

MATTEO SAPONATI

Research Scientist - Project Manager - Machine Learning and Edge AI

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🏠 Zürich, Switzerland



Experience

Postdoctoral Researcher

2023 - present

📍 Institute of Neuroinformatics, ETH/UZH, Zurich (CH)

- Design and test advanced learning algorithms for neuromorphic devices and edge AI applications.
- Successfully secure competitive research funding for algorithm development projects.
- Lead scientific research and deployment projects on Spiking Neural Networks and Transformer architectures.
- Publish 2 scientific articles and present research at 5 international conferences.
- Supervise students (M.Sc. and Ph.D.) from ETH Zürich, University of Zürich, and ZHAW Center for Artificial Intelligence.

Research Associate (PhD)

2019 - 2023

📍 Max-Planck Institute for Brain Research and Ernst Strüngmann Institute, Frankfurt Am Main (DE)

- Design learning algorithms for Spiking Neural Networks (SNNs), with applications in Machine Learning and Computational Neuroscience.
- Publish 3 scientific articles and present research at 6 international conferences.
- Employ state-of-the-art ML frameworks (PyTorch, Tensorflow).
- Lead data analysis projects.
- Coordinate a series of scientific talks, inviting external speakers, and teaching classes at the Theoretical Neuroscience course from Radboud University.

Assistant Research Scientist

2019

📍 Institute des Neurosciences des Systemes Aix-Marseille University, Marseille (FR)

- Conduct research in the field of Computational Neuroscience.
- Develop and implement computational models to describe neuronal coupling at different spatial scales.
- Investigations of theoretical limits in The Virtual Brain technology (TVB).

Research Intern

2018

📍 Barcelona Biomedical Research Park, Barcelona (ESP)

- Publish scientific articles and present at international conferences (2 scientific articles, 1 presentation).
- Employ mathematical models and statistical analysis to study SNNs models of the thalamo-cortical system.
- Traineeship period with Erasmus+ grant. Main Subjects: Neural Network Dynamics, Stochastic Processes, Numerical Simulation, Statistical Analysis.

Education

2020 - 2023 **Ph.D. in Neuroinformatics**

Highest Honors (top 5%) - Donders Centre for Neuroscience, Radboud University (NL)

2016 - 2018 **M.Sc. in Physics**

110/110 - Department of Physics, University of Pisa (IT)

2011 - 2016 **B.Sc. in Physics**

94/110 - Department of Physics, University of Pisa (IT)

Skills

Coding Skills	Python, Matlab, LaTeX, C++, Adobe Illustrator, Music production DAWs
Research Skills	Mathematical Modelling, Data Analysis, Critical Thinking, Public Speaking, Teamwork, Problem Solving
Language Skills	Italian (Mother tongue), English (Business Fluent), Portuguese (Business Intermediate), French (Basic)

Research

- Saponati, M.,** De Luca, C., Indiveri, G., & Grewe, B. (2025). A feedback control optimizer for online and hardware-aware training of spiking neural networks. *2025 Neuro-Inspired Computational Elements Conference (NICE)*. <https://doi.org/-inpress->
- Saponati, M.,** Sager, P., Aceituno Vilimelis, P., Stadelmann, T., & Grewe, B. (2025). The underlying structures of self-attention: Symmetry, directionality, and emergent dynamics in transformer training. *Proceedings of the 41st International Conference on Machine Learning*. <https://doi.org/10.48550/arXiv.2502.10927>
- Saponati, M.,** & Vinck, M. (2023a, August 27). *Inhibitory feedback enables predictive learning of multiple sequences in neural networks*. <https://doi.org/10.1101/2023.08.26.554928>
- Saponati, M.,** & Vinck, M. (2023b). Sequence anticipation and spike-timing-dependent plasticity emerge from a predictive learning rule. *Nature Communications*, 14(1), 4985. <https://doi.org/10.1038/s41467-023-40651-w>
- Saponati, M.,** Garcia-Ojalvo, J., Cataldo, E., & Mazzoni, A. (2022). Thalamocortical Spectral Transmission Relies on Balanced Input Strengths. *Brain Topography*, 35(1), 4–18. <https://doi.org/10.1007/s10548-021-00851-3>
- Spyropoulos, G., **Saponati, M.,** Dowdall, J. R., Schölvinck, M. L., Bosman, C. A., Lima, B., Peter, A., Onorato, I., Klon-Lipok, J., Roesse, R., Neuenschwander, S., Fries, P., & Vinck, M. (2022). Spontaneous variability in gamma dynamics described by a damped harmonic oscillator driven by noise. *Nature Communications*, 13(1), 2019. <https://doi.org/10.1038/s41467-022-29674-x>
- Saponati, M.,** Garcia-Ojalvo, J., Cataldo, E., & Mazzoni, A. (2019). Integrate-and-fire network model of activity propagation from thalamus to cortex. *Biosystems*, 183, 103978. <https://doi.org/10.1016/j.biosystems.2019.103978>

Grants and Awards

Jan 2024 - Jan 2026	ETH Postdoctoral Fellowship ETH Zurich Postdoctoral Fellowship programme (Zürich, CH)
Mar 2023	Cosyne Presenters Travel Grant Cosyne Conference 2023 (Montreal, CA)
Sep 2019 - Sep 2023	IMPRS Research Fellowship International Max Planck Research School (IMPRS) for Neural Circuits, MPI for Brain Research, Frankfurt am Main (DE)
Jul 2018 - Aug 2018	Erasmus+ Grant Erasmus program (EU)