Tommaso Pagliari

Curriculum Vitae

Interests

My primary background is in theoretical physics, particularly Quantum Field Theory and Statistical Mechanics. I am interested in the applications of theoretical physics to information theory, both classical and quantum, and the implications this may have on modern technologies.

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Education

2020–2023 **MSc in Theoretical Physics**, *University of Trieste*, Italy.
110/110 cum laude

2017–2020 **BSc in Physics**, *University of Trieste*, Italy.
109/110

2012–2017 **High-School Diploma**, *Liceo Classico e Scientifico M. G. Vida*, Italy.
100/100

Masters Thesis

Title *Optimal paths in stochastic thermodynamics and information theory*

Supervisor Professor Sebastian Goldt

Description We show a formal correspondence between the dynamic of Natural Gradient Descent and the geodesics that define the optimal protocols for a statistical mechanics problem. This duality might show new insights into the dynamic of learning for a neural network; in particular, we believe that such parallelism provides us with a way to update the learning rate in a thermodynamically optimal manner.

Bachelor's Thesis

Title *Hamiltonian dynamics with Clifford's algebra*

Supervisor Professor Marco Budinich

Description We introduce the Clifford's algebra and present the symplectic structure of the cotangent bundle of a Hamiltonian system. We analyze the theory of canonical transformations and report an elegant proof of Liuville's theorem that makes use of such a symplectic formalism. We aim to discuss the possibility of an invariant formulation of Hamiltonian mechanics through Clifford's algebra.

Computer Skills

GNU/Linux Arch Linux and Debian

Programming `C++` and `Python`. I am also familiar with `Fortran`, `C`, `bash/shell`.

A little project: fast-stack-pool

Tools I am using or have used `vim`, `git`, `SageMath`, `ROOT`, LaTeX

Training and Workshops attended

05/2023 **Workshop on Signatures of Non-equilibrium Fluctuations in Life**, *ICTP*, Italy.
The aim of the workshop is to discuss existing efforts on understanding non-equilibrium fluctuations using biological and physical methods. Click for more information.

2022–2023 **Large Deviations Lecture Group**, *SISSA & ICTP*, Italy.
Lectures are based on the book from Firas Rassoul-Agha and Timo Seppäläinen, called *A Course on Large Deviations with an Introduction to Gibbs Measures* and on the lectures notes by Hugo Touchette. Lecturers: Prof. Jean Barbier and Prof. Sebastian Goldt

2019–2020 **Internship**, *INFN*, Italy.
I worked on radiative effects and corrections for the COMPASS 2016 Liquid Hydrogen run at CERN. In particular, I run `C++` Monte Carlo simulations to reproduce the desired scattering processes. I used `ROOT`, the open-source framework for data analysis to analyze the obtained data. Supervisor: Prof. Andrea Bressan.

Classes Taught

2022–2023 **Linear Algebra and Affine Geometry**, *University of Trieste*, Italy.
Tutor Assistant under Prof. Valentina Beorchia

2022–2023 **Elements of Mathematics**, *University of Trieste*, Italy.
Tutor Assistant under Prof. Chiara Pagani

Languages

Italian **Mothertongue**

English **Full professional level**