

# 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

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## 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

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## Publications

28/02/2020 **Random geometric graphs in high dimension**  
Erba, Ariosto, Gherardi, Rotondo  
Arxiv preprint, [2002.12272](#)  
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.

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## 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 Eu<sup>3+</sup> fluorescence spectrum
- 02/2012 **Valerio Filippini Internship**  
*European Joint Research Centre* Ispra (IT)

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## 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”

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## 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

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## 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

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## Participation to conferences

- 24-26/06/2019 **XXIV Statistical Physics Meeting**  
*University of Parma* Parma (IT)  
 ◦ Poster on “Intrinsic dimension estimation for locally undersampled data”
- 7-14/08/2017 **XXXII International Conference of Physics Students**  
*University of Torino* Torino (IT)
- 11-13/05/2017 **III Italian Conference of Physics Students**  
*University of Bari* Bari (IT)

11-17/08/2016	<b>XXXI International Conference of Physics Students</b> <i>University of Malta</i> ◦ Contributed talk on “Jack polynomials and quantum Hall effect”	Valletta (MT)
22-24/04/2016	<b>II Italian Conference of Physics Students</b> <i>University of Torino</i>	Torino (IT)
15-17/05/2015	<b>I Italian Conference of Physics Students</b> <i>University of Torino</i>	Torino (IT)

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## Other experiences

12/2017	<b>Secretary and IT contributor</b>	
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 ◦ <b>Organizer of the PAPAP16 event</b> ◦ Organizer of outreach events ◦ Volunteer for the XXXII International Conference of Physics Students	
12/2017	<b>Supervisor for 6 Junior Camps</b>	
09/2014	<i>Sardinia Radio Telescope &amp; Nus Observatory</i> ◦ Responsible for up to 54 high school students ◦ Teaching support to lecturers	Cagliari (IT) & Nus (IT)

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## Scholarships & Awards

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

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## Computer Skills

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

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## Languages

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