Fabrizio Boninsegna

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Professional Summary

Ph.D. Candidate specializing in **Randomized Algorithms**, **Probabilistic Modelling**, and **High-Dimensional Data** with a foundational background in **Theoretical Physics**. Proven track record of publishing at top-tier AI venues (**NeurIPS** and **ICML** with a spotlight work). Expert in designing efficient algorithms for complex data constraints, with deep proficiency in **Python**. Seeking ML Research or Engineering roles to apply rigorous statistical inference to large-scale, real-world challenges.

Technical Expertise

Core Foundations: **Randomized Algorithms**, **Differential Privacy**, Statistical Inference, Probabilistic Modelling, High-Dimensional Geometry, Network Science, Statistical and Quantum Physics.

AI & Data Science: **PyTorch**, TensorFlow, Scikit-learn, NumPy, Pandas, GeoPandas, Scipy, Matplotlib/Seaborn.

Engineering: **Python** (Expert), **Rust** & **C++** (Functional proficiency), **SQL**, **Bash**, Git, LaTeX.

Domain Focus: **Trustworthy AI** (Private training and Fairness), Private Data Science, Urban Analytics, Complex Systems Modelling, Mobility Data Science.

Education

Ph.D. in Information Engineering (Computer Science)
University of Padova *2022 – 2026*

- **Research Focus:** Algorithms for Differential Privacy, High Dimensional Similarity Search, and Mobility.
- **Key Achievements:** Results published at **ICML, NeurIPS, PETS, and FORC** on private quantile estimations, private nearest neighbour counting in high dimension, and private release of mobility data.
- **Collaboration:** Industrial PhD in partnership with **Motion Analytica Srl**.
- *Supervisors:* Prof. Francesco Silvestri, Prof. Martin Aumüller.

M.Sc. in Physics
University of Padova, 110/110 cum laude *2019 – 2022*

- **Thesis:** *Problems of Ranking and Dynamics of Complex Bipartite Networks in Economic Complexity.*
- **Specialization:** Statistical Physics, Complex Systems, and Many-Body Quantum Theory.

B.Sc. in Physics
University of Padova, 105/110 *2016 – 2019*

- **Thesis:** *Solitons in Classical and Quantum Fluids.*

Research Experience

IT University of Copenhagen & Basic Algorithmic Research Copenhagen **Denmark**
Visiting Researcher *2024*

- Investigated **Locality Sensitive Filters** for differentially private approximate counting queries under the supervision of Prof. Martin Aumüller; resulted in a publication at the **Foundations of Responsible Computing (FORC)**.
- Researched **Quantile Estimation under Local Differential Privacy** with the Providentia group, led by Prof. Rasmus Pagh. Resulted in a **Spotlight publication** at the **International Conference on Machine Learning (ICML)**.

Motion Analytica Srl **Padova, Italy**
Ph.D. Researcher *2022 – 2025*

- **Project Lead:** Orchestrated a comprehensive **15-Minute City analysis**, integrating population data and probabilistic modelling into mobility metrics; resulted in a peer-reviewed journal publication.
- **Privacy Research:** Analyzed the release of origin-destination data under differential privacy, resulting in a publication at the **Privacy Enhancing Technologies Symposium (PETS)**.

Ruprecht Karl University of Heidelberg **Germany**
Erasmus+ Scholar *2020 – 2021*

- Focus on Monte Carlo Simulations, Quantum Information, and Advanced Statistical Physics.

Grants and Scholarships

2024: **Ing. Aldo Gini Foundation Scholarship**: Funding for research period in Copenhagen.

2024: **Oxford DP Bootcamp**: Selected participant for the Oblivious Differential Privacy bootcamp (Oxford, UK).

Prior Professional Experience

2019 – 2020: Academic Support: Physics Tutor & Librarian, University of Padova.

2016 – 2022: Service Industry: Part-time and seasonal roles as Bartender and Waiter (Events and 4-star hospitality). Managed high-pressure environments while completing academic degrees.

Professional References

- **Prof. Francesco Silvestri** (PhD Supervisor, University of Padova) – silvestri@dei.unipd.it
- **Prof. Martin Aumüller** (Associate Prof, ITU Copenhagen) – maau@itu.dk

Interests & Community

Music: Bassist (5 years Jazz training) and Producer. Released progressive rock album *L'assenzio* with *Elettroliti*.

Outdoor: Sport climbing and hiking. Assistant guide for *The South Adventure* youth hiking excursions.

List of Publications

[1] Jacob Imola, Fabrizio Boninsegna, Hannah Keller, Anders Aamand, Amrita Roy Chowdhury, and Rasmus Pagh. *Differentially Private Quantiles with Smaller Error*. The Thirty-Ninth Annual Conference on Neural Information Processing Systems (NeurIPS 2025). 2025. arXiv: 2505.13662 [cs.DS]. URL: arXiv:2505.13662.

[2] Anders Aamand, Fabrizio Boninsegna, Abigail Gentle, Jacob Imola, and Rasmus Pagh. "Lightweight Protocols for Distributed Private Quantile Estimation". In: *Proceedings of the 42nd*

International Conference on Machine Learning. Vol. 267. Proceedings of Machine Learning Research. 13–19 Jul 2025, pp. 27–58. URL: https://proceedings.mlr.press/v267/aamand25a.html.

[3] Fabrizio Boninsegna and Francesco Silvestri. "Differentially Private Release of Hierarchical Origin/Destination Data with a TopDown Approach". In: *Proceedings on Privacy Enhancing Technologies Symposium* (2025).

[4] Martin Aumüller, Fabrizio Boninsegna, and Francesco Silvestri. "Differentially Private High-Dimensional Approximate Range Counting, Revisited". In: *6th Symposium on Foundations of Responsible Computing*. 2025.

[5] Fabrizio Boninsegna, Alessandro Nalin, Andrea Simone, Bruno Zamengo, Denis Cappellari, and Francesco Silvestri. "Towards a Fair and Comprehensive Evaluation of Walkable Accessibility and Attractivity in the 15 Min City Scenario Based on Demographic Data". In: *Infrastructures* 11.1 (2026). ISSN: 2412-3811. DOI: 10.3390/infrastructures11010004. URL: https://www.mdpi.com/2412-3811/11/1/4.

[6] Hannah Keller, Jacob Imola, Fabrizio Boninsegna, Rasmus Pagh, and Amrita Roy Chowdhury. *Piquantε: Private Quantile Estimation in the Two-Server Model*. 2025. arXiv: 2509.14035v1 [cs.CR]. URL: https://arxiv.org/abs/2509.14035v1.

[7] Fabrizio Boninsegna. *InfTDA: A Simple TopDown Mechanism for Hierarchical Differentially Private Counting Queries*. Workshop on Theory and Practice of Differential Privacy (TPDP). 2025. arXiv: 2505.05347 [cs.DS]. URL: https://arxiv.org/abs/2505.05347.

[8] Jacob Imola, Fabrizio Boninsegna, Hannah Keller, Anders Aamand, Amrita Roy Chowdhury, and Rasmus Pagh. *Private Quantile Estimation in the Two Server Model*. Workshop on Theory and Practice of Differential Privacy (TPDP). 2025.

[9] Fabrizio Boninsegna. "Locality Sensitive Hashing of Trajectories Under Local Differential Privacy". In: *Proceedings of the 31st Symposium of Advanced Database Systems, Galzingano Terme, Italy, July 2nd to 5th, 2023*. Vol. 3478. CEUR Workshop Proceedings. 2023, pp. 681–687. URL: https://ceur-ws.org/Vol-3478/paper56.pdf.