Giorgio Nicoletti

Contacts

Department of Physics and Astronomy
University of Padova, Italy

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giorgionicoletti.github.io

giorgionicoletti

Skills

Programming

Advanced Knowledge

Python   Wolfram Mathematica

Basic Knowledge

C++   Matlab   Julia

R   Bash

Tools

Latex   Powerpoint & MS Office

HTML   CSS

Languages

NATIVE: Italian

FLUENT: English

INTERMEDIATE: French

BEGINNER: German, Japanese

Research experience

Department of Mathematics, University of Padova *Padova, Italy*
RESEARCHER   JAN 2023 - PRESENT
Projects: models of biological information processing, neuronal networks, and population dynamics at the Laboratory of Interdisciplinary Physics

Tübingen University   *Tübingen, Germany*
VISITING PH.D. STUDENT   SEPT 2022 - DEC 2022
Projects: properties of recurrent neural networks and reservoir computing. Hosted by the "Self-organization of neuronal networks" group, under the supervision of prof. Anna Levina

Max Planck Institute for the Physics of Complex Systems   *Dresden, Germany*
VISITING PH.D. STUDENT   JUNE 2022 - JULY 2022
Projects: models of sensing in multi-scale biological systems. Hosted by the Division of Biological Physics, under the supervision of Dr. Daniel M. Busiello

Education

Ph.D. in Physics *cum laude*   *University of Padova*
THESIS: *Information and Criticality in Complex Stochastic Systems*   OCT 2019 - APR 2023
Supervisors: prof. Amos Maritan and prof. Samir Suweis

Master's Degree in Physics   *University of Padova*
THESIS: *Scaling and Renormalization Group for models of neural activity*   OCT 2017 - JULY 2019
Final grade: 110/110 *cum laude*, GPA: 29.93/30

Erasmus semester   *Paris-Sud University*
INTERNATIONAL MASTER IN PHYSICS OF COMPLEX SYSTEM   SEPT 2018 - FEB 2019
ECTS GPA: A/A

Bachelor's Degree in Physics   *University of Padova*
THESIS: *A Bayesian interpretation of quantum probability*   OCT 2014 - JULY 2017
Final grade: 110/110 *cum laude*, GPA: 29.19/30

Selected publications

Mutual information disentangles interactions from changing environments   PHYS. REV. LETT.
G. NICOLETTI, D. M. BUSIELLO   *127, 228301 (2021)*
Physical Review Letters Editors' Suggestion, viewpoint in the APS "Physics" magazine and highlight in PRL's weekly tip sheet for reporters

Disentangling the critical signatures of neural activity   SCI. REP.
B. MARIANI, G. NICOLETTI, M. BISIO, M. MASCHIETTO, S. VASSANELLI, S. SUWEIS   *12, 10770 (2022)*
Featured in the "Top 100 papers in Neuroscience" published by Scientific Reports in 2022

The emergence of scale-free fire outbreaks in Australia   ISCIENCE
G. NICOLETTI, L. SARAVIA, F. MOMO, A. MARITAN, S. SUWEIS   *26 (3) 106181 (2023)*
Best poster award at the conference "Stochastic Models and Experiments in Ecology and Biology 2021" Venice, Italy

Invited talks

Max Planck Institute for the Physics of Complex Systems   *Dresden, Germany*
INFORMATION THEORY IN STOCHASTIC PROCESSES AND COMPLEX SYSTEMS   *13th Jul 2022*

BrainNet workshop, KTH Royal Institute of Technology   *Stockholm, Sweden*
WHAT CAN PHASE TRANSITIONS AND CRITICALITY TEACH US ABOUT BRAIN DYNAMICS?   *23rd - 24th May 2022*

Young Seminars of the Italian Society of Statistical Physics   *Online*
UNFOLDING COMPLEX SYSTEMS WITH INFORMATION THEORY   *10th Mar 2022*

Organized conferences

Robustness, Adaptability and Critical Transitions in Living Systems   *Lyon, France*
MAIN ORGANIZER   *27th Oct 2021*
Satellite of the Conference on Complex Systems 2021

Publications and preprints

Emergent encoding of dispersal network topologies in spatial metapopulation models
G. Nicoletti*, P. Padmanabha*, S. Azaele, S. Suweis, A. Rinaldo, A. Maritan (*equal contribution)
2023.05.21.541471 (2023)

A network-based method for extracting the organization of brain-wide circuits from reconstructed connectome datasets
K. K. H. Manjunatha, M. Bruzzone, G. Nicoletti, S. Suweis, M. Dal Maschio
2023.05.21.541471 (2023)

Prenatal experience with language shapes the brain
B. Mariani, G. Nicoletti, G. Barzon, M. C. O. Barajas, M. Shukla, R. Guevara, S. Suweis, J. Gervain
2023.05.25.542259 (2023)

The architecture of information processing in biological systems
G. Nicoletti, M. Bruzzone, S. Suweis, M. Dal Maschio, D. M. Busiello
2301.12812 (2023)

Mutual information in changing environments: Nonlinear interactions, out-of-equilibrium systems, and continuously varying diffusivities
G. Nicoletti, D. M. Busiello
106, 014153 (2022)

Information-driven transitions in projections of underdamped dynamics
G. Nicoletti, A. Maritan, D. M. Busiello
106, 014118 (2022)

Criticality and network structure drive emergent oscillations in a stochastic whole-brain model
G. Nicoletti*, G. Barzon*, B. Mariani, M. Formentin, S. Suweis (*equal contribution)
3, 025010 (2022)

Neuronal avalanches across the rat somatosensory barrel cortex and the effect of single whisker stimulation
B. Mariani, G. Nicoletti, M. Bisio, M. Maschietto, R. Oboe, A. Leparulo, S. Suweis, S. Vassanelli
15:709677 (2021)

Scaling and criticality in a phenomenological renormalization group
G. Nicoletti, S. Suweis, A. Maritan
2, 023144 (2020)

Contributed talks and posters

28th International Conference on Statistical Physics — *Tokyo, Japan*
TALK: The architecture of information processing in biological systems
7th - 11th Aug 2023

Brain Criticality Meeting 2022 — *Online*
POSTER: Criticality and network structure drive emergent oscillations in a stochastic whole-brain model
7th - 9th Nov 2022

Conference on Complex Systems 2022 — *Palma de Mallorca, Spain*
TALK: Criticality and network structure drive emergent oscillations in a stochastic whole-brain model
TALK: Information-driven transitions in optimal projections of underdamped dynamics
17th - 21st Oct 2022

Bernstein Conference 2022 — *Berlin, Germany*
POSTER: Disentangling the critical signatures of neural activity: avalanches, spatial correlations and information
14th - 16th Sept 2022

Conference on Complex Systems 2021 — *Lyon, France*
TALK: Disentangling the role of external and intrinsic dynamics on the critical signatures of neural activity
TALK: Modeling the emergence of scale-free fire outbreaks in Australia
POSTER: Disentangling internal interactions from noisy environments through mutual information
25th - 29th Oct 2021

Stochastic Models and Experiments in Ecology and Biology 2021 — *Venice, Italy*
POSTER: Modeling the emergence of scale-free fire outbreaks in Australia
22nd - 25th June 2021

Brain Criticality Virtual Meeting — *Online*
POSTER: What can a phenomenological Renormalization Group teach us about criticality in a network of neurons?
6th - 9th Oct 2020

Bernstein Conference 2020 — *Online*
POSTER: Scaling and criticality in a phenomenological renormalization group
29th Sept - 1st Oct 2020

Italian Conference on Complex Systems — *Trento, Italy*
POSTER: Scaling and Renormalization Group for the activity of neurons
1st - 3rd July 2019

Attended schools and workshops

Winter Workshop on Complex Systems 2022 — *Arc-et-Senans, France*
WORKSHOP
24th - 28th Jan 2022

Beg Rohu Summer School on "Statistical Mechanics and Emergent Phenomena in Biology" — *St. P. Quiberon, France*
SCHOOL
30th May - 12th June 2021

Computational and Theoretical Models in Neuroscience — *Venice, Italy*
SCHOOL
9th - 16th Sept 2019

TEACHING EXPERIENCE AND SUPERVISION

2022 - 23   **Advanced Statistical Mechanics**, PhD course in Physics, University of Padova   *Invited lecturer*

2022 - 23   **Physics with applications to biological systems**, Bachelor's Degree in Biology of Human and Environmental Health, University of Padova   *Teaching assistant*

2021 - 23   **Co-supervision of two Master's thesis and two Bachelor's thesis**, Department of Physics and Astronomy, University of Padova   *Co-supervision*

2021 - 22   **Models of Theoretical Physics**, Master's Degree in Physics of Data, University of Padova   *Teaching assistant*

2020 - 22   **IT and Bioinformatics**, Bachelor's Degree in Biology and Molecular Biology, University of Padova   *Teaching assistant*

HONORS AND AWARDS

29th Nov 2022   **Graduate Alumni Award** awarded to the best graduate student of the School of Science, University of Padova

22nd Nov 2021   **Physical Review Letters Editors' Suggestion, viewpoint in "Physics" magazine and highlight in PRL's weekly tip sheet for reporters** for the article *Mutual information disentangles interactions from changing environments*, Phys. Rev. Lett. 127, 228301 (2021)

25th Jun 2021   **Best Poster Award** for "Modeling the emergence of scale-free fire outbreaks in Australia" at *Stochastic Models and Experiments in Ecology and Biology 2021*, ECLT, Venice, Italy. Sponsored by MDPI

Feb 2017   **Student grant** for the best students enrolled in scientific degrees, granted by University of Padova

10th Oct 2014   **Best student award** for the best high school students in Italy, awarded by the Italian Ministry for Education

SERVICE AND MEMBERSHIPS

2021 - present   **Member of the Complex Systems Society**

2021 - 2023   **Member of the Italian Society of Physics**

2021 - 2023   **Elected representative** in the PhD Program Committee and the Academic Board of the PhD program, Department of Physics and Astronomy, University of Padova