

Betteti Simone

University of Padua



Education

- 2016–2019 **B.Sc. Psychological Science**, *University of Padua*, Padova, IT, Graduation mark: 110 Cum Laude/110; GPA: 28.15/30.
Thesis: '[Structure Development in Dynamically Pruned ANNs](#)'
- 2019–2022 **M.Sc. Mathematical Engineering**, *University of Padua*, Padova, IT, Graduation mark: 110 Cum Laude/110; GPA: 28.97/30.
Thesis: '[The Relationship Between MSR and Network Properties in Simple Neural Networks of the Cortex](#)'
- 2022–2025 **Ph.D. Information Engineering**, *University of Padua*, Padova, IT, Project: Mathematical Models for the Virtual Brain.

Publications

- 1 Betteti S., Baggio G., and Zampieri S., *On the capacity of continuous-time Hopfield models*, 2024 63rd IEEE Conference on Decision and Control (Accepted), 2024.
- 2 Betteti S., Baggio G., Bullo F., and Zampieri S., "[Input-Driven Dynamics for Robust Memory Retrieval in Hopfield Networks](#)", arXiv, 2024.
<https://doi.org/10.48550/arXiv.2411.05849>
- 3 Betteti S., Baggio G., Bullo F., and Zampieri S., "[Firing Rate Models as Associative Memory: Excitatory-Inhibitory Balance for Robust Retrieval](#)", arXiv, 2024.
<https://doi.org/10.48550/arXiv.2411.07388>

Internships

- February-
July 2019 **Project/Thesis**, *Computational Cognitive Neuroscience Lab*, Padova.
Achievements:
- Development of an evolutionary pruning process for a Deep Belief Network (DBN).
 - Development of equally effective DBNs architectures with high sparsity (.15 active synaptic connections at the end of training).
 - Assessment of topological similarities between synaptic explosion/pruning in biological neuronal development and DBNs.
- Supervisors:** Prof. [Testolin A.](#), Prof. [Suweis S.S.](#)
- August-
December 2021 **Thesis**, *Kavli Institute for Systems Neuroscience, NTNU*, Trondheim.
Achievements:
- Spike series analysis by means of Multiscale Relevance (MSR).
 - Development of spiking neural networks exhibiting sustained chaotic activity.
 - Analysis of the dependence of MSR on topological network properties.
- Supervisors:** Prof. [Suweis S.S.](#), Prof. [Roudi Y.](#)
- September
2024, June 2025 **Research visit**, *Center for Control, Dynamical Systems and Computation, UCSB*, Santa Barbara, CA.
Achievements (in progress):
- Study of classical rate models for associative memory and modern Hopfield architectures for the improvement of transformer models.
 - Study of stochastic processes and their associated probability measure, with a close focus on its convergence properties.
 - Study of the equilibrium tracking problem for systems with noise, where the equilibrium trajectory depends on the first moment of the stochastic process.
- Supervisors:** Prof. [Zampieri S.](#), Prof. [Bullo F.](#), Prof. [Baggio G.](#)

Summer Schools

- September
2019 **Summer School**, *Computational and Theoretical Models in Neuroscience*, Venice, IT.
Achievements:
- Study of signaling in Neuronal populations.
 - Inference of functional and physiological connectivity from time series of neuronal clusters' signaling.
- August 2021 **Summer School**, *Mathematical Methods in Computational Neuroscience*, Online.
Lectures on:
- Reinforcement Learning.
 - Dimensionality Reduction techniques.
 - Automata.
 - Spiking Neural Networks.

- September 2023 **Fall School**, *EITN School In Computational Neuroscience*, Paris, FR.
Achievements:
- Comprehensive study of biophysical, mean field, and whole brain models.
 - Simulation of synaptic dynamics for single neurons.
- July 2024 **Summer School**, *SIDRA*, Bertinoro, IT.
Achievements:
- Study of nonlinear ordinary differential equations (ODEs) by means of Lyapunov theory.
 - Application of suitable controls to steer the system towards the set of fixed points for the ODE dynamics.

Computer Skills

Python: Full professional use
Matlab: Full professional use
Java: Beginner
SLURM: Intermediate level user
LaTeX: Full professional use
Office: Intermediate level user
Linux, Windows: Intermediate level user

Language

Italian: Mother tongue
English: C2
French: A1