# Giorgio Cipolloni

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## General Information


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|---|---|
| Affiliation | Princeton Center for Theoretical Science (PCTS) and Department of Mathematics, Princeton University |
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## Positions

Sep 2021-Current **Research Fellow**, *Princeton Center for Theoretical Sciences (PCTS)*.

Feb 2021-Aug 2021 **Postdoc**, *IST Austria*, Erdős Group.

## Education

2021 **PhD student**, *IST Austria*, Erdős Group.
**PhD Thesis Advisor:** Prof. László Erdős
**Title:** Fluctuations in the spectrum of random matrices

2017 **Master Degree**, *Univeristy of Rome Tor Vergata*, Dept. of Mathematics, Rome.
**Master Thesis Advisor:** Prof. Carlangelo Liverani
**Title:** Deterministic walks
**Grade:** 110/110 Summa cum laude

2015 **Bachelor's Degree**, *Univeristy of Rome Tor Vergata*, Dept. of Mathematics, Rome.
**Thesis Advisor:** Prof. Carlo Sinestrari
**Title:** Equazioni di Hamilton-Jacobi e problemi di controllo ottimale
**Grade:** 110/110 Summa cum laude

2012 **High School Diploma**, *Liceo Scientifico M. Vitruvio Pollione*, Avezzano, Italy.
**Grade:** 100/100

## Publications

1. **Fluctuations for differences of linear eigenvalue statistics for sample covariance matrices** with László Erdős.
   Random Matrices: Theory and Applications 9, Vol. 3 (2020).
   **arXiv version:** arXiv:1806.08751.
2. **Cusp universality for random matrices II: The real symmetric case** with László Erdős, Torben Krüger, and Dominik Schröder.
   Pure Appl. Anal. 1, 615-707 (2019).

**arXiv version:** arXiv:1811.04055.

3. **Edge Universality for non-Hermitian Random Matrices**
   with László Erdős, and Dominik Schröder.
   Probab. Theory and Related Fields 179, 1–28 (2021).
   **arXiv version:** arXiv:1908.00969.
4. **Optimal Lower Bound on the Least Singular Value of the Shifted Ginibre Ensemble**
   with László Erdős, and Dominik Schröder.
   Prob. Math. Physics 1, 101–146 (2020).
   **arXiv version:** arXiv:1908.01653.
5. **Central Limit Theorem for Linear Eigenvalue Statistics of non-Hermitian Random Matrices**
   with László Erdős, and Dominik Schröder.
   Communications on Pure and Applied Mathematics 76.5, 946-1034 (2023).
   **arXiv version:** arXiv:1912.04100.
6. **Fluctuation Around the Circular Law for Random Matrices with Real Entries**
   with László Erdős, and Dominik Schröder.
   Electron. J. Probab. 26: 1-61 (2021).
   **arXiv version:** arXiv:2002.02438.
7. **Eigenstate Thermalization Hypothesis for Wigner Matrices**
   with László Erdős, and Dominik Schröder.
   Communications in Mathematical Physics, 388, 1005–1048 (2021).
   **arXiv version:** arXiv:2012.13215.
8. **Functional Central Limit Theorems for Wigner Matrices**
   with László Erdős, and Dominik Schröder.
   Annals of Applied Probability 33.1, 447-489 (2023).
   **arXiv version:** arXiv:2012.13218.
9. **Thermalisation for Wigner matrices**
   with László Erdős, and Dominik Schröder.
   Journal of Functional Analysis 282, Issue 8 (2022).
   **arXiv version:** arXiv:2102.09975.
10. **Normal fluctuation in quantum ergodicity for Wigner matrices**
    with László Erdős, and Dominik Schröder.
    Ann. Probab. 50 (3): 984-1012 (2022).
    **arXiv version:** arXiv:2103.06730.
11. **On the condition number of the shifted real Ginibre ensemble**
    with László Erdős, and Dominik Schröder.
    SIAM Journal on Matrix Analysis and Applications 43.3, 1469-1487 (2022).
    **arXiv version:** arXiv:2105.13719.
12. **Density of small singular values of the shifted real Ginibre ensemble**
    with László Erdős, and Dominik Schröder.
    Annales Henri Poincaré. Vol. 23. No. 11. (2022).
    **arXiv version:** arXiv:2105.13720.
13. **Quenched universality for deformed Wigner matrices**
    with László Erdős, and Dominik Schröder.
    Probability Theory and Related Fields 185.3-4, 1183-1218 (2023).
    **arXiv version:** arXiv:2106.10200.
14. **On the Spectral Form Factor for Random Matrices**
    with László Erdős, and Dominik Schröder.
    Communications in Mathematical Physics 401, 1665–1700 (2023).

**arXiv version:** arXiv:2109.06712.

15. **Optimal multi-resolvent local laws for Wigner matrices**
    with László Erdős, and Dominik Schröder.
    Electronic Journal of Probability 27, 1-38 (2022).
    **arXiv version:** arXiv:2112.13693.
16. **Rank-uniform local law for Wigner matrices**
    with László Erdős, and Dominik Schröder.
    Forum of Mathematics, Sigma. Vol. 10 (2022).
    **arXiv version:** arXiv:2203.01861.
17. **Directional Extremal Statistics for Ginibre Eigenvalues**
    with László Erdős, Dominik Schröder, and Yuanyuan Xu.
    Journal of Mathematical Physics 63.10 (2022). Selected as Editor's Pick.
    **arXiv version:** arXiv:2206.04443.
18. **On the rightmost eigenvalue of non-Hermitian random matrices**
    with László Erdős, Dominik Schröder, and Yuanyuan Xu.
    Accepted to Annals of Probability (2023).
    **Preprint:** arXiv:2206.04448.
19. **Dynamical Localization for Random Band Matrices up to $W \ll N^{1/4}$**
    with Ron Peled, Jeffrey Schenker, and Jacob Shapiro (2022).
    **Preprint:** arXiv:2206.05545.
20. **Entanglement Entropy of Non-Hermitian Eigenstates and the Ginibre Ensemble**
    with Jonah Kudler-Flam.
    Physical Review Letters 130.1 (2023).
    **arXiv version:** arXiv:2206.12438.
21. **Ruminations on Matrix Convexity and the Strong Subadditivity of Quantum Entropy**
    with Michael Aizenman.
    Letters in Mathematical Physics 113.1 (2023).
    **arXiv version:** arXiv:2210.10729.
22. **Mesoscopic Central Limit Theorem for non-Hermitian Random Matrices**
    with László Erdős, and Dominik Schröder.
    Accepted to Probability Theory and Related Fields (2023).
    **Preprint:** arXiv:2210.12060.
23. **Precise asymptotics for the spectral radius of a large random matrix**
    with László Erdős, and Yuanyuan Xu (2022).
    **Preprint:** arXiv:2210.15643.
24. **Fluctuations of eigenvector overlaps and the Berry conjecture for Wigner matrices**
    with Lucas Benigni (2022).
    **Preprint:** arXiv:2212.10694.
25. **Optimal Lower Bound on Eigenvector Overlaps for non-Hermitian Random Matrices**
    with László Erdős, Joscha Henheik, and Dominik Schröder (2023).
    **Preprint:** arXiv:2301.03549.
26. **Gaussian fluctuations in the Equipartition Principle for Wigner matrices**
    with László Erdős, Joscha Henheik, and Oleksii Kolupaiev.
    Forum of Mathematics, Sigma. Vol. 11 (2023).
    **arXiv version:** arXiv:2301.05181.
27. **Non-Hermitian Hamiltonians Violate the Eigenstate Thermalization Hypothesis**
    with Jonah Kudler-Flam (2023).
    **Preprint:** arXiv:2303.03448.

28. **The Dissipative Spectral Form Factor for I.I.D. Matrices**
with Nicoló Grometto (2023).
**Preprint:** arXiv:2306.16262.
29. **Eigenstate thermalisation at the edge for Wigner matrices**
with László Erdős, and Joscha Henheik.
**Preprint:** arXiv:2309.05488.

## Proceedings

1. **Edge Universality for non-Hermitian Random Matrices**
Oberwolfach Rep. 16 (2019), no. 4, pp. 3480–3481.
2. **Fluctuations in the Spectrum of non-Hermitian i.i.d. Matrices**
J. Math. Phys. 63, 053503 (2022).

## Grants and awards

2017-2019 **Marie Sklodowska-Curie scholarship**.

2018 **Prize for outstanding master thesis in Mathematics**, *University of Rome Tor Vergata*.

2013-2015 **Prize for outstanding students**, *University of Rome Tor Vergata*.

## Invited Talks

2023 **Probability Seminar**, *University of Toronto*.

2023 **Probability Seminar**, *Universitá di Roma Tre*.

2023 **High Dimensional Statistics and Random Matrices**, *Island of Porquerolles*.

2023 **Mathematical Physics Seminar**, *SISSA, Trieste*.

2023 **Probability Seminar**, *CMSA, Harvard University*.

2023 **Probability Seminar**, *University of Minnesota/Leigh University (Online)*.

2023 **Probability Seminar**, *Brown University*.

2023 **High Energy Theory Seminar**, *Princeton University*.

2023 **Probability Seminar**, *CUNY*.

2022 **Probability Seminar**, *University of Erlangen*.

2022 **Analysis, PDE & Probability Seminar**, *KIAS*.

2022 **Mathematical Physics Seminar**, *UT Austin*.

2022 **Probability Seminar**, *Courant Institute*, New York University.

2022 **Probability Seminar**, *Cornell University*.

2022 **Probability Seminar**, *University of California San Diego*.

2022 **Probability Seminar**, *Tulane University*.

2022 **Spectral Theory Seminar**, *Rice University*.

2022 **Probability and Statistical Physics Seminar**, *University of Chicago*.

2022 **Penn/Temple Probability Seminar**, *University of Pennsylvania*.

2021 **Probability Seminar**, *Princeton University*.

2021 **Mathematical Physics Seminar**, *Princeton University*.

2021 **ICMP (International Congress on Mathematical Physics)**, *Contributed Talk, Session Probability & Random Structures, Geneva*.

2021 **Probability Seminar**, *Universitá di Roma Tre*.
2021 **Queen Mary Postgraduate Seminar**, *Queen Marry (Online)*.
2021 **Stanford Probability Seminar**, *Stanford University (Online)*.
2021 **QLunch Seminar**, *University of Copenhagen (Online)*.
2021 **Matrices et graphes aléatoires (MEGA)**, *Institute Henri Poincaré (Online)*.
2020 **Mathematical Physics Learning Seminar**, *University of Connecticut (Online)*.
2020 **Disordered Systems Group Seminar**, *King's College (Online)*.
2020 **Oberseminar Stochastics**, *University of Bonn (Online)*.
2020 **Random Matrix Seminar**, *KTH (Online)*.
2020 **Probability Seminar**, *University of California Los Angeles (Online)*.
2020 **UniMelb-Bielefeld RMT Seminar**, *University of Melbourne (Online)*.
2019 **Workshop on Random Matrices**, *MFO Oberwolfach*.
2019 **Randomness in Physics and Mathematics: From Stochastic Processes to Networks**, *ZiF Center*, Bielefeld.
2019 **From Many Body Problems to Random Matrices**, *BIRS Center*, Banff.
2017 **Dynamical Systems seminar**, *University of Vienna*.

## Teaching Experience

2023 **Calculus (MAT103)**, *Princeton University*.
2023 **Linear Algebra (MAT202)**, *Princeton University*.
2020-2021 **Teaching assistant "Selected Topics in Analysis and Applications"**, *IST Austria*.
2020 **Teaching assistant "Random Matrices"**, *IST Austria*.
2017 **Teaching assistant "Calculus 2 for chemistry"**, *University of Rome Tor Vergata*.

## Conferences, Workshops, and Schools

2022 **Random media** & **large deviations**, *Courant Institute*, New York University.
2022 **Random Matrices and Random Landscapes**, *Ascona*.
2020 **Random Matrices and Their Applications**, *New York (Online)*.
2019 **Dynamical Systems: From Geometry to Mechanics**, *Rome*.
2018 **XIX International Congress of Mathematical Physics**, *Montreal*.
2018 **EMS-IAMP Summer School in Mathematical Physics**, *Ischia*.
2018 **Budwiser Seminars**, *Budapest*.
2017 **Summer School in Mathematical Physics**, *Ravello*.
2016 **Summer School in Mathematical Physics**, *Ravello*.

## Service work

### Reviewing activities:

Annales de l'Institut Henri Poincaré (B) Probabilités et Statistiques (AIHP), Annals of Applied Probability (AAP), Annales Henri Poincaré (AHPO), Annals of Probability (AoP), Astérisque, Bernoulli Journal (BEJ), Communications in Mathematical Physics (CIMP), Electronic Communications in Probability (ECP), Journal of Functional Analysis (JFA),

Journal of Statistical Physics (JSP), Mathematical Reviews, Nature Physics, Probability Theory and Related Fields (PTRF).

### Workshop organizing:

1) "Mathematical Challenges in Quantum Mechanics", co-organized with Michael Aizenman, Bruno Nachtergaele, Simone Warzel, and Jacob Shapiro.
2) "Physics for Neural Networks", co-organized with William Bialek, Boris Hanin, and Francesca Mignacco.
3) "Random Physics", co-organized with Jonah Kudler–Flam, Samuel A. Leutheusser, Gautam Satishchandran, and Edward Witten.

### Seminar organizing:

1) Princeton Center for Theoretical Science (PCTS) seminars.
2) Probability seminars Princeton University.
3) Mathematical Physics seminars Princeton University.

## Language Skills

- Italian — Mother tongue
- English — Fluent