

Simmaco Di Lillo

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Education

- Ph.D. Visiting Student** Feb 2025 – Mar 2025
Center for Computational Mathematics, Flatiron Institute, Simons Foundation
Host supervisor: Dr. Alberto Bietti
- Ph.D. Candidate in Mathematics** Sep 2023 – Present
University of Rome “Tor Vergata”
Thesis: “The Geometry of Random Neural Networks”
Supervisor: Prof. Domenico Marinucci
- Master in Mathematics (Applied Mathematics curriculum)** Sep 2021 – Sep 2023
University of Rome “La Sapienza”
Thesis: *Stein’s method and applications to change point detection*
Supervisor: Prof.ssa. Alessandra Faggionato
Final grade: 110/110 with honors
- Bachelor in Mathematics (Applied Mathematics curriculum)** Sep 2018 – Sep 2021
University of Pisa
Thesis: *The SIR model: bottom-up on a network*
Supervisor: Dr. Fabio Durastante
Final grade: 110/110 with honors

Publications

- (2026) S. Di Lillo, C. Macci, B. Pacchiarotti. *Large deviation principles and functional limit theorems in the deep limit of wide random neural networks*.
arXiv: [2601.04677](#)
- (2025) S. Di Lillo. *Critical Points of Random Neural Networks*.
arXiv: [2505.17000](#) (in press in *Springer INdAM Series*)
- (2025) S. Di Lillo, et al. *Fractal and Regular Geometry of Deep Neural Networks*.
arXiv: [2504.06250](#) (in review on the *Annals of Applied Probability*).
- (2025) S. Di Lillo, et al. *Spectral complexity of deep neural networks*.
SIAM Journal on Mathematics of Data Science, **7**(3). doi: [10.1137/24M1675746](#).
- (2025) S. G. Grisanti, et al. *Neurological long COVID in the outpatient clinic: Is it so long?*
European Journal of Neurology **32** (2025). doi: [10.1111/ene.16510](#).
- (2023) L. Pezza, S. Di Lillo.
Fractional Dynamical Systems solved by a Collocation Method based on Refinable Spaces.
Axioms **12**(5). doi: [10.3390/axioms12050451](#).

Co-supervision and Refereeing Activity

- Referee for the journal *Bernoulli*
- Referee for the journal *Applied and Computational Harmonic Analysis*.
- Valerio Bretti, Master Thesis in Mathematics: *Orthogonal polynomials and applications to Neural Networks*, a.a. 2023/24.
- Agnese Profico, Bachelor Thesis in Mathematics: *Spazi di funzioni e Reti Neurali: il teorema di Bach e Bietti*, a.a. 2023/24.

Talks and Posters

1. *Three Regimes of Spectral and Geometric Complexity in Deep Networks* 21 Jan 2026
4th Workshop of UMI Group “Math4AiML” University of Roma “La Sapienza”. (Contributed talk)
2. *The Geometry of Random Neural Networks* 8 – 12 Sep 2025
Summer School: Mathematical methods for high-dimensional data
University of Rome “La Sapienza”. (Poster)
3. *The Geometry of Random Neural Networks* 28 Nov 2025
Statistics Seminar Collegio Carlo Alberto. Torino (Invited speaker)
4. *A Geometrical Overview of Random Neural Networks* 16 – 20 June 2025
PRIN GRAFIA Conference, Cortona (Italy). (Invited speaker)
5. *On the Fractal Geometry of Random Neural Networks.* 7 – 9 May 2025
Fractional Calculus, Probability and Non-Local Operators 2025,
University “Luigi Vanvitelli”. (Poster)
6. *Random Neural Networks: Spectral Complexity. Fractal or Regular Boundary?* 20 March 2025
University of Trento, Department of Mathematics. (Invited speaker)
7. *On the Spectral Complexity of Deep Neural Networks.* 29 – 31 Jan 2025
3rd Workshop of UMI Group “Math4AiML” University of Bari. (Contributed talk)
8. *Spectral Complexity of Deep Neural Networks.* 6 – 15 Aug 2024
Machine Learning Theory Summer School, August 2024, Princeton, New Jersey. (Poster)

Conferences, Schools and Seminars

- Phd School: “Network and Risk Propagation” 18 – 31 Jan 2025
Collegio Internazionale Ca’ Foscari. University of Venice
- PhD Course: Analytical Methods for Markov Processes Jan – Feb 2025
University of Rome “La Sapienza”
- Summer School: *Mathematical methods for high-dimensional data* 8 – 12 Sep 2025
University of Rome “La Sapienza”
- Conference: *Random Geometric Structures and Statistical Physics* 30 Jun – 4 Jul 2025
University of Rome “La Sapienza”
- Conference: *International Conference PRIN GRAFIA* 16 – 20 Jun 2025
Cortona (Italy).
- PhD Course *Statistical mechanics and disordered systems* 26 May – 19 Jun 2025
University of “Roma Tor Vergata” (Italy).
- Conference: *Fractional Calculus, Probability and Non-Local Operators* 7 – 9 May 2025
University “Luigi Vanvitelli”, Caserta (Italy)
- Summer School: *High-Dimensional Approximation* 23 – 27 Sep 2024
CIME, Cetraro (Italy).
- Meeting *Mathematics of Machine Learning* 9 – 13 Sep 2024
INdAM, Cortona (Italy).
- Workshop: *Analysis and Geometry of Random Fields,* 4 – 6 Sep 2024
INdAM Rome (Italy).
- Summer School: *Machine Learning Theory* 6 – 15 Aug 2024
University of Princeton (New Jersey).
- PhD course: *Introducing Random Geometry* 18 Mar – 12 Apr 2024
University of Rome “La Sapienza”. Mark: 30/30
- Workshop: *One day workshop on Random Fields* 29 Feb 2024
University of Milano-Bicocca (Italy).
- PhD course *An introduction to Score-based Generative Models* 19 – 22 Feb 2024
RoMaDS Centre, University of “Roma Tor Vergata” (Italy).

- PhD course *Computational Topology and Topological Data Analysis*. 16 Jan – 15 Feb 2024
University of “Roma Tor Vergata” (Italy) Mark: 30/30

Work Experience

University Tutor Mar 2024 – Jun 2025

University of Rome “Tor Vergata”

- Delivered classroom lectures for *Calculus*. Supervisor: Prof. Mario Abundo.
- Delivered classroom lectures for *Geometry*. Supervisor: Prof. Filippo Viviani.
- Assisted in conducting examinations.

Trainee (Multimodal Biomedical Data Analysis) Nov 2022 – Sep 2023

Policlinico “San Martino” Hospital (Scholarship), Genoa, Italy

Supervisor: Prof. Michele Piana.

- Applied unsupervised AI and statistical models to interpret clinical data associated with long COVID-19 patients.
- Employed Machine Learning techniques to deconvolve MRI data of glioma.
- Used R and Python for data analysis.

University Tutor Aug 2021 – Nov 2022

University of Rome “La Sapienza”

- Remedial classes for *General Mathematics* (75h). Supervisor: Prof. Eugenio Montefusco.
- Delivered lectures for *Numerical Analysis* (150h). Supervisor: Prof. Laura Pezza.
- Remedial classes for *Calculus and Biostatistics* (75h). Supervisor: Prof. Gianluca Panati.
- Assisted in conducting examinations.

Skills

Programming: C, C++, R, Python, MATLAB, Wolfram (Mathematica), Bash, OCaml, Julia.

Markup: \LaTeX , HTML.

Other IT: Office suite, Unix-like systems.

Languages: Italian (Native), English (University B2).

Participation in Research Groups and Centers

Gruppo Nazionale per l’Analisi Matematica, la Probabilità e le loro Applicazioni

Istituto Nazionale di Alta Matematica “Francesco Severi”

Oct 2023 – Present

Director: Prof. Gianni Dal Maso

Rome Centre on Mathematics for Modelling and Data Sciences

Sep 2023 – Present

Department of Mathematics, University of Rome “Tor Vergata”

Coordinator: Prof. Domenico Marinucci

Updated: February 3, 2026