

Giorgio Nicoletti

CONTACTS

📍 ECHO Laboratory
EPFL, Lausanne, Switzerland
✉️ giorgio.nicoletti@epfl.ch
🏠 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 Inkscape

Languages

NATIVE: Italian

FLUENT: English

INTERMEDIATE: French

BEGINNER: German, Japanese

RESEARCH EXPERIENCE

École Polytechnique Fédérale de Lausanne

POSTDOCTORAL RESEARCHER

Laboratory of Ecohydrology, with prof. Andrea Rinaldo

Lausanne, Switzerland

2023 - PRESENT

Tübingen University

VISITING PH.D. STUDENT

"Self-organization of neuronal networks" group, with prof. Anna Levina

Tübingen, Germany

SEPT 2022 - DEC 2022

Max Planck Institute for the Physics of Complex Systems

VISITING PH.D. STUDENT

Division of Biological Physics, with Dr. Daniel M. Busiello

Dresden, Germany

JUNE 2022 - JULY 2022

EDUCATION

Ph.D. in Physics *cum laude*

THESIS: *Information and Criticality in Complex Stochastic Systems*

Supervisors: prof. Amos Maritan and prof. Samir Suweis

University of Padova

2019 - 2023

Master's Degree in Physics

THESIS: *Scaling and Renormalization Group for models of neural activity*

Final grade: 110/110 *cum laude*, GPA: 29.93/30

University of Padova

2017 - 2019

Erasmus student

INTERNATIONAL MASTER IN PHYSICS OF COMPLEX SYSTEM, ECTS GPA: A/A

Paris-Sud University

2018 - 2019

Bachelor's Degree in Physics

THESIS: *A Bayesian interpretation of quantum probability*

Final grade: 110/110 *cum laude*, GPA: 29.19/30

University of Padova

2014 - 2017

INVITED TALKS

Max Planck Institute for the Physics of Complex Systems

INFORMATION THEORY IN STOCHASTIC PROCESSES AND COMPLEX SYSTEMS

Dresden, Germany

13th Jul 2022

BrainNet workshop, KTH Royal Institute of Technology

WHAT CAN PHASE TRANSITIONS AND CRITICALITY TEACH US ABOUT BRAIN DYNAMICS?

Stockholm, Sweden

23rd - 24th May 2022

Young Seminars of the Italian Society of Statistical Physics

UNFOLDING COMPLEX SYSTEMS WITH INFORMATION THEORY

Online

10th Mar 2022

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)

PNAS

120 e2311548120 (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

BIORXIV

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

BIORXIV

2023.05.25.542259 (2023)

The emergence of scale-free fire outbreaks in Australia

G. NICOLETTI, L. SARAVIA, F. MOMO, A. MARITAN, S. SUWEIS

ISCIENCE

26 (3) 106181 (2023)

Best poster award at the conference "Stochastic Models and Experiments in Ecology and Biology 2021" Venice, Italy

The architecture of information processing in biological systems

G. NICOLETTI, M. BRUZZONE, S. SUWEIS, M. DAL MASCHIO, D. M. BUSIELLO

ARXIV

2301.12812 (2023)

Mutual information in changing environments: Nonlinear interactions, out-of-equilibrium systems, and continuously varying diffusivities

G. NICOLETTI, D. M. BUSIELLO

PHYS. REV. E
106, 014153 (2022)

Information-driven transitions in projections of underdamped dynamics

G. NICOLETTI, A. MARITAN, D. M. BUSIELLO

PHYS. REV. E
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)

J. PHYS. COMPLEX.
3, 025010 (2022)

Disentangling the critical signatures of neural activity

B. MARIANI, G. NICOLETTI, M. BISIO, M. MASCHIETTO, S. VASSANELLI, S. SUWEIS

Featured in the "Top 100 papers in Neuroscience" published by Scientific Reports in 2022

SCI. REP.
12, 109770 (2022)

Mutual information disentangles interactions from changing environments

G. NICOLETTI, D. M. BUSIELLO

Physical Review Letters Editors' Suggestion, viewpoint in the APS "Physics" magazine and highlight in PRL's weekly tip sheet for reporters

PHYS. REV. LETT.
127, 228301 (2021)

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

FRONT. SYST. NEUR.
15:709677 (2021)

Scaling and criticality in a phenomenological renormalization group

G. NICOLETTI, S. SUWEIS, A. MARITAN

PHYS. REV. RES.
2, 023144 (2020)

CONTRIBUTED TALKS AND POSTERS

28th International Conference on Statistical Physics

TALK: THE ARCHITECTURE OF INFORMATION PROCESSING IN BIOLOGICAL SYSTEMS

Tokyo, Japan
7th - 11th Aug 2023

Brain Criticality Meeting 2022

POSTER: CRITICALITY AND NETWORK STRUCTURE DRIVE EMERGENT OSCILLATIONS IN A STOCHASTIC WHOLE-BRAIN MODEL

Online
7th - 9th Nov 2022

Conference on Complex Systems 2022

TALK: CRITICALITY AND NETWORK STRUCTURE DRIVE EMERGENT OSCILLATIONS IN A STOCHASTIC WHOLE-BRAIN MODEL

TALK: INFORMATION-DRIVEN TRANSITIONS IN OPTIMAL PROJECTIONS OF UNDERDAMPED DYNAMICS

Palma de Mallorca, Spain
17th - 21st Oct 2022

Bernstein Conference 2022

POSTER: DISENTANGLING THE CRITICAL SIGNATURES OF NEURAL ACTIVITY: AVALANCHES, SPATIAL CORRELATIONS AND INFORMATION

Berlin, Germany
14th - 16th Sept 2022

Conference on Complex Systems 2021

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

Lyon, France
25th - 29th Oct 2021

Stochastic Models and Experiments in Ecology and Biology 2021

POSTER: MODELING THE EMERGENCE OF SCALE-FREE FIRE OUTBREAKS IN AUSTRALIA

Venice, Italy
22nd - 25th June 2021

Brain Criticality Virtual Meeting

POSTER: WHAT CAN A PHENOMENOLOGICAL RENORMALIZATION GROUP TEACH US ABOUT CRITICALITY IN A NETWORK OF NEURONS?

Online
6th - 9th Oct 2020

Bernstein Conference 2020

POSTER: SCALING AND CRITICALITY IN A PHENOMENOLOGICAL RENORMALIZATION GROUP

Online
29th Sept - 1st Oct 2020

Italian Conference on Complex Systems

POSTER: SCALING AND RENORMALIZATION GROUP FOR THE ACTIVITY OF NEURONS

Trento, Italy
1st - 3rd July 2019

ATTENDED SCHOOLS AND WORKSHOPS

Winter Workshop on Complex Systems 2022

WORKSHOP

Arc-et-Senans, France
24th - 28th Jan 2022

Beg Rohu Summer School on "Statistical Mechanics and Emergent Phenomena in Biology"

SCHOOL

St. P. Quiberon, France
30th May - 12th June 2021

Computational and Theoretical Models in Neuroscience

SCHOOL

Venice, Italy
9th - 16th Sept 2019

ORGANIZED CONFERENCES

Robustness, Adaptability and Critical Transitions in Living Systems

MAIN ORGANIZER

Satellite of the Conference on Complex Systems 2021

Lyon, France
27th Oct 2021

TEACHING EXPERIENCE AND SUPERVISION

2023 - 24	Fundamental of Information Systems , Master's Degree in Data Science, University of Padova	<i>Teaching assistant</i>
2022 - 23	Advanced Statistical Mechanics , PhD course in Physics, University of Padova	<i>Invited lecturer</i>
2022 - 23	Physics with applications to biological systems , Bachelor's Degree in Biology of Human and Environmental Health, University of Padova	<i>Teaching assistant</i>
2021 - 23	Co-supervision of two Master's thesis and two Bachelor's thesis , Department of Physics and Astronomy, University of Padova	<i>Co-supervision</i>
2021 - 22	Models of Theoretical Physics , Master's Degree in Physics of Data, University of Padova	<i>Teaching assistant</i>
2020 - 22	IT and Bioinformatics , Bachelor's Degree in Biology and Molecular Biology, University of Padova	<i>Teaching assistant</i>

HONORS AND AWARDS

12 th Mar 2023	Featuring in the "Top 100 papers in Neuroscience" published by Scientific Reports in 2022 for the article <i>Disentangling the critical signatures of neural activity</i> , Sci. Rep. 127, 12, 10770 (2022)
29 th Nov 2022	Graduate Alumni Award awarded to the best graduate student of the School of Science, University of Padova
22 nd Nov 2021	Physical Review Letters Editors' Suggestion, viewpoint in "Physics" magazine and highlight in PRL's weekly tip sheet for reporters for the article <i>Mutual information disentangles interactions from changing environments</i> , Phys. Rev. Lett. 127, 228301 (2021)
25 th Jun 2021	Best Poster Award for "Modeling the emergence of scale-free fire outbreaks in Australia" at <i>Stochastic Models and Experiments in Ecology and Biology 2021</i> , ECLT, Venice, Italy. Sponsored by MDPI
Feb 2017	Student grant for the best students enrolled in scientific degrees, granted by University of Padova
10 th 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