

## PERSONAL INFORMATION

Luigi Marcello Borasi



## JOB APPLIED FOR

Ricercatore Tenure Track - s.c. 01/A3, ssd MAT/05-MAT/06 ora 01/MATH-03, ssd MATH-03/A-MATH-03/B (Codice 5582)

## WORK EXPERIENCE

March 2023 – Present

## Adjunct Professor

University of Milan (La Statale)  
Via Saldini, 50 20133 MILANO (MI), Italy

- Laboratorio di statistica matematica (2023/2024), Università di Milano (La Statale), (Triennale, CDL Matematica)
- Probabilità e statistica (2023/2024), Università di Verona, (Primo anno, CDL Informatica)

June 2023 – Present

## Type A Postdoctoral Fellow

University of Milan (La Statale)  
Via Saldini, 50 20133 MILANO (MI), Italy

Postdoctoral mentor: Prof. Dr. Stefania Ugolini

October 2019 – March 2021

## Postdoctoral researcher

Institute for Applied Mathematics, Universität Bonn  
Endenicher Allee 60 D-53115 Bonn, Germany

Postdoctoral mentors: Prof. Dr. Massimiliano Gubinelli & Prof. Dr. Sergio Albeverio

2017 (Summer term)

## Teaching assistant

Bonn University, Germany

- Nonlinear PDE II, under Prof. Dr. Margherita Disertori

## EDUCATION AND TRAINING

19.7.2019

## PhD in Mathematics

Institute for Applied Mathematics, Friedrich-Wilhelms-Universität Bonn, Germany

Thesis: Probabilistic and differential geometric methods for relativistic and Euclidean Dirac and radiation fields

Advisors: Prof. Dr. Juan J. L. Velázquez & Prof. Dr. Sergio Albeverio

20.10.2014

MA in Physics (*Laurea specialistica in Scienze fisiche*)

Università di Pisa, Pisa, Italy

Thesis: Complex scaled time oscillatory infinite dimensional integrals and the Gell-Mann Low formula

Advisor: Prof. Dr. Sergio Albeverio

24.6.2008

BA in Physics (*Laurea triennale in fisica*)

Università di Pisa, Pisa, Italy

**Thesis:** *Solitons and Instantons*

**Advisor:** Prof. Dr. Damiano Anselmi

## PERSONAL SKILLS

**Mother tongue** Italian

| Other languages   | UNDERSTANDING |         | SPEAKING           |                   | WRITING |
|-------------------|---------------|---------|--------------------|-------------------|---------|
|                   | Listening     | Reading | Spoken interaction | Spoken production |         |
| English           | C2            | C2      | C2                 | C2                | C2      |
| Toefl test (2015) |               |         |                    |                   |         |
| German            | A2            | A2      | A2                 | A2                | A2      |

Levels: A1 and A2: Basic user – B1 and B2: Independent user – C1 and C2: Proficient user  
[Common European Framework of Reference for Languages](#)

**Communication skills**

- team work: Having worked in various types of research teams, I developed a good ability of working in teams and I believe that teamwork is fundamental in the context of research. Moreover I strongly believe in establishing a productive environment which is friendly and collaborative.
- mediating skills: I work with people with different background and I believe to have gained very good interpersonal and communication skills which help to bring people together.
- intercultural skills: I have extensive experience working with people of different cultures and nationalities. I strongly believe that an international environment is crucial for research and more generally to gain a more thorough understanding of any topic.

**Organisational / managerial skills**

- during my PhD I was co organizer of a experimental series of interdisciplinary seminars called “Math Salon”. There we experimented with a different format for seminars and lectures which aimed to be more interactive and engaging than standard lecture formats. At the same time, we managed to include a very broad set of topics in Mathematics and to give the audience not only a general understanding of these topics, but also a glance at specific current research directions. This experiment resulted in a long lasting series of seminars. According to the participants the experiment was very successful and it has been a very thrilling experience for me which I am wish to iterate in the future.

| Digital competences | SELF-ASSESSMENT        |                   |                   |                   |                   |
|---------------------|------------------------|-------------------|-------------------|-------------------|-------------------|
|                     | Information Processing | Communication     | Content creation  | Safety            | Problem solving   |
|                     | Advanced, Level 6      | Advanced, Level 6 | Advanced, Level 5 | Advanced, Level 5 | Advanced, Level 6 |

[Digital competences - Self-assessment grid](#)

**Computer skills**

- competent with free-and-open-source software (FOSS) and GNU/Linux administration
- experience with programming languages including: Bash, C, Java, Javascript, Matlab/Octave, Mathematica, Maxima, Python, R.
- experience with formatting languages including: L<sup>A</sup>T<sub>E</sub>X, HTML, CSS
- experience with developing tools, e.g. git, make, ecc. . .

**Other skills** Composing, playing piano, listening to (mainly “classical”) music, love to travel and experience different cultures.

**Driving licence** B

## THESIS

[1] L. Borasi. “Probabilistic and differential geometric methods for relativistic and Euclidean Dirac and radiation fields.” PhD thesis. Bonn, 2019.

## ARTICLES

- [1] S. Ugolini L. Borasi F. De Vecchi. "A Nelson stochastic mechanics approach to time-dependent BEC." In: *In preparation* ().
- [2] L. Borasi. "Massive free fields of spin 0, 1/2, 1: a Rosetta stone." In: *In preparation* ().
- [3] L. Borasi. "Review and concrete description of the irreducible unitary representations of the universal cover of the complexified Poincaré group." In: *Rev. Math. Phys.* (2022).
- [4] L. Borasi. "Finite dimensional systems of free Fermions and diffusion processes on Spin groups." In: *J. Math. Phys.* **63** (2022).
- [5] S. Albeverio, L. Borasi, F. C. de Vecchi, and M. Gubinelli. "Grassmannian stochastic analysis and the stochastic quantization of Euclidean Fermions." In: *Probab. Theory Relat. Fields* (2022).

## TALKS (SELECTION)

- Jun 2024 *Grassmann stochastic analysis and Grassmann probability measures*. Fourth Italian Meeting on Probability and Mathematical Statistics, Roma, Italy
- Jun 2022 *Grassmann stochastic analysis and Euclidean Fermion Fields*. Third Italian Meeting on Probability and Mathematical Statistics, Bologna, Italy
- Jun 2018 *A geometric stochastic model for Fermions*, 42nd LQP Workshop "Foundations and Constructive Aspects of QFT", Bergische Universität Wuppertal, Germany
- Oct 2017 *A geometric stochastic model for Fermions*, Bogoliubov laboratory of theoretical physics, JINR, Dubna, Russia
- Sep 2016 *Integrability and tail estimates for Gaussian rough differential equations* (on the paper: T. Cass, C. Litterer, and T. Lyons, *Ann. Probab.* **41**, (2013) 3026-3050), Summer School: Paraproducts and Analysis of Rough Paths, Kopp, Germany
- Nov 2015 *A Poisson random field model and Euclidean quantum electromagnetic field*, Applied Analysis seminar, Bonn University, Bonn, Germany

## CONFERENCES AND WORKSHOPS (SELECTION)

- Jun. 2024 *Analysis, PDEs and applications*, Yerevan, Armenia
- Jun. 2024 *Fourth Italian Meeting on Probability and Mathematical Statistics*, Rome, Italy
- Feb. 2024 *Two-scale Convergence Homogenization Techniques and Multiscale Modeling*, PhD Lectures by Prof. Adrian Muntean, University of Milan (La Statale), Italy
- Nov. 2023 *Numerical Approximations of Stochastic Partial Differential Equations*, Minicourse by Prof. Peter Kloeden, University of Milan (La Statale), Italy
- Jun. 2022 *Third Italian Meeting on Probability and Mathematical Statistics*, Bologna, Italy
- Jul. 2019 *Mathematics of interacting QFT models*, York, UK
- Jul. 2018 Lake Como School of Advanced Studies: *Complexity and emergence: ideas, methods, with a special attention to economics and finance (CEIM)*, Como, Italy
- Jun. 2018 42nd LQP Workshop: *Foundations and Constructive Aspects of QFT*, Wuppertal, Germany
- Jun 2017 40th LQP Workshop: *Foundations and Constructive Aspects of QFT*, Leipzig, Germany
- Sep 2016 Summer School: *Paraproducts and Analysis of Rough Paths*, Kopp, Germany
- Aug 2016 CIME-EMS Summer School in applied mathematics: *Singular Random Dynamics*, Cetraro, Italy
- Jun 2016 *Stochastic Partial Differential Equations and Applications - X*, CIRM Levico, Italy
- May 2015 MASDOC Summer School: *Topics in renormalisation group theory and regularity structures*, Warwick, UK
- Feb & Jun 2015 *Geometric Mechanics, Variational and Stochastic Methods*, EPFL, Lausanne, Switzerland
- Jan. 2015 *Interacting particle systems in thermodynamic models*, GSSI, L'Aquila, Italy

## CURRENT RESEARCH

- |                           |  |
|---------------------------|--|
| Current projects          | <ul style="list-style-type: none"> <li>– Extension of probabilistic methods to the non-commutative case of Fermionic interacting particle systems and Euclidean Fermionic quantum fields.</li> <li>– Application of Nelson stochastic mechanics to time-dependent Bose-Einstein condensation employing probabilistic techniques, joint project with Prof. De Vecchi and Prof. Ugolini.</li> <li>– Application of double-stochastic processes (e.g. Cox process) to interacting many-particle stochastic systems, joint project with Prof. Ugolini.</li> <li>– Algebraic generalizations of white noise analysis, joint project with Prof. De Vecchi, Prof. Patras, Prof. Ugolini.</li> </ul> |
| Areas of specialization   | <ul style="list-style-type: none"> <li>• Stochastic calculus • Interacting diffusion processes and scaling limits • Random fields, Markov fields • Non-commutative probability • Axiomatic QFT, Euclidean QFT • Oscillatory infinite dimensional integrals, rigorous Feynman path integrals • Global analysis, semisimple Lie groups</li> </ul>  |
| Further areas of interest | <ul style="list-style-type: none"> <li>• Singular SPDEs, • Renormalization group, Constructive renormalization • Rough paths • Gauge theories • Infinite dimensional Lie algebras and groups</li> </ul>  |

## TEACHING STATEMENT

In my carrier so far, I had the opportunity of presenting scientific material to a broad audience. I have experience teaching large classrooms of students as well as a small audience. Moreover I found myself teaching students in different disciplines such as Informatics (Computer Science) and Mathematics. I had the occasion of co-organizing an experimental Seminar for PhD and Post-doctoral students in Mathematics where we experimented with a different way to present technical material. Finally, I have given many talks in different universities and departments addressing audiences from very different scientific backgrounds including Mathematicians, Physicists, Computer Scientists, Economists, and Engineers. I have been very lucky, having the opportunity of visiting many universities around the world. Which taught me different cultures on how to talk to an audience and how to present and teach. This experience has taught me a lot. Moreover I realized that I personally enjoy teaching and I am very motivated to improve my own teaching ability as well as, when given the opportunity, to experiment with different teaching formats.

1. I believe, teaching to be a core activity in the university, which complements and contributes to the research. It fulfill at least two main purposes. On one hand one needs to teach basic material which is fundamental for the preparation of the students during their studies and for their future career. On the other hand, in advanced courses, it is very important to expose the students to aspects and ideas from the present research in the particular fields. I have learned a lot on how to communicate to students when teaching fundamental basic material versus abstract technical knowledge or current research topics. In particular, I believe in simplifying the presentation and to communicate efficiently the structural cornerstone idea in a given discipline. It is important to keep the right balance between the simplification of the material and the objective of teaching the important ideas of a topic, especially considering that students come from different background and aim at different level of understanding of the given topic.
2. I have learned that different audience is sensitive to different types of presentation of the material. I believe in establishing a good communication between students and the lecturer(s). To achieve a good level of communication I have tried to understand the background of different students and to keep in mind the fundamental objective of a given course. Moreover I make a great effort to make the lectures engaging for the students and to promote questions during the lecture. I believe these questions are extremely important for the students to learn the material during the lectures and on the other hand help me understand if my exposition can be better trimmed for the given audience. I have been pleased to see that the student feedback to my teaching has been very positive.
3. I have personally experienced, as a lecturer and as a student in different universities, different techniques of presentation. I have realized that different means of presentation complement each-other. For example it is stimulating for students to complement a blackboard presentation with a simulation at the computer (e.g. for statistical analysis or to simulate the distribution of random variables, for example using R). Moreover, I have come to appreciate how important exercises are for students. They serve different purposes. Of course they prepare the students for the exam. But they serve much more than that. They also develop their problem solving ability and help them grow their confidence in their abilities and in their knowledge. This helps students well beyond the scope of a course.

To conclude, I see myself both as a researcher and as a lecturer and I hope, in my career, to be useful in both of these activities.

19/07/2024

Luigi Marcello Borasi