GABRIELE MONTEFALCONE

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Research Interests: dark energy, dark matter, LSS and CMB cosmology, galaxy clusters, physics of the early universe.

Education

Princeton University, Princeton, NJ — June 2020
Bachelor of Arts – Major: Physics

- GPA: 3.75;
- Coursework includes: Classical & Quantum Mechanics; Adv. Electromagnetism; Experimental Physics; Contemporary Cosmology; Quantum Field Theory; General Relativity; Mathematical Methods in Physics
- Independent Work: "The DarkSide-Low Mass Experiment and its physics potential" (Junior Paper); "Properties of Galaxy Clusters with the Atacama Cosmology Telescope" (Senior Thesis)
- Publications: "Dark Energy, Extra Dimensions, the Swampland, and NEC violation" (https://arxiv.org/abs/2005.01143); "Inpainting CMB maps Partial Convolutional Neural Networks" (https://arxiv.org/abs/2011.01433)
- Honor: 2018 & 2019 A. G. Shenstone Prize Winner in Physics (excellence in course work; promise in independent research)

Liceo Scientifico Statale Augusto Righi, Rome, Italy — May 2015
Scientific High School Diploma; Score: 93/100

Landau Forte Academy Sixth Form, Tamworth, UK — December 2013

- 1 Semester- Student Exchange Program

Work and Research Experience

PU Department of Physics, *Assistant Instructor & Research Intern*, Princeton University, Princeton, NJ — Summer 2020-Ongoing

- As a researcher, my work centers on the analysis of the latest cluster catalog from the Atacama Cosmology Telescope (ACT) collaboration, with the goal of detecting the lensing induced cluster signature through a CMB gradient oriented stacking.
- As an assistant instructor, I support the labs and homework administration and grading for the physics introductory courses in mechanics (Fall) and electromagnetism (Spring).
- Refs: Prof. L. Page Jr. page@princeton.edu; Dr. K. Visnjic visnjic@princeton.edu; Prof. P. Meyers meyers@princeton.edu

Astrophysics Dep. Summer Internship Programme, *Research Intern,* Oxford University, Oxford, UK — Summer 2019

- My work centered on the development of a machine learning (ML) algorithm using partial convolutional neural networks (PCNNs) to in-paint masked images of the CMB.
- Our results showed that the network can reconstruct both the maps and the power spectra to a few percent for circular and irregularly shaped masks, and it outperforms other recently developed ML methods that inpaint pure CMB maps.
- Ref: Dr. M. A. Abitbol maximilian.abitbol@physics.ox.ac.uk

DarkSide, *Research Assistant,* Gran Sasso National Laboratories (LNGS), Assergi, Italy — Summer 2018

- I worked as a research assistant in the photo-electronics group of the DarkSide-20k experiment, a 20-ton liquid argon detector to search for WIMP dark matter particles held at LNGS.
- I was in charge of testing and analyzing different Silicon PhotoMultipliers (SiPMs) variants and their integrated electronics. My finalized reports provided guidance for the optimization of the SiPMs and boosting of the photon detection efficiency.
- Refs: Prof. C. Galbiati galbiati@Princeton.EDU ; Dr. A. Razeto alessandro.razeto@lngs.infn.it

The McGraw Center for Teaching & Learning, *Learning Consultant*, Princeton University, Princeton, NJ — AY 2017-20

- I consulted students from a variety of disciplines to develop an individualized and strategic approach to learning that enables them to make the most of lectures, precepts and readings; and to achieve their goals while maintaining a healthy balance.
- I held both individual and study hall sessions for introductory and intermediate PU courses in both Math and Physics.
- Ref: Nic Voge, Senior Associate Director, nvoge@princeton.edu

Leadership and Member Organizations

Men's Varsity Track & Field, *Captain*, Princeton University, Princeton, NJ — AYs 2017-20

- 7 times Ivy League Track & Field Team Champion
- Italian U20 & U18 400hs Champion & 500m Indoor U23 National Record Holder
- World U20 400hs Championship Semifinalist

The Italian Society, *President*, Princeton University, Princeton, NJ — AYs 2017-20

- Founded a student organization which aims at disseminating Italian culture and history within the Princeton community, with emphasis on the culinary, cinematic, musical, and literary traditions of Italy.

PU Physics Competition '18 by Physics Unlimited, *Co-Director,* Princeton University, Princeton, NJ — Fall 2018/19

- Directed the organizing committees and designed both onsite and online exams with challenging physics problems.
- Wrote the onsite and online exam for the international competitions organized by Physics Unlimited.

Special Skills and Interests

Languages: Native Italian; Proficient English; Intermediate Spanish
Digital Competence: Data Analysis in Python, Mathematica and C++; Machine Learning with Keras; Proficient user in LaTeX
Interests: Acoustic Guitar; Italian Cooking; Motorcycle Riding; Backpacking