Simone Azeglio

Personal Information

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Education

Oct 2022 – Present **PhD in Computational Neuroscience**, – *Institut de la Vision (Sorbonne University) & École Normale Supérieure, Paris, France.*

Oct 2018 – Apr 2021 **M.Sc. in Physics of Complex Systems**, – *University of Turin, Turin, Italy.*

- **Grade**: *110/110 cum laude and honourable mention.*

Oct 2014 – Apr 2018 **B.Sc. in Physics** – *University of Turin, Turin, Italy.*

Publications

May 2025 *Azeglio S, Di Bernardo A*, **What's Inside Your Diffusion Model? A Score-Based Riemannian Metric to Explore the Data Manifold**, submitted to NeurIPS 2025

May 2025 Laquitaine S*, *Azeglio S*, Paris C, Ferrari U, Chalk M*, **Decomposing stimulus-specific sensory neural information via diffusion models**, submitted to NeurIPS 2025

Mar 2025 *Azeglio S, Garcia V C, Glaziou G, Neri P, Marre O, Ferrari U*, **Higher-Order Convolution Improves Neural Predictivity in the Retina** , submitted to CCN 2025

Dec 2024 *Azeglio S, Marre O, Neri P, Ferrari U*, **Convolution goes higher-order: a biologically inspired mechanism empowers image classification**, submitted to NeurIPS 2025

Dec 2023 Sanborn S, Shewmake C, *Azeglio S, Miolane N*, **Symmetry and Geometry in Neural Representations**, PMLR - NeurReps workshop at NeurIPS 2023

Mar 2023 Willeke K F, ..., *Azeglio S, Ferrari U, Neri P, Marre O, ..., Sinz F*, **Retrospective on the SENSORIUM 2022 competition**, PMLR - Sensorium Competition at NeurIPS

Dec 2022 Sanborn S, Shewmake C, *Azeglio S, Di Bernardo A, Miolane N*, **Symmetry and Geometry in Neural Representations**, PMLR - NeurReps workshop at NeurIPS 2022

Mar 2022 *Azeglio S, Poetto S, Savant Aira L, Nurisso M*, **Improving Neural Predictivity in the Visual Cortex with Gated Recurrent Connections**, BrainScore Workshop, Cosyne 2022

Oct 2021 *Azeglio S, Di Bernardo A, Penna G, Pittatore F, Poetto S, Gruenwald J, Kapeller C, Kamada K, Guger C*, **Topological Data Analysis (TDA) Techniques Enhance Hand Pose Classification from ECoG Neural Recordings**, arXiv

Oct 2021 *Azeglio S, Fordiani M*, **Optimizing Urban Mobility Restrictions: a Multi-Agent System (MAS) for SARS-CoV-2**, arXiv

Aug 2021 *Azeglio S*, **Modernization of the TMVA GUI. RVariablePlotter: modular plotting for TMVA**, CERN Document Server

Jul 2021 *Zubov K, McCarthy Z, Ma Y, Calisto F, Pagliarino V, Azeglio S, Bottero L, Luján E, Sulzer V, Bharambe A, Vinchhi N, Balakrishnan K, Upadhyay D, Rackauckas C*, **NeuralPDE: Automating Physics-Informed Neural Networks (PINNs) with Error Approximations**, arXiv

Mar 2021 *Bottero L, Calisto F, Graziano G, Pagliarino V, Scauda M, Tiengo S, Azeglio S*, **Physics-Informed Machine Learning Simulator for Wildfire Propagation**, AAAI-MLPS 2021.

Editing

Dec 2024 *Azeglio S, Toloosham B, Shewmake C, Sanborn S, Miolane N*, **Proceedings of the NeurIPS 2024 Workshop on Symmetry and Geometry in Neural Representations**, PMLR

Dec 2023 *Sanborn S, Shewmake C, Azeglio S, Di Bernardo A, Miolane N*, **Proceedings of the NeurIPS 2023 Workshop on Symmetry and Geometry in Neural Representations**, PMLR

Dec 2022 *Sanborn S, Shewmake C, Azeglio S, Miolane N*, **Proceedings of the NeurIPS 2022 Workshop on Symmetry and Geometry in Neural Representations**, PMLR

Reviewing

May 2025 **CCN 2025**, Cognitive Computational Neuroscience

Mar 2025 **ICML 2025**, International Conference on Machine Learning

Oct 2024 **ICLR 2025**, International Conference on Learning Representations

Oct 2024 **NeurReps at NeurIPS 2024**, NeurReps 2024

Mar 2023 **Deep Learning Indaba 2023**, Annual Meeting of the African ML and AI Community

Experience

Research

Aug 2024 - Present **Guest Researcher** –Flatiron Institute (Simons Foundation), Center for Computational Neuroscience, *New York City, USA*

- Continuing my previous internship project with *Alex Williams*

May 2024 - Aug 2024 **Research Intern** –Flatiron Institute (Simons Foundation), Center for Computational Neuroscience, *New York City, USA*

- Bayesian Inference and Deep Learning models for image and video encoding in mice and macaque visual system, with *Alex Williams* and *Eero Simoncelli*

Oct 2022 - Present **PhD Student** –Institut de la Vision (Sorbonne University) & École Normale Supérieure, *Paris, France*

- Machine and deep learning models for **vision** neuroscience (retina and primary visual cortex) with *Ulisse Ferrari*, *Olivier Marre* and *Peter Neri*

Nov 2021 – Sept 2022 **Research Engineer** – Institut de L'Audition, Institut Pasteur, *Paris, France*

- Machine and deep learning models for auditory perception in *Brice Bathellier's* Lab.
- Devised an **activity-driven** framework to map the neuronal activity across stages of the auditory pathway with multi-layer models (multi-layer perceptron, CNNs).

Apr 2019 – Present **Co-Founder & President** – Machine Learning Journal Club, *Turin, Italy*

- Non-profit organization managed by students, in cooperation with the University of Turin.
- Obtained **+20k Euros** from both U. of Turin and several companies for research purposes
- I collaborate with **Julia Computing** and *Christopher Rackauckas* (**MIT**) on Scientific Machine Learning. Currently working on *NeuralPDE* and its applications for climate related problems (e.g. wildfire propagation).
- I designed and supervised several Machine Learning projects: data-driven dynamical system identification and control (with **NPO Torino S.r.l**); Brain Computer Interfaces data analysis, e.g. applications of **Topological Data Analysis** and **Random Convolutional Kernels** for feature extraction, (in collaboration with **g.tec**); biologically plausible vision models for *Brain-Score* benchmarks
- I teach **Python** for Scientific Computing and practical Machine (and Deep) Learning to undergraduate and graduate students.

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Jun 2021 – Aug 2021 **Research Intern** – CERN, *Geneva, Switzerland*

- Contributed to *ROOT*, one of the largest scientific data analysis and Machine Learning **C++** packages (**1.6k+ stars**) by implementing low-level ROOT data structures conversion, supervised by *Lorenzo Moneta*

Aug 2020 – Jun 2021 **Visiting Student Researcher** – University of Ottawa, *Centre for Neural Dynamics, Ottawa, Canada* (Longtin's & Maler's Labs)

- Recurrent neuronal network architecture for sequential memory retrieval as part of my master thesis project: **Transients in Hippocampal Attractor Networks**

May 2020 – Dec 2020 **Mentor** – University of Toronto, *ProjectX2020 Competition*

- Worked on **Physics Informed Neural Networks** (PINNs) techniques (in **Julia**) for wildfire propagation models. Paper accepted in AAAI-MLPS 2021

Jul 2019 – Sep 2019 **Visiting Student Researcher** – University of Ottawa, *Centre for Neural Dynamics,*
Jul 2018 – Sep 2018 *Ottawa, Canada* , (Maler's Lab - In collaboration with André Longtin)

- Increased animal tracking accuracy by **33%** and reduced manual labelling time by **90%** by introducing **DeepLabCut** (based on CNNs) instead of non-Deep-Learning based softwares.

Teaching

Jan 2024 – May 2024 **Teaching Assistant for the course "Data Science"** – Sorbonne Université

- Teaching data science (with practicals in Python) to undergraduate mathematics students

Jul 2023 – Jul 2023 **Lecturer at *Machine and Deep Learning Summer School*** – Sorbonne University Abu Dhabi

- Teaching Machine and Deep Learning with practicals in Python at this summer school organized by Sorbonne and Abu Dhabi Investment Authority (ADIA)

Jan 2023 – April 2023 **Teaching Assistant for the course "Data Science"** – Sorbonne Université

- Teaching data science (with practicals in Python) to undergraduate mathematics students

Consulting

Apr 2021 – Present **Machine Learning Consultant** – Freelance

- Freelance projects on *UpWork*; also with *NPO Torino S.r.l* and *TIM Group*.

Presentations

Invited Talks

Jan 2025 **Convolution Goes Higher-Order** – FADEX-NeuroAI 2025

Sep 2022 **Activity-driven deep models for learning sound transformations across the auditory pathway** – Bernstein Conference 2022

Apr 2022 **An Overview of Brain-Score and How to Get a Better Ventral Visual Stream Model with Gated Recurrent Connections** – Meta AI Paris - Journal Club

Feb 2020 **Machine Learning Journal Club: Open Learning for Open Science** – Machine Learning Meets Chemistry, Department of Chemistry, University of Turin (Programme)

Selected Talks

Dec 2022 **Combining Scattering Networks and Stochastic Gabor filter banks as models for V1** – Sensorium Competition Workshop, NeurIPS 2022, (Schedule)

Mar 2022 **Improving Neural Predictivity in the Visual Cortex with Gated Recurrent Connections** – BrainScore Workshop, Cosyne 2022, (Schedule)

Posters

Mar 2024 **Towards end-to-end cell-typing in large-scale recordings** – CoSyNe Conference 2024

Mar 2024 **Scalable gaussian process inference of neural responses to movies** – CoSyNe Conference 2024

Sep 2023 **Estimating the Surround of Ganglion Cells in Large-Scale Recordings** – Bernstein Conference 2023

Sep 2022 **Activity-driven deep models for learning sound transformations across the auditory pathway** – Bernstein Conference 2022

Jul 2022 **Activity-driven deep models for learning sound transformations across the auditory pathway** – FENS Forum 2022 - International Neuroscience Conference

Jan 2021 **Physics-Informed Machine Learning Simulator for Wildfire Propagation** – Mediterranean Machine Learning Summer School (www.m2lschool.org)

Sep 2018 **Active Electrosensing for Spatial Map Encoding in a Fish** – Neural Coding 2018, International Workshop on Theoretical and Computational Neuroscience (www.neuralcoding2018.unito.it)

May 2017 **Leggett-Garg Inequality Violation Exploiting Weak Measurements** – Quantum 2017, International Workshop on Quantum Optics and Quantum Information (www.quantum2017.unito.it)

Scientific Animation

Dec 2024 **Symmetry and Geometry in Neural Representations (3rd Edition)** – Workshop, NeurIPS Conference 2024

Mar 2024 **Sharpening our Sight: Advances in Naturalistic Visual Perception through Efficient Representations and Active Search** – Workshop, CoSyNe Conference 2024

Dec 2023 **Symmetry and Geometry in Neural Representations (2nd Edition)** – Workshop, NeurIPS Conference 2023

Sep 2023 **2nd Workshop on Symmetry, Invariance and Neural Representations** – Workshop, Bernstein Conference 2023

Dec 2022 **Symmetry and Geometry in Neural Representations** – Workshop, NeurIPS Conference 2022

Sep 2022 **Symmetry, Invariance and Neural Representations** – Workshop, Bernstein Conference 2022

Art & Science

May 2023 **First Spatio-Temporal Block of Vision** – part of "Quelques formes discretes" with the artist Kaspar Ravel, hosted at Sorbonne Universitè in Paris (Programme)

- Collaborated with Kaspar Ravel, artist in residence (Sorbonne Université), on a part of his exposition: "Quelques formes discretes"

Public Outreach

Feb 2021 **National TV News Program, TG1** – RAI, Radiotelevisione italiana (video excerpt)

- Presented Machine Learning Journal Club's work on Physics Informed Neural Network for wildfire spread prediction.

Funding, Scholarships & Awards

Dec 2022 **3rd Place** – *Sensorium Competition, NeurIPS 2022*

- Awarded a 250 EUR prize to have reached the 3rd position in this international competition on deep learning models for the primary visual cortex.

Nov 2022 **Independent Travel Grant** – *NeurIPS 2022*

- Awarded a 1000 EUR travel grant from *TesiSquare* and *Digital Innovation Gate 421* to attend NeurIPS 2022.

Oct 2022 **Top-Rated Freelancer** – *Upwork*

- Awarded as a top-rated freelancer (best 10% of the entire platform) as a Machine Learning consultant.

Jun 2022 **Brains for Brains Young Researcher Award** – *Bernstein Network for Computational Neuroscience*

- Awarded a 2000 EUR bi-annual prize, as an outstanding pre-doctoral researcher (more info)

Jun 2022 **SCAI Doctoral Fellowship** – *Sorbonne Center for Artificial Intelligence (SCAI)*

Mar 2022 **3rd Place** – *Brain-Score Competition, Cosyne 2022*

- Awarded a 750$ prize to have reached the 3rd position in this international competition on deep learning models of the ventral visual stream.

Mar 2022 **Travel Grant** – *Cosyne 2022*

- Awarded a 1000$ travel grant as one of the selected *new attendees* at Cosyne 2022.

Jun 2021 – Aug 2021 **Summer Student Scholarship** – *CERN, Geneva, Switzerland*

- Awarded a 10-weeks paid (2400 EUR) scholarship, selected **among +7k candidates**.

Jan 2021 **Outstanding Poster** – *Mediterranean Machine Learning School*

- Awarded a 700 EUR prize in Google Cloud resources. Poster presentation

Dec 2020 – Mar 2021 **Overseas Mobility Scholarship** – *University of Turin, Turin, Italy*

- Awarded a 4-months scholarship (**maximum allowed**, 1200 EUR) for my Master Thesis project

Aug 2020 - Jun 2021 **Visiting Student Researcher Scholarship** – *University of Ottawa, Ottawa, Canada*

- Selected as a recipient of this scholarship (**+20k CAD**) for my master thesis project.

Jul 2014 – Sep 2014 **Master Talenti Neodiplomati Scholarship** – *Fondazione CRT, Turin, Italy*

- Selected as **1 out of 103** eligible students (in my high school) for a *studying-working* 3-months experience as in Malta (5000 EUR).

Jul 2013 – Sep 2013 **Banca Sella Scholarship** – *Banca Sella Group, Biella, Italy*

- Selected among the most promising students in the province of Biella for a 10-weeks *studying-working* experience in the E-Commerce section (300 EUR).

Languages

Italian, *Native.* **English**, *Advanced.* **French**, *Elementary.*

Training Programs

Jul 2023 **Systems Vision Science Summer School** *Max Planck Institute for Biological Cybernetics, Tubingen*

Jul 2022 **Applied Harmonic Analysis and Machine Learning** *University of Genoa*

Aug 2021 **Neuromatch Academy: Deep Learning**

- 3 weeks program on *Deep Learning Theory* and hands-on *Pytorch* implementations.

Jul 2021 **Eastern European Machine Learning Summer School**, *Deepmind*

Jun 2021 **Regularization Methods for Machine Learning** ,*University of Genoa*

Apr 2021 **g.tec BCI & Neurotechnology Spring School**,*g.tec., (web-based due to Covid19)*

- 10 days program on *BCI*s and signal processing.

Jan 2021 **Mediterranean Machine Learning Summer School**, *Deepmind, (web-based due to Covid19)*

- 5 days lectures on Deep Learning and practical sessions with *JAX*. Presented a poster rewarded with an "outstanding poster award".

Oct 2020 – Dec 2020 **HelloAI RIS** *EITHealth*

- Training program designed to introduce participants to the field of AI in Healthcare. Mentored by experts from **GE**, **KTH** and **LEITAT**.

May 2018 – Jun 2018 **Eight Summer School of the Centre for Neural Dynamics** *University of Ottawa, Ottawa, Canada*

- Simulated a "strokes toy model" by using **AllenSDK** for data retrieval.

Interests & Side Projects

Hackathons

Oct 2021 **IEEE SMC 2021**, Virtual Br41n.io Hackathon.

- Achieved state-of-the-art classification error scores in sub-second settings on SSVEP data analysis by employing **Random Convolutional Kernels** for **feature extraction**. Currently working on a pre-print by extending results on novel data.

Apr 2021 **Virtual BR41N.IO**, International Brain Computer Interface Hackathon.

- Won the competition by employing **Topological Data Analysis** techniques and **data augmentation** on ECoG time series. Pre-print available on *"arXiv"*

Personal Projects

Feb 2021 – Nov 2021 **LearningNLP**: A tutorial series on Natural Language Processing, mainly applied on Social Science problems.

- Designed, wrote and coded several tutorials with the aim of paving the way for NLP competitions, such as the CommonLit Readability Challenge. Source code at https://github.com/MachineLearningJournalClub/LearningNLP

Jun 2020 – Mar 2021 **GAMELEON**: A multi-agent simulation of Covid-19 epidemics in the city of Toronto.

- Processed **GIS** data and employed multiplex networks with Python (*multinetx*), multi-agent-systems with **GAMA** and gathered data through APIs (e.g. TomTom API for traffic data). Source code at https://github.com/MachineLearningJournalClub/GAMELEON/ and pre-print published on *arXiv*

May 2018 – Jun 2018 **MineNavigation**: Navigation Tasks in a Reinforcement Learning Framework

- Developed a Reinforcement Learning exploration strategy for my Minecraft Agent (Microsoft's **Project Malmo**). Source at terna.to.it/tesineEconofisica/navigation.htm

Volunteering

Mar 2020 – Jun 2020 **Covid-19 Forecasting** – Future of Humanity Institute, University of Oxford

- Built parts of database by annotating useful news. Project available at epidemicforecasting.org

Mar 2020 **Covid-19 News Tracker**, – University of Greenwich, ISI Foundation & Quick Algorithm

- Annotated news for sentiment analysis purposes. Project available at covid19.scops.ai