertagnolli**, Manlio De Domenico. Unraveling the hidden organisation of urban systems and their mobility flows. *EPJ Data Sci.* 10, 3 (2021). doi:10.1140/epjds/s13688-020-00258-3

Nina Verstraete, Giuseppe Jurman, **Giulia Bertagnolli**, Arsham Ghavasieh, Vera Pancaldi, Manlio De Domenico. CovMulNet19, integrating proteins, diseases, drugs, and symptoms: a network medicine approach to covid-19. *Network and systems medicine*, Volume 3, 1, 130–141 (2020). doi:10.1089/nsm.2020.0011.

Giulia Bertagnolli, Claudio Agostinelli, Manlio De Domenico. Network depth: identifying median and contours in complex networks. *Journal of Complex Networks*, Volume 8, Issue 4 (2019). doi:10.1093/comnet/cnz041

Lorenzo Candeago, **Giulia Bertagnolli**, Paolo Bosetti, Michele Vescovi, Francesco Sacco and Bruno Lepri. Cities of a feather flock together: a study on the synchronization of communication between Italian cities. *EPJ Data Sci.* 8 (1), 19 (2019). doi:10.1140/epjds/s13688-019-0198-4

Books

Oriol Artime, Barbara Benigni, **Giulia Bertagnolli**, Valeria D'Andrea, Riccardo Gallotti, Arsham Ghavasieh, Sebastian Raimondo, Manlio De Domenico (2022). *Multilayer Network Science: From Cells to Societies (Elements in the Structure and Dynamics of Complex Networks)*. Cambridge: Cambridge University Press. doi:10.1017/9781009085809

Recent Talks

Workshop of the Italian chapter of the Complex Systems Society

WORKSHOP CSS/ITALY

online

May 25 2022

Giulia Bertagnolli and Manlio De Domenico. Functional rich-clus in complex networks. **Invited talk.**

Conference on Complex Systems

CCS2021

Lyon, FR

Oct 25-29 2021

Giulia Bertagnolli and Manlio De Domenico. Diffusion geometry of multiplex and interdependent systems.

A Joint Sunbelt and NetSci Conference

NETWORKS 2021

IUNI Indiana, US

Jul 5-10 2021

Giulia Bertagnolli and Manlio De Domenico. Diffusion geometry of multiplex and interdependent systems.

International (Online) Conference on Complex Networks

COMPLENET LIVE 2021

Exeter, UK

May 24-26 2021

Giulia Bertagnolli and Manlio De Domenico. Diffusion geometry of multiplex and interdependent systems.

International (Online) Conference on Complex Systems

CCS 2020

Thessaloniki, GR

Dec 4-11 2020

Giulia Bertagnolli and Riccardo Gallotti and Manlio De Domenico. Quantifying efficient information exchange in real network flows. DOI: 10.5281/zenodo.4419178

International School and Conference (Online) on Network Science

NETSCI 2020

Rome, IT

Sept 7-15 2020

Giulia Bertagnolli and Riccardo Gallotti and Manlio De Domenico. Quantifying efficient information exchange in real network flows.

International School and Conference (Online) on Network Science

Rome, IT

NETSCI 2020 - NETCENT SATELLITE

Sept 7-15 2020

Giulia Bertagnolli and Claudio Agostinelli and Manlio De Domenico. Network depth: identifying median and contours in complex networks.

Higher-order connectivity and correlations in complex systems

Vienna, AT

CSH WORKSHOP ON HIGHER-ORDER INTERACTIONS

Nov 25-26 2019

Giulia Bertagnolli and Manlio De Domenico. Diffusion processes and the functional organization of complex networks.

Teaching Activity

Statistical Methods for Biomedicine

Università degli Studi di Genova,

Italy

TEACHING

April 2024 (20h)

Statistics

Free University of Bolzano-Bozen,

Italy

EXTERNAL LECTURER

Oct 2023-Sept 2024 (48h)

Basic course in probability and statistics for the Bachelor in Economics and Social Sciences See the unibz webpage of G. Bertagnolli

The geometry of statistical models

Trento, Italy

TEACHING

March 2023

A short course (8h) to introduce some students of the master in Mathematics, curriculum: Mathematics and Statistics for Life and Social Sciences (track: Mathematics for data science) to Information geometry. Details on my webpage

Probability and Statistics Undergraduate Course

Trento, Italy

TUTOR

Spring sem. 2022/2023

42h of tutoring/teaching in the Probability and Statistics course for the Undergraduate degree in Computer Science

Probability and Statistics Undergraduate Course

Trento, Italy

TUTOR

Spring sem. 2021/2022

30h of tutoring/teaching in the Probability and Statistics course for the Undergraduate degree in Computer Science

Graphical models and network science

Trento, Italy

INVITED LECTURER

12h Dec. 2021

An introduction to network science for the Master degree in Mathematics, inside the course "Graphical models and network science" of prof. Veronica Vinciotti.

Fundamentals of network analysis: hands on

Trento, Italy

SEMINAR

4h Spring 2021

Seminar for the course "Network Science: theory and lab" of the MSc in Data Science.

Fundamentals of network analysis: hands on

Trento, Italy

SEMINAR

6h Spring 2020

Seminar for the course "Network Science: theory and lab" of the MSc in Data Science.

Probability and Statistics Undergraduate Course

Trento, Italy

TUTOR

Autumn sem. 2018/2019

34h of tutoring/teaching in the Probability and Statistics course for the Undergraduate degree in Computer Science

Thesis supervision

I co-supervised the master thesis of G. Colombani, see the theses section on my unibz page. An article resulting from this work is under review in *Journal of Physics: Complexity*.

Other Projects

R package: diffudist Released on CRAN and [gbertagnolli.github.io/diffudist](https://github.com/gbertagnolli/diffudist) CRAN, this R package collects the functions for the computation of diffusion distances on complex (single-layer) networks.

R package: intsegration Released on github.com/gbertagnolli/intsegration, this R package enables the evaluation of the efficiency of weighted networks. The main algorithm is written in C, as a variation on the classic Floyd-Warshall algorithm for computing weighted shortest paths and distances. This package collects the code used in the paper [EPJ Data Sci. 10, 3 (2021)] and [Commun. Phys. 4, 125

(2021)].

R package: muxViz 3.0 I contributed in this R package by Dr. Manlio De Domenico. In particular I built the R package, starting from R scripts, built the package website, using pkgdown, and helped deploying it on github.

Notte dei Ricercatori e della Ricerca 2019, 2021, 2023. Since the first year of my PhD, I always took part to the Researcher's night, with projects on networks and complex systems (2019, 2021) and on statistics (2023). In 2023, in particular, the demo is called "Statistica dove non te l'aspetti" and show-cases, among others, functional data analysis methods for the analysis of vibrational data.

Orientamento Dipartimento Matematica I often take part (2023, 2022, 2019) in *orientation* activities for high-school student, which aim to help students in the choice of a university course.

Research Visits

Research visit to prof. Nihat Ay

Hamburg, Germany

TUHH - INSTITUTE FOR DATA SCIENCE FOUNDATIONS

April-May 2023

Nihat Ay is an expert in the field of Information Geometry. Project: Information geometry of graphs, in collaboration with Giovanni Pistone, another expert in the field.

Nonparametric Information Geometry Lecture Series and Seminar at DIMA UNIGE

Genova, Italy

GIANNIDIORESTINO.IT/HTMLS/2023-IG-SEMINAR.HTML

Spring 2023

PhD course given by Giovanni Pistone to the research group of Eva Riccomagno.

Reviewer Activity

My peer review activity is documented on the Web of Science ResearcherID: GQB-0396-2022. I reviewed articles for:

- Information Geometry – Springer
- Physical Review Letters – American Physical Society
- Statistics Surveys – Institute of Mathematical Statistics
- Journal of the Royal Statistical Society: Series A (Statistics in Society) – Royal Statistical Society
- Physical Review E – American Physical Society
- Journal of Physica A: Mathematical and Theoretical – IOP Publishing (Selected as an Outstanding Reviewer for Journal of Physics A: Mathematical and Theoretical for 2019)
- Physical Biology – American Physical Society

Skills

Languages Italian (native), English (C1), German (C1), Spanish (B1)

Programming Languages R, C++, C, Python, Julia, SAS, SPSS, Matlab, Mathematica, HTML, CSS