Vittorio **Erba**

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Education

Ph.D. in Theoretical Physics 2018 - Present
Università degli Studi di Milano Milano (IT)

- Supervisor: Sergio Caracciolo
- Research topics: Euclidean random combinatorial optimization, Machine learning, Disordered systems
- Main collaborators: Sergio Caracciolo, Pietro Rotondo, Andrea Sportiello

M.Sc. in Physics (110 cum laude/110) 2016 - 2018
Università degli Studi di Milano Milano (IT)

B.Sc. in Physics (110 cum laude/110) 2013 - 2016
Università degli Studi di Milano Milano (IT)

Schools & Internships

Mathematical and Computational Aspects of Machine Learning 10/2019
Ennio De Giorgi center Pisa (IT)

- Lectures on optimal transport, mean field Bayesian inference, numerical methods in machine learning and approximation theory

Lectures on Statistical Field Theories 02/2019
Galileo Galilei Institute Firenze (IT)

- Lectures on tensors networks, Floquet physics, Luttinger liquids and transport phenomena in 1d

Internship in Electronic Structure 09/2015
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

Publications

8. **Self-induced quenched disorder in multimodal cavity quantum electrodynamic.** Erba, Pastore, Rotondo. In preparation
7. **The number of optimal matchings in the Euclidean assignment problem on the line.** Caracciolo, Erba*, Sportiello. In preparation
6. **The p-Airy distribution.** Caracciolo, Erba*, Sportiello. Preprint Arxiv (2020)
5. **Statistical learning theory of structured data.** Pastore, Rotondo, Erba, Gherardi. Physical Review E (2020, Editor's suggestion)
4. **Random geometric graphs in high dimension.** Erba, Ariosto, Gherardi, Rotondo. Physical Review E (2020)
3. **The Dyck bound in the concave 1-dimensional random assignment model.** Caracciolo, D'Achille, Erba*, Sportiello. Journal of Physics A (2020)

2. **Intrinsic dimension estimation for locally undersampled data.** Erba, Gherardi, Rotondo. Scientific Reports (2019)

1. **Unified Fock space representation of fractional quantum Hall states.** Di Gioacchino, Molinari, Erba, Rotondo. Physical Review B (2017)

*: authors are listed in alphabetical order. I had a major role in the research, simulation and writing of these papers.

Talks and Posters

Invited talk | Intrinsic dimension estimation for locally undersampled data 12/11/2019
Michele Parrinello's group, Università della Svizzera Italiana Lugano (CH)

Talk | Intrinsic dimension estimation for locally undersampled data 31/10/2019
Complex System Meeting, Università degli Studi di Milano Milano (IT)

Poster | Intrinsic dimension estimation for locally undersampled data 24/06/2019
Complex System Meeting, Università degli Studi di Milano Parma (IT)

Teaching

Tutoring for university courses Spring 2019 - Present
University of Milan Milano (IT)

- Fall 2020: Numerical treatment of experimental data (C++, OOP and numerical methods)
- Fall 2020: Precourse of mathematics for freshmen in physics (basic maths)
- Spring 2020: Mathematical methods in physics (complex and functional analysis)
- Fall 2019: Recovery course of mathematics for freshman in natural sciences (basic maths)
- Spring 2019: Mathematical methods in physics (complex and functional analysis)

Thesis supervision Fall 2019
University of Milan Milano (IT)

- Fall 2019, Sebastiano Ariosto, "Random geometric graphs in high dimension"
- Fall 2019, Mirko Rossini, "Geometry of structured datasets via multi-scale persistency analysis"

Substitute physics teacher for a secondary public school 20/2016 - 06/2017
Istituto Professionale "L. Einaudi" Varese (IT)

Scholarships

Ph.D Scholarship 2021-2019
Awarded by Università degli Studi di Milano

Excellence Scholarship 2015-2017
Awarded by Università degli Studi di Milano to students complying with annual courses requirements

Skills

- **Programming:** Julia, C++, Mathematica, Python
- **M. Learning/Optimization::** PyTorch, Flux, JuMP, CPLEX
- **Tools/Techs:** Bash, LaTeX, Inkscape
- **Web:** HTML/CSS

Languages

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

Participation to conferences

Brain Criticality Meeting 10/2020
Virtual venue

Complex Systems Meeting 10/2019
University of Milan Milano (IT)

Statistical Physics Meeting 06/2019
University of Parma Parma (IT)

International Conference of Physics Students 2016 & 2017
Organized by IAPS

Italian Conference of Physics Students 2015, 2016 & 2017
Organized by AISF

Other experiences

Teacher for an e-textiles workshop for elementary school students 22/05/2018
Makerstown 2018 Brussels (BE)

- Guided multiple groups of 20 children into making a bracelet with conductive sewing threads and LED lights

Student job at the office for didactics 11/2017 - 03/2018
Università degli Studi di Milano, Maths dept. Milano (IT)

- Responsible for exams' scheduling
- Responsible for the update of the informations on courses, professors and exams on the department websites

Secretary and IT contributor 09/2014 - 12/2017
Italian Association of Physics Students

- 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, a visit to the Gran Sasso national laboratories with 40 participants from all around Europe
- Organizer of outreach events
- Volunteer for the XXXII International Conference of Physics Students

Supervisor for 6 Junior Camps 09/2014 - 12/2017
Sardinia Radio Telescope & Nus Observatory Cagliari (IT), Nus (IT)

- Responsible for up to 54 high school students
- Teaching support to lecturers