Federico Brunero

Senior Research Engineer

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Professional Summary

Extremely determined and highly ambitious engineer with strong background in mathematics and programming. Eager to learn and dive deep into problems to have a crystal-clear understanding of how things work. Highly organized hard worker who is keen on collaboratively working within a team of international researchers and engineers. Standing out for dedication, meticulousness and critical thinking. Exceedingly interested in **software development**, **signal processing** and **wireless systems** in addition to **machine learning**, **information theory**, **coding theory** and **combinatorics**.

Work Experience

Senior Research Engineer
June 2023 – Current

Huawei, Munich, Germany

- Focus on coherent optical communications, and low-power and low-complexity implementation of DSP algorithms.
- Responsible for the development of simulation platforms in Python to test and validate PoCs.
- Contribution to standardization of future long-reach optical communications within the OIF forum.

Research Assistant
July 2019 – December 2022

EURECOM, Sophia Antipolis, France

- In-depth study of combinatorial and information-theoretic aspects of caching and computing networks. Explored the key role played by structure either in data or in topology for memory-aided communication networks.
- Designed efficient algorithms for highly combinatorial caching and distributed computing settings. Developed mathematical proofs based on information-theoretic arguments to establish the optimal performance.
- Teaching assistant for the course **Information Theory** (2021), for the semester project **6G Communications for Virtual Reality Networks** (2022).

MATLAB Student Ambassador
October 2017 – July 2018

The MathWorks srl, Torino, Italy

- Organized talks and seminars about MATLAB and its toolboxes with focus on image processing applications and linear algebra.
- Organized MATLAB/Simulink demo sessions on real-time object detection, inverted pendulum project and FM broadcast receiver.

Software Developer
March 2017 – June 2017

VEM Solutions S.r.l., Venaria Reale, Italy

- Analyzed car accidents data from accelerometers. Developed in `C#` a data analysis software to process the input data structures.
- Exploited digital filters to make statistical analysis on the extracted data. Determined empirical thresholds on acceleration and jerk to establish accident events.

Education

PhD in Computer Science, Telecommunications and Electronics
December 2022

Sorbonne Université, France

Thesis title Unearthing the Impact of Structure in Data and in Topology for Caching and Computing Networks
Advisor Petros Elia

Master of Science in Data Science and Engineering
January 2021

Institut Mines-Télécom and EURECOM, France

GPA: 4.0/4.0

Master of Science in Electrical and Computer Engineering
August 2019

University of Illinois Chicago, US

GPA: 4.0/4.0

Thesis title Low-Density Parity-Check Code Design for the AWGN Channel with Additive Radar Interference
Advisor Natasha Devroye (co-advisor in Italy) **Co-advisors** Daniela Tuninetti, Roberto Garello (advisor in Italy)

Master's Degree in Communications and Computer Networks Engineering
July 2019

Politecnico di Torino, Italy

Grade: 110/110 Summa Cum Laude (highest grade)

Bachelor's Degree in Telecommunications Engineering
July 2017

Politecnico di Torino, Italy

Grade: 110/110

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Skills

Software/frameworks ANSYS HFSS, AWS, Code::Blocks, GNU Emacs, JupyterLab, MS Office, Visual Studio, Wireshark
Programming and markup languages `Bash`, `C`, `C#`, `JavaScript`, LaTeX, `Markdown`, `MATLAB`, `Python`
Languages fluent in English, native Italian

Publications

Journals

[J1] **F. Brunero** and P. Elia, "Multi-access distributed computing," *IEEE Transactions on Information Theory*, vol. 70, no. 5, pp. 3385–3398, May 2024.

[J2] **F. Brunero** and P. Elia, "Fundamental limits of combinatorial multi-access caching," *IEEE Transactions on Information Theory*, vol. 69, no. 2, pp. 1037–1056, Feb. 2023.

[J3] **F. Brunero** and P. Elia, "Unselfish coded caching can yield unbounded gains over selfish caching," *IEEE Transactions on Information Theory*, vol. 68, no. 12, pp. 7871–7891, Dec. 2022.

Conferences

[C1] **F. Brunero**, K. Wan, G. Caire, and P. Elia, "Coded distributed computing for sparse functions with structured support," in *2023 IEEE Information Theory Workshop (ITW)*, Apr. 2023, pp. 474–479.

[C2] **F. Brunero** and P. Elia, "Coded caching does not generally benefit from selfish caching," in *2022 IEEE International Symposium on Information Theory (ISIT)*, Jun. 2022, pp. 1139–1144.

[C3] **F. Brunero** and P. Elia, "On the optimality of coded caching with heterogeneous user profiles," in *2022 IEEE Information Theory Workshop (ITW)*, Nov. 2022, pp. 166–171.

[C4] **F. Brunero** and P. Elia, "The exact load-memory tradeoff of multi-access coded caching with combinatorial topology," in *2022 IEEE International Symposium on Information Theory (ISIT)*, Jun. 2022, pp. 1701–1706.

[C5] **F. Brunero**, D. Tuninetti, and N. Devroye, "On code design for wireless channels with additive radar interference," in *2019 IEEE Information Theory Workshop (ITW)*, Aug. 2019, pp. 1–5.