

Giulia Bertagnolli

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Education

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

Trento, Italy

PHD IN MATHEMATICS, SUMMA CUM LAUDE

2019 - Dec. 2021

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

University of Trento

Trento, Italy

MASTER OF SCIENCE IN IN MATHEMATICS FOR LIFE SCIENCES

2016 - 2018

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

Bologna Business School, Alma Mater Studiorum - Università di Bologna

Bologna, Italy

1ST LEVEL MASTER IN DATA SCIENCE

2015 - 2016

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

University of Trento

Trento, Italy

BACHELOR IN MATHEMATICS

2010 - 2014

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

Liceo Bertrand Russell

Cles (TN), Italy

DIPLOMA DI LICEO LINGUISTICO

2005 - 2010

- 4th year of study abroad at the Theo-Koch-Schule, Grünberg, Germany

Experience

Department of Mathematics, University of Trento

Trento, Italy

RESEARCH FELLOW

Dec 2021 - currently

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).

Fondazione Bruno Kessler

Trento, Italy

INTERN AT THE COMUNE LAB

Dec 2018 - Oct 2018

Research activity for the MSc thesis

TIM JOL SKIL Lab, Fondazione Bruno Kessler

Trento, Italy

DATA SCIENTIST INTERN

May 2016 - Oct 2016

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.

Residencehotel S.p.a. Trento

Trento, Italy

DATA ANALYST INTERN

May 2015 - Oct 2015

- I developed new macros and UDFs in Excel for the analysis of data (booking engine, social networks), programming in VBA (Visual Basic for Applications)
- I built the (old) website www.residencehotel.it with Joomla!3 and custom CSS and Javascript.

Publications

Arsham Ghavasieh, **Giulia Bertagnolli**, Manlio De Domenico (2021). Dismantling the information flow in complex interconnected systems. *Phys. Rev. Research* 5, 013084 (2023). DOI

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

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 Structure and Dynamics of Complex Networks*, Cambridge University Press, coming soon.

Giulia Bertagnolli, Riccardo Gallotti and Manlio De Domenico (2021). Quantifying efficient information exchange in real network flows. Commun. Phys. 4, 125 (2021). DOI, arXiv.

Giulia Bertagnolli and Manlio De Domenico (2021). Diffusion geometry of multiplex and interdependent systems. Phys. Rev. E 103, 042301. DOI. arXiv

Riccardo Gallotti, **Giulia Bertagnolli**, Manlio De Domenico (2021). Unraveling the hidden organisation of urban systems and their mobility flows. EPJ Data Sci. 10, 3 (2021). DOI, arXiv

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

Giulia Bertagnolli, Claudio Agostinelli, Manlio De Domenico (2019). Network depth: identifying median and contours in complex networks. Journal of Complex Networks, Volume 8, Issue 4. DOI, arXiv

Lorenzo Candéago, **Giulia Bertagnolli**, Paolo Bosetti, Michele Vescovi, Francesco Sacco and Bruno Lepri (2019). Cities of a feather flock together: a study on the synchronization of communication between Italian cities. EPJ Data Sci. 8 (1), 19 DOI

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

NETSCI 2020 - NETCENT SATELLITE

Rome, IT

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

CSH WORKSHOP ON HIGHER-ORDER INTERACTIONS

Vienna, AT

Nov 25-26 2019

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

Teaching Activity

The geometry of statistical models

TEACHING

Trento, Italy

March 2020

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

TUTOR

Trento, Italy

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

TUTOR

Trento, Italy

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

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.

Reviewer Activity

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

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