Della Vecchia, Mattia

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Citizenship: Italian
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Research interests

Computational Neuroscience, Machine Learning, Biologically-Inspired Artifical Intelligence, Statistical Physics, Reinforcement Learning,

Education

Ph.D. in Neuroscience — Paris, France
École Normale Supérieure, PSL University — 10/2022 - Present

M2 in Physics of Complex Systems — Paris, France
Sorbonne UPMC, Paris Saclay, Paris Diderot — 10/2020 – 07/2021
GPA: 19/20 - Mention - Très bien

M.Sc. in Physics of Complex Systems — Turin, Italy
Politecnico di Torino — 10/2019 – 10/2021
Final Mark: 110/110 cum Laude

B.Sc. in Physical Engineering — Turin, Italy
Politecnico di Torino — 10/2016 – 07/2019
Final Mark: 110/110

Honors and scholarships

QLife Ph.D. grant (issued by PSL-QLife Institute) — 2021
Master Thesis Project Abroad (issued by Politecnico di Torino) — 2021
ERASMUS Scholarship Programme — 2020
PCS International Track admission (selective master course - 20 alumns - jointly operated by Politecnico di Torino, three universities in Paris, SISSA, and ICTP) — 2019

Research Experience

Ph.D student — 10/2022 – Present
Extension of the computational model created during the research assistantship. Development of an hierarchical model to predict collaborations between cerebellum and basal ganglia. Possible insights in new RL algorithms.

Research Assistantship — 10/2021 – 10/2022
Model of cerebellar computations in the context of RL tasks. Analysis of the artificial architecture and comparison against experimental evidence. Implementation of multiple learning rules in the same network.
Mentor: Natasha Alex Cayco Gajic (Department of Cognitive Science, École Normale Supérieure)

Master Thesis 02/2021 – 07/2021

Analysis of low-dimensional RNN activity in cognitive tasks. Development of biologically-plausible SDG learning rule inspired by cerebellar mechanisms.
Mentor: Vincent Hakim (Department of Physics, École Normale Supérieure)

Bachelor Thesis 03/2019 – 06/2019

Benchmarking evaluation of analysis methods for spike sorting on data acquired from different animal models by CMOS-based high-density electrodes. Specific algorithms developed to compare the computational costs and reliability.
Mentor: Luca Berdondini, Fabio Boi (Microtechnology for Neuroelectronics, Italian Institute of Technology)

Teaching Experiences

Teacher Assistant, Advanced Data Analysis (2023), École Normale Supérieure
Teacher Assistant, Quantitative Viral Dynamics (2022), École Normale Supérieure
Teacher Assistant, Math and computer science introduction (2022), École Normale Supérieure

Other Experiences

Spring College in the Physics of Complex Systems, ICTP 02/2021 - 03/2021

Selection of topics in theoretical and computational tools for a quantitative analysis of complex systems. Intensive 4-week programme.

Visiting Student, SISSA 09/2019 - 02/2020

First semester of Master in Complex Systems (Topics: Quantum Mechanics, Probability and Information Theory, Introduction to Neuroscience, Molecular Dynamics and Statistical Physics).

Visiting Student, ICTP 09/2019 - 02/2020

First semester of the Master in Complex Systems, jointly organized with SISSA.

Skills

Languages
Mother Tongue: Italian
Fluent: English, French
Intermediate: Spanish

Programming Languages
Proficient in: Python, LaTeX, Microsoft Office
Familiar with: Julia, C, C++, bash