DOMENICO CAUDO

PhD Student (XXXIX Cycle) at Department of Physics - University of Rome "La Sapienza"

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EDUCATION

University of Rome "La Sapienza" ***November 2023 - Currently***
Ph.D. Student at the Department of Physics with scholarship given by the Italian Institute of Technology (IIT).

Università degli Studi "La Sapienza", Roma ***October 2020 - May 2023***
MSc in Theoretical Physics, graduation mark 110/110 cum laude.

Université Paris-Saclay, Paris ***September 2021 - February 2022***
Eramus+

Università degli Studi "La Sapienza", Roma ***October 2016 - March 2020***
Bachelor degree in Physics, graduation mark 109/110

Liceo Scientifico "Augusto Righi", Roma ***September 2010 - June 2016***
High school diploma, graduation mark 97/100

Corpus Christi College, Perth, WA ***July - August 2013 and August 2014***
Study experience abroad with the intercultural exchange association "Intercultura"

SKILLS

Languages: **English B2 (University of Cambridge Esol Examination, 2020)**
French B1 (Sorbonne Université de Paris, 2022)
Programming: **Python, C++, C, Matlab, R**

RESEARCH EXPERIENCE

Partitioning Noise and EMT transition ***November 2023 - currently***
- The doctoral research project, under the mentorship of the research team directed by Professor Giancarlo Ruocco, is dedicated to elucidating the mechanisms underlying the epithelial to mesenchymal transition (EMT) and its relationship to partitioning noise in cell division. This multifaceted inquiry encompasses various stages, ranging from data acquisition via in vitro experiments on cellular lineages to computational simulations and the construction of theoretical frameworks.

Dynamics of mutating pathogen conferring cross immunity ***September 2022 - currently***
- This study, conducted as part of a Master's thesis supervised by Professor Francesca Tria and PhD Francesca Colaiori, investigates the interaction between the immune system's selective pressure and the high mutation rate of RNA-based pathogens in shaping epidemics. Specifically, the focus is on comparing the antigenic and genetic characteristics of viruses. The research demonstrates that considering epistatic effects leads to to a non trivial phase space, therefore to a more nuanced understanding of epidemic dynamics and a more realistic depiction of the phenomenon.

Mesenchymal stem cells and analysis of the mitosis tree ***November 2022 - July 2023***
- The experiment is conducted by the COBBS (Collective Behaviour in Biological Systems) laboratory, under the leadership of Professor Andrea Cavagna and Professor Irene Giardina. It entails an investigation into the growth dynamics, cellular division modalities, and self-organization phenomena within a colony of stem cells. This research poses challenges in terms of experimental methodologies, notably pertaining to continuous cell tracking and comprehensive lineage tracing, alongside theoretical considerations concerning the elucidation of tree-like structures delineating cellular division. The inquiry delves into branching processes and the emergence of nematic patterns during the confluence phase, with the overarching objective of unraveling insights into the processes of stem cell specialization and intercellular interactions, from both biological and theoretical standpoints.

GNN with strong inductive biases ***June 2022 - September 2022***

- The research initiative pertains to the examination for the "Advanced Machine Learning" and "Neural Network Models" exams. The individual, alongside their peers, engaged in the critical review, recontextualization, and proposition of enhancements for the Deep Learning algorithm expounded in the published work titled "Discovering symbolic models from Deep Learning with Inductive Biases" authored by Miles Cranmer et al.

CYGNO ***March 2021 - June 2021***

- The research endeavor was conducted in collaboration with the CYGNO research team at the INFN (National Institute of Nuclear Physics) laboratories in Frascati. The primary objective of the study was to characterize the performance of the revelation chamber known as LEMOn. This research initiative was facilitated by participation in the "Physics Laboratory II" course.

Direct CP violation in Meson B decays ***January 2020 - March 2020***

- The research undertaking constitutes the culmination of the Bachelor's degree program, focusing on an exploration of the BABAR experiment and the phenomenon of Charge Parity (CP) symmetry violation. The thesis supervision is provided by Dr. Francesco Pandolfi.

CONFERENCES AND TALKS

Talk title: "Quantifying fluctuations at cell division via population-level measurements "
Annual Meeting of the Physics of Living Systems (PoLS) Student Research Network ***June 2024***
Accepted Speaker

WORK EXPERIENCE

Tutoring grant at "La Sapienza" ***September 2022 - January 2023***
Tutor
- He won the grant for the tutoring of the course of "Stochastic Processes" for the master degree in Statics.

Tutoring grant at "La Sapienza" ***March 2022 - June 2022***
Tutor
- He won the grant for the tutoring of the course of "Physics I" for the bachelor degree in Biological Sciences.

Tutoring grant at "La Sapienza" ***April 2021 - June 2021***
Tutor
- He won the grant for the tutoring of the course of "Physics I" for the bachelor degree in Chemistry.

Athletics Instructor, Sport Society "Acquacetosa" ***September 2021 - June 2021***
Tutor
- He was an athletic instructor for the "Diamoci una mossa" project. Sport as a physical and therapeutic activity for children, teenagers and adults with the autistic syndrome.

Tutor with ACLI Roma ***March 2019 - February 2020***
Tutor
- He was a tutor of mathematics for the project "L'isola che c'è" for motivation to study mathematics for middle school students at the institute "Fratelli Cervi", Rome.

Collaboration Grant at "La Sapienza" ***March 2018 - November 2018***
- He won the grant for the collaboration activity at the "Historical Archive" of University "La Sapienza".

With publication purpose