

Elisabetta Cornacchia

Assistant Professor at Bocconi University

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🌐 <https://sites.google.com/view/e-cornacchia/home>

Research Interests

Theory of Deep Learning, High-Dimensional Statistics.

Academic and Professional Experience

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| Feb 2026 – ongoing | Assistant Professor, Bocconi University, Milan, Italy.
Department of Computing Sciences. |
| Oct 2024 – Dec 2025 | Postdoctoral Researcher, Inria and École Normale Supérieure (ENS) Paris, France.
Computer Science Department (DI), Argo project-team.
Academic Host: Prof. Laurent Massoulié. |
| Oct 2023 – Oct 2024 | Postdoctoral Researcher, Massachusetts Institute of Technology (MIT), US.
NSF-Simons Collaboration on the Mathematics of Deep Learning.
Academic Host: Prof. Elchanan Mossel, Department of Mathematics. |
| Sept 2022 – Dec 2022 | Visiting Ph.D. Student, Massachusetts Institute of Technology (MIT), US.
Institute for Data, Systems and Society (IDSS). |
| Aug 2018 – Jan 2019 | Risk and Middle Office Intern, Mercuria Energy Trading S.A., London UK.
Developed quantitative tools to evaluate the risk of portfolios within the firm, and supported the Agricultural Desk's Data Science Team. |

Education

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| Sept 2019 – July 2023 | Ph.D. Mathematics, École Polytechnique Fédérale de Lausanne (EPFL), Switzerland.
Thesis supervisor: Prof. Emmanuel Abbé, Chair of Mathematical Data Science.
Thesis title: <i>Fundamental Limits in Statistical Learning Problems: Block Models and Neural Networks.</i> |
| Sept 2017 – July 2019 | M.Sc. Applied Mathematics, École Polytechnique Fédérale de Lausanne (EPFL), Switzerland.
Specialization in Applied Probabilities and Statistics.
Thesis title: <i>Crowd Polarization under Pairwise Interaction.</i> |
| Sept 2014 – July 2017 | B.Sc. Mathematics for Engineering, Polytechnic of Turin, Italy.
Final grade: 110/110 with honors.
Thesis title: <i>Epidemic Dynamics over a Graph.</i> |

Awards

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| 2023 | Article on Quanta Magazine, 'Mathematicians Roll Dice and Get Rock-Paper-Scissors',
https://www.quantamagazine.org/mathematicians-roll-dice-and-get-rock-paper-scissors-20230119/ . |
| 2021 | Best Student Paper Award, Conference on Learning Theory (COLT) 2021. |
| 2020 | PhD Teaching Award, Section of Mathematics, EPFL. |
| 2015-2017 | Young Talent Project, Polytechnic of Turin and Fondazione CRT bank. |
| 2016 | European Innovation Academy (EIA). |
| 2015 | Women in Engineering, Polytechnic of Turin and Fondazione CRT bank. |

Awards (continued)

FCA Awards Program, FCA Group.

Research Publications

- 1 Cornacchia, E., Mikulincer, D., & Mossel, E. (2025). Low-dimensional functions are efficiently learnable under randomly biased distributions. *Conference on Learning Theory (COLT) 2025*.
<https://arxiv.org/abs/2502.06443>
- 2 Abbe, E., Cornacchia, E., Hązła, J., & Kougang-Yombi, D. (2024). Learning high-degree parities: The crucial role of the initialization, In *International Conference on Learning Representations (ICLR) 2025*. <https://arxiv.org/abs/2412.04910>
- 3 Bach, F., Cornacchia, E., Pesce, L., & Piccioli, G. (2024). Theory and applications of the sum-of-squares technique. *Journal of Statistical Mechanics: Theory and Experiment (Les Houches 2022 Lecture Notes)*.
<https://arxiv.org/abs/2306.16255>
- 4 Abbe, E., Cornacchia, E., & Lotfi, A. (2023). Provable advantage of curriculum learning on parity targets with mixed inputs, In *Advances on Neural Information Processing Systems (NeurIPS) 2023*.
<https://arxiv.org/abs/2306.16921>
- 5 Cornacchia, E., & Mossel, E. (2023). A mathematical model for curriculum learning for parities, In *International Conference on Machine Learning (ICML) 2023*. <https://arxiv.org/abs/2301.13833>
- 6 Abbe, E., Bengio, S., Cornacchia, E., Kleinberg, J., Lotfi, A., Raghu, M., & Zhang, C. (2022). Learning to reason with neural networks: Generalization, unseen data and boolean measures, In *Advances on Neural Information Processing Systems (NeurIPS) 2022*. <https://arxiv.org/abs/2205.13647>
- 7 Abbe, E., Cornacchia, E., Hązła, J., & Marquis, C. (2022). An initial alignment between neural network and target is needed for gradient descent to learn, In *International Conference on Machine Learning (ICML) 2022*. <https://arxiv.org/abs/2202.12846>
- 8 Cornacchia, E., Mignacco, F., Veiga, R., Gerbelot, C., Loureiro, B., & Zdeborová, L. (2022). Learning curves for the multi-class teacher-student perceptron, In *Machine Learning: Science and Technology (MLST)*. <https://arxiv.org/abs/2203.12094>
- 9 Abbe, E., Cornacchia, E., Gu, Y., & Polyanskiy, Y. (2021). Stochastic block model entropy and broadcasting on trees with survey, In *Conference on Learning Theory (COLT) 2021, Best Student Paper Award*. <https://arxiv.org/abs/2101.12601>
- 10 Cornacchia, E., & Hązła, J. (2020). Intransitive dice tournament is not quasirandom, In *Journal of Combinatorial Theory*. <https://arxiv.org/abs/2011.10067>
- 11 Cornacchia, E., Singer, N., & Abbe, E. (2020). Polarization in attraction-repulsion models, In *International Symposium on Information Theory (ISIT) 2020*.
<https://arxiv.org/abs/2006.05251>

Research Talks

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| Dec 2025 | MIPA Laboratory Seminar , Université de Nimes, France (invited seminar). |
| Sept 2025 | ENUMATH 2025-Minisymposium on Numerical Optimization in Machine Learning , Heidelberg University, Heidelberg, Germany (invited talk). |
| June 2025 | ASCAI Workshop , Laboratoire de Mathématiques D'Orsay (LMO), Orsay, France (invited talk). |
| May 2025 | LemanTh Workshop , EPFL, Lausanne, Switzerland (invited talk). |
| March 2025 | SuPerGRandMa Seminar , Laboratoire de Mathématiques D'Orsay (LMO), Orsay, France (invited seminar). |

Research Talks (continued)

Feb 2025	Ellis Talk , Institute of Science and Technology Austria (ISTA), Vienna, Austria (invited seminar).
Jan 2025	Department of Computing Sciences Seminar , Bocconi University, Milan, Italy (invited seminar).
Dec 2024	Argo Team Seminar , Inria, Paris, France (seminar). MaLGa-LCSL Seminar , Machine Learning Genoa Center (MaLGa), Genoa, Italy (invited seminar).
Nov 2024	Center for Data Science (CSD) Seminar , École Normale Supérieure (ENS), Paris, France (invited seminar).
Sept 2024	Mathematics of Machine Learning Workshop , Cortona, Italy (invited talk).
June 2024	4th Italian Meeting on Probability and Mathematical Statistics , Rome, Italy (invited talk).
May 2024	Mathematics of Deep Learning Collaboration Meeting , UCSD, San Diego, US (invited talk).
March 2024	Women in Data Science Workshop , Microsoft NERD Center, Cambridge, US (poster and spotlight talk).
Jan 2024	Mathematics for Artificial Intelligence and Machine Learning Workshop , Bocconi University, Milan, Italy (contributed talk).
March 2023	Seminar of Nicolas Flammarion's group , EPFL, Lausanne, Switzerland (invited seminar).
Feb 2023	Dyogene Team Seminar , Inria, Paris, France (seminar).
Nov 2022	Seminar of Bin Yu's group , UC Berkeley, Berkeley (CA), US (seminar).
Sept 2022	2022 Mathematical and Scientific Foundations of Deep Learning Annual Meeting , Simons Foundation, New York City, US (plenary talk). Seminar of Yury Polyanskiy's group , MIT, Cambridge (MA), US (invited seminar).
June 2022	Youth in High Dimensions , ICTP, Trieste, Italy (invited talk). DISMA - Eccellenza seminar , Polytechnic of Turin, Turin, Italy (invited seminar).
May 2022	MoDL Monthly Meeting , online (seminar).
Sept 2021	Workshop in Rigorous Evidence for Information-Computation Trade-offs , EPFL, Lausanne, Switzerland (invited talk).
Aug 2021	Conference on Learning Theory (COLT) 2021 , online and Boulder, Colorado, US (long oral, joint with Y. Gu).
Feb 2020	Swiss Winter School on Theoretical Computer Science , Zinal, Switzerland (contributed talk).

Teaching, Mentoring and Service

Teaching	Teaching Assistant, École Polytechnique Fédérale de Lausanne (EPFL), Switzerland. <i>Bachelor courses:</i> Advanced Linear Algebra II (2019), Probabilities and Statistics (2020, 2021, 2022), Analysis II (2023). <i>Graduate courses:</i> Applied Biostatistics (2019), Combinatorial Statistics (2019, 2020, 2021). Teaching Assistant, Polytechnic of Turin. <i>Bachelor courses:</i> Mathematical Analysis I and II (2016,2017).
Mentoring	Tutor at the 5th Learning Theory Alliance (Let-All) Mentoring Workshop , Oct. 2023, online. Held a 2-hour mentoring session for undergraduate and graduate students interested in the theory of machine learning.

Teaching, Mentoring and Service (continued)

- Service** **Co-Organizer of the ‘Principles of Generative Models’ Workshop at EurIPS 2025**, Dec 2025, Copenhagen, Denmark.
- Co-Organizer of the ‘Methods and Opportunities at Small Scale (MOSS)’ Workshop at ICML 2025**, July 2025, Vancouver, Canada.
- Reviewer for NeurIPS, ICLR, ICML, ISIT, M3L Workshop at NeurIPS.**