

# MATTEO SAPONATI

Research Scientist - Project Manager - Machine Learning and Edge AI

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🏠 Zürich, Switzerland



## Experience

### Postdoctoral Research Scientist

2023 - present

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

🏢 Full-time, on-site

- Secured competitive research funding to design advanced learning algorithms for edge AI.
- Lead research and deployment of Large Language Models, Spiking Neural Networks, and Recurrent Neural Networks.
- Published 2 peer-reviewed papers; presented at 7 international conferences.
- Supervise M.Sc. and Ph.D. students from ETH Zurich, University of Zurich, and ZHAW Center for Artificial Intelligence.

### Consultant - Neuromorphic Computing

2025 - 2025

📍 Neuronova, Milan (IT)

🏢 Part-time, remote

- Conducted an R&D project on Spiking Neural Networks for audio applications, focusing on hardware implementation.
- Provided expert consulting on neuromorphic training algorithms and hardware–software codesign principles
- Worked independently as an external consultant, coordinating with the Neuronova team throughout the project lifecycle.

### Research Associate (PhD)

2019 - 2023

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

🏢 Full-time, on-site

- Designed learning algorithms for Spiking Neural Networks applied to Machine Learning and Neuroscience.
- Published 3 peer-reviewed articles; presented at 6 international conferences.
- Led data analysis projects; Coordinated scientific seminars.

### Assistant Research Scientist

2019

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

🏢 Full-time, on-site

- Conducted research in Computational Neuroscience.
- Developed models to describe neuronal coupling across spatial scales.
- Investigated theoretical limits using The Virtual Brain platform (TVB).

### Research Intern

2018

📍 Barcelona Biomedical Research Park, Barcelona (ESP)

🏢 Full-time, on-site

- Published 2 papers and presented research at international conferences.
- Modeled and statistically analyzed SNNs of the thalamo-cortical system.
- Erasmus+ trainee; focus areas: Neural Network Dynamics, Stochastic Processes, Numerical Simulations, and Statistical Analysis.

## Education

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- 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

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- 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

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- 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/10.1109/NICE65350.2025.11065428>
- 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., Schölvinc, M. L., Bosman, C. A., Lima, B., Peter, A., Onorato, I., Klon-Lipok, J., Roese, 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

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- 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)