

Vittorio Erba

Ph.D. candidate in Statistical Mechanics

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Current position

Present **Ph.D. Student in Statistical Mechanics**
10/2018 *Università degli Studi di Milano* Milano (IT)
◦ Topics: Euclidean random combinatorial optimization, Theoretical data science
◦ Supervisor: Sergio Caracciolo
◦ Main collaborators: Sergio Caracciolo, Marco Gherardi, Pietro Rotondo, Andrea Sportiello

Education

10/2018 **M.Sc. Student in Theoretical Physics**
10/2016 *Università degli Studi di Milano* Milano (IT)
◦ Final grade: 110/110 cum laude
◦ Thesis topic: Euclidean random combinatorial optimization
◦ Supervisor: Sergio Caracciolo
07/2016 **B.Sc. Student in Physics**
10/2013 *Università degli Studi di Milano* Milano (IT)
◦ Final grade: 110/110 cum laude
◦ Thesis topic: Fractional quantum Hall effect
◦ Supervisor: Luca Molinari

Publications

20/05/2020 **Statistical learning theory of structured data**
Erba, Ariosto, Gherardi, Rotondo
Arxiv preprint, [2005.10002](#)
14/07/2020 **Random geometric graphs in high dimension**
Erba, Ariosto, Gherardi, Rotondo
Physical Review E (2020), [doi:10.1103/PhysRevE.102.012306](#)
14/01/2020 **The Dyck bound in the concave 1-dimensional random assignment model**
Caracciolo, D'Achille, Erba* & Sportiello
Journal of Physics A (2020), [doi:10.1088/1751-8121/ab4a34](#)
18/06/2019 **Intrinsic dimension estimation for locally undersampled data**
Erba, Gherardi & Rotondo
Scientific Reports (2019), [doi:10.1038/s41598-019-53549-9](#)
19/05/2017 **Unified Fock space representation of fractional quantum Hall states**
Di Gioacchino, Molinari, Erba & Rotondo
Physical Review B (2017), [doi:10.1103/PhysRevB.95.245123](#)

*: in these publications, authors are listed in alphabetical order. I had a major role in performing the research, the numerical simulations and the writing involved in all of those manuscripts.

International schools & Internships

10/2019 **Mathematical and Computational Aspects of Machine Learning**
Ennio De Giorgi center Pisa (IT)
◦ Lectures on optimal transport, mean field Bayesian inference, numerical methods in machine learning and approximation theory

- 02/2019 **Lectures on Statistical Field Theories**
Galileo Galilei Institute Firenze (IT)
 ◦ Lectures on tensors networks, Floquet physics, Luttinger liquids and transport phenomena in 1d
- 09/2015 **Internship in Electronic Structure**
European Synchrotron Radiation Facility Grenoble (FR)
 ◦ Lectures on X-ray and neutron physics and imaging techniques
 ◦ Experimental project with the ID26 - “X-ray absorption and emission spectroscopy” group (PI: Pieter Glatzel) on the measurement of Eu3+ fluorescence spectrum
- 02/2012 **Valerio Filippini Internship**
European Joint Research Centre Ispra (IT)

Supervising experience

- Fall 2019 **Co-supervisor for M.Sc. Theses**
Università degli Studi di Milano Milano (IT)
 ◦ Sebastiano Ariosto, “Random geometric graphs in high dimension”
 ◦ Mirko Rossini, “Geometry of structured datasets via multi-scale persistency analysis”

Teaching experience

- Spring 2020 & 2019 **Tutoring for the “Mathematical methods in Physics” course**
Università degli Studi di Milano (IT), Physics dept. Milano (IT)
 ◦ Complex and functional analysis for second year B.Sc. course
- Fall 2019 **Tutoring for the “Introductory Mathematics” course**
Università degli Studi di Milano (IT), Natural Sciences dept. Milano (IT)
 ◦ High school level mathematics for students starting university with gaps in their knowledge
- 06/2017 **Substitute physics teacher for a secondary public school**
 10/2016 *Istituto Professionale “L. Einaudi”* Varese (IT)
- 06/2018 **Private lectures**
 11/2013 Varese (IT)
 ◦ Math and Physics from middle school level to bachelor level
 ◦ Chemistry, Computer Science, Latin, English at high school level

Talks & Posters

- 12/11/2019 **Intrinsic dimension estimation for locally undersampled data**
Michele Parrinello’s group, Università della Svizzera Italiana Lugano (CH)
 ◦ 30min invited talk
- 31/10/2019 **Intrinsic dimension estimation for locally undersampled data**
Complex System Meeting, Università degli Studi di Milano Milano (IT)
 ◦ 15min contributed talk
- 24/06/2019 **Intrinsic dimension estimation for locally undersampled data**
XXIV Statistical Physics Meeting, University of Parma Parma (IT)
 ◦ Poster
- 14/08/2016 **Slater decomposition of fractional quantum Hall states**
International Conference of Physics Students 2016, University of Malta Valletta (MT)
 ◦ 15min contributed talk

Participation to conferences

24-26/06/2019	XXIV Statistical Physics Meeting <i>University of Parma</i> ◦ Poster on “Intrinsic dimension estimation for locally undersampled data”	Parma (IT)
7-14/08/2017	XXXII International Conference of Physics Students <i>University of Torino</i>	Torino (IT)
11-13/05/2017	III Italian Conference of Physics Students <i>University of Bari</i>	Bari (IT)
11-17/08/2016	XXXI International Conference of Physics Students <i>University of Malta</i> ◦ Contributed talk on “Jack polynomials and quantum Hall effect”	Valletta (MT)
22-24/04/2016	II Italian Conference of Physics Students <i>University of Torino</i>	Torino (IT)
15-17/05/2015	I Italian Conference of Physics Students <i>University of Torino</i>	Torino (IT)

Other experiences

22/05/2018	Teacher for an e-textiles workshop for elementary school students <i>Makerstown 2018</i> ◦ Guided multiple groups of 20 children into making a bracelet with conductive sewing threads and LED lights	Brussels (BE)
03/2018	Student job at the office for didactics	
11/2017	<i>Università degli Studi di Milano, Maths dept.</i> ◦ Responsible for exams’ scheduling ◦ Responsible for the update of the informations on courses, professors and exams on the department websites	Milano (IT)
12/2017	Secretary and IT contributor	
09/2014	<i>Italian Association of Physics Students</i> ◦ Responsible for the bureaucracy of the non-profit association ◦ Contributor to the public website and the private online database of the association ◦ Organizer of the PAPAP16 event ◦ Organizer of outreach events ◦ Volunteer for the XXXII International Conference of Physics Students	
12/2017	Supervisor for 6 Junior Camps	
09/2014	<i>Sardinia Radio Telescope & Nus Observatory</i> ◦ Responsible for up to 54 high school students ◦ Teaching support to lecturers	Cagliari (IT) & Nus (IT)

Scholarships & Awards

2021-2019	Ph.D Scholarship Awarded by Università degli Studi di Milano	
2015-2017	Excellence Scholarship Yearly scholarship awarded by Università degli Studi di Milano to students complying with annual courses requirements	
2012	Valerio Filippini Scholarship First prize for a physics contest for high school students	
2012 & 2005	Classical Guitar studies Scholarship Awarded by the municipality of Besozzo (IT) to excellent students	
2008	Diplom in music theory and solfège Awarded by Conservatorio di Novara (IT)	

Computer Skills

Wolfram Mathematica	Proficient user
Office suites	Proficient user
Python	Intermediate user, proficient with the scientific and machine learning stack (numpy, pandas, matplotlib, pytorch)
C++	Intermediate user, familiar with LEMON and CGAL libraries
UNIX shell	Intermediate user. Experience with bash scripting and vim text editor
HTML, CSS, PHP	Intermediate user. Experience with static websites and php interfaces to SQL databases
L^AT_EX	Intermediate user
Julia	Beginner user
Haskell	Beginner user

Languages

Italian	Mothertongue
English	CEFR C1 (Certifications: Cambridge BULATS C1 (2019), Cambridge FCE B2 (2012))