

# Della Vecchia, Mattia

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## Research interests

Computational Neuroscience, Machine Learning, Biologically-Inspired Artificial Intelligence, Statistical Physics, Reinforcement Learning, Recurrent Neural Networks

## Education

<b>MA in Physics of Complex Systems</b> Sorbonne UPMC, Paris Saclay, Paris Diderot <i>GPA: 19/20</i>	Paris, France 10/2020 – 07/2021
<b>MA in Physics of Complex Systems</b> Politecnico di Torino <i>Final Mark: 110/110 cum Laude</i>	Turin, Italy 10/2019 – 10/2021
<b>BA in Physical Engineering</b> Politecnico di Torino <i>Final Mark: 110/110</i>	Turin, Italy 10/2016 – 07/2019

## Honors and scholarships

<i>Master Thesis Project Abroad</i> (issued by Politecnico di Torino)	2021
<i>ERASMUS Scholarship Programme</i>	2020
<i>PCS International Track admission</i> (selective master course - 20 alumns - jointly operated by Politecnico di Torino, three universities in Paris, SISSA, and ICTP)	2019

## Research Experience

<b>Mathematics of Neural Circuits, Group of Neural Theory, ENS</b> Mentors: Natasha Alex Cayco Gajic (École Normale Supérieure) The project aims to question classical views on cerebellar learning that sustain an error-based supervised learning rule. Emerging evidence shows that the teaching signals can encode for reward-context, thus, a RL-based computational model is currently under investigation as a principle of working for alternative/complementary forms of cerebellar learning.	10/2021 – Present
<b>Theoretical Neuroscience, LPENS</b> Mentors: Vincent Hakim (École Normale Supérieure) Analysis of low-dimensional trajectories in RNNs activity on simulated cognitive tasks. Development of a stochastic gradient descent learning rule to train RNNs in a biologically-plausible way, inspired by mechanisms observed in the cerebellum.	02/2021 – 07/2021

## **Microtechnology for Neuroelectronics, IIT**

Mentors: Luca Berdondini (Italian Institute of Technology)

03/2019 – 06/2019

Benchmarking evaluation of analysis methods for spike sorting on data acquired from different animal models by means of CMOS-based high-density, large arrays. Specific algorithms have been developed to compare performances in terms of computational cost and reliability.

## **Skills**

### **Languages**

Mother Tongue: Italian

Advanced: English

Intermediate: French, Spanish

### **Programming Languages**

Proficient in: Python, LaTeX, Microsoft Office

Familiar with: Julia, C

## **Other Experiences**

### **Visiting Student, SISSA**

09/2019 - 02/2020

The courses of the first semester of the Master in Complex Systems were jointly organized by SISSA and ICTP. (Quantum Mechanics, Probability and Information Theory, Introduction to Neuroscience, Molecular Dynamics and Statistical Physics).

### **Visiting Student, ICTP**

09/2019 - 02/2020

The courses of the first semester of the Master in Complex Systems were jointly organized by SISSA and ICTP. (Quantum Mechanics, Probability and Information Theory, Introduction to Neuroscience, Molecular Dynamics and Statistical Physics).

### **Spring College in the Physics of Complex Systems, ICTP**

02/2021 - 03/2021

It aims to expose students to a selection of topics at the forefront of research, in theoretical and computational tools for a quantitative analysis of complex systems, during an intensive, 4-week programme. (Lecturers: D. Buetti, SISSA; M. Dalmonte and A. Rodriguez Garcia, ICTP; M. Marsili, ICTP; E. Roldan, ICTP; G. Sanguinetti, SISSA).