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)

- Secured competitive research funding to design advanced learning algorithms for neuromorphic devices and edge AI.
- Lead research and deployment of Spiking Neural Networks, Recurrent Neural Networks, and Transformer models.
- Published 2 peer-reviewed papers; presented at 5 international conferences.
- Supervise M.Sc. and Ph.D. students from ETH Zurich, University of Zurich, 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)

- Designed learning algorithms for Spiking Neural Networks applied to Machine Learning and Neuroscience.
- Published 3 peer-reviewed articles; presented at 6 international conferences.
- Utilized modern ML frameworks (PyTorch, TensorFlow).
- Led data analysis projects.
- Coordinated a scientific seminar series and taught in the Theoretical Neuroscience course at Radboud University.

Assistant Research Scientist

2019

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

- 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)

- 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

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., 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

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)