

MATTEO BARBETTI

Ph.D. student in Smart Computing

Department of Physics and Astronomy, University of Florence

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INTERESTS

deep-learning, adversarial-learning, generative-models, optimization-studies,
high-energy-physics, particle-simulation, detector-simulation, ultrafast-simulation

EDUCATION

University of Florence

Firenze, Italy

🎓 PH.D. IN SMART COMPUTING

Nov 2020 – present

Topic: *Smart Computing Techniques applied to Medical Physics, Nuclear Physics and Particle Physics*

Advisor: Lucio Anderlini

University of Florence

Firenze, Italy

🎓 M.SC. IN PARTICLE PHYSICS

Sep 2017 – Jun 2020

Thesis: *“Techniques for parametric simulation with deep neural networks and implementation for the LHCb experiment at CERN and its future upgrades”*

Thesis Advisors: Lucio Anderlini, Piergiulio Lenzi

Graduation Score: 110/110 *cum laude*

University of Florence

Firenze, Italy

🎓 B.SC. IN PHYSICS AND ASTROPHYSICS

Sep 2013 – Sep 2017

Thesis: *“Study of the charmonium resonances in $B^+ \rightarrow p\bar{p}K^+$ and $B^+ \rightarrow p\bar{p}\gamma K^+$ decays with the LHCb experiment at CERN”*

Thesis Advisor: Lucio Anderlini, Giuseppe Latino

Graduation Score: 110/110

EXPERIENCE

University of Florence

Firenze, Italy

GRADUATE RESEARCHER (LHCb Florence Group)

Nov 2020 – present

📖 *Research focused on development and deployment of Ultra-Fast Simulation for LHCb, generative models optimization and parallel computing for intense hyperparameter studies.*

Advisor: Lucio Anderlini

INFN-Firenze

Firenze, Italy

STUDENT RESEARCHER

Feb 2020 – Apr 2020

📖 *Traineeship focused on application of machine learning techniques to High Energy Physics.*

Tutors: Gabriele Pasquali, Lucio Anderlini

CERN

Geneva, Switzerland

RESEARCH INTERN (LHCb Experiment)

Sep 2019 – Dec 2019

📖 *Research in generative models to parameterise the LHCb particle identification system.*

Host: Giovanni Passaleva

University of Florence

Firenze, Italy

STUDENT RESEARCHER (LHCb Florence Group)

Jun 2019 – Jun 2020

📄 *Research aimed to build (non)parametric models for the LHCb detector and to develop a new simulation framework for High Energy Physics applications.*

Mentors: Lucio Anderlini, Giacomo Graziani

CERN

Geneva, Switzerland

STUDENT RESEARCHER (LHCb Experiment)

Jul 2017

📄 *Research in statistical methods for data analysis in High Energy Physics.*

Host: Giovanni Passaleva

University of Florence

Firenze, Italy

STUDENT RESEARCHER (LHCb Florence Group)

May 2017 – Sep 2017

📄 *Research aimed to study charmonium resonances decaying into purely hadronic final states as reconstructed by the LHCb experiment.*

Mentors: Lucio Anderlini, Giacomo Graziani

HONORS & AWARDS**Ph.D. Scholarship in Smart Computing**, INFN

2020 – 2023

📄 *Scholarship to carry out machine learning research for Physics applications*

Scholarship for research activity, INFN

2019

📄 *National grant to pass three months at CERN for research activity*

Scholarship for thesis abroad, University of Florence

2017

📄 *Local grant to pass ten days at CERN for bachelor thesis*

CONFERENCES, WORKSHOPS & SCHOOLS**107° Congresso Nazionale della SIF**

online

Italian Physical Society (SIF)

Sep 2021

Presentation: “*Simulating the LHCb detector with GANs*” (restricted access)

**8th Thematic CERN School of Computing**

online

CERN School of Computing

Jun 2021

Theme: *Scientific Software for Heterogeneous Architectures*

**Workshop della Commissione Calcolo e Reti dell'INFN**

online

INFN Computing and Network Service

May 2021

Presentation: “*Simulating the LHCb detector with GANs*”

**1st CloudBank EU Workshop**

online

CERN IT and IPT Departments

Apr 2021

Presentation: “*LHCb deployment in AWS*” (restricted access)

**2nd Summer School in Physical Sensing and Processing**

online

University of Bologna

Jul 2020

Theme: *Sensing devices, DAQ systems and data processing strategies*

**Artificial Intelligence in Health and Well-Being**

Firenze, Italy

IFAC-CNR & University of Florence

May 2019

Theme: *Artificial Intelligence applications to health and well-being*



OPEN SOURCE SOFTWARE

OptunAPI

PYTHON

API to distribute hyperparameters optimization through HTTP requests



LNHunter

JUPYTER NOTEBOOK, PYTHON

Bulky mediastinal lymphoma classification with machine learning techniques



lab3-numpyntro

JUPYTER NOTEBOOK

Introduction to NumPy for Physics Laboratory III students of the University of Florence



PUBLICATIONS

Papers reported in reverse chronological order

Preprints & Working Papers

- [1] LHCb Collaboration, R. Aaij *et al.*, *Study of Z bosons produced in association with charm in the forward region*, [arXiv:2109.08084](#)
- [2] LHCb Collaboration, R. Aaij *et al.*, *Measurement of $\chi_{c1}(3872)$ production in proton-proton collisions at $\sqrt{s} = 8$ and 13 TeV*, [arXiv:2109.07360](#)
- [3] LHCb Collaboration, R. Aaij *et al.*, *Search for the doubly charmed baryon Ξ_{cc}^+ in the $\Xi_c^+ \pi^- \pi^+$ final state*, [arXiv:2109.07292](#)
- [4] LHCb Collaboration, R. Aaij *et al.*, *Observation of the suppressed $\Lambda_b^0 \rightarrow DpK^-$ decay with $D \rightarrow K^+ \pi^-$ and measurement of its CP asymmetry*, [arXiv:2109.02621](#)
- [5] LHCb Collaboration, R. Aaij *et al.*, *Measurement of the lifetimes of promptly produced Ω_c^0 and Ξ_c^0 baryons*, [arXiv:2109.01334](#)
- [6] LHCb Collaboration, R. Aaij *et al.*, *Measurement of the W boson mass*, [arXiv:2109.01113](#)
- [7] LHCb Collaboration, R. Aaij *et al.*, *Study of the doubly charmed tetraquark T_{cc}^+* , [arXiv:2109.01056](#)
- [8] LHCb Collaboration, R. Aaij *et al.*, *Observation of an exotic narrow doubly charmed tetraquark*, [arXiv:2109.01038](#)
- [9] LHCb Collaboration, R. Aaij *et al.*, *Updated search for B_c^+ decays to two charm mesons*, [arXiv:2109.00488](#)
- [10] LHCb Collaboration, R. Aaij *et al.*, *Measurement of J/ψ production cross-sections in pp collisions at $\sqrt{s} = 5$ TeV*, [arXiv:2109.00220](#)
- [11] LHCb Collaboration, R. Aaij *et al.*, *Angular analysis of the rare decay $B_s^0 \rightarrow \phi \mu^+ \mu^-$* , [arXiv:2107.13428](#)

TEACHING & TUTORING

B.Sc. in Physics and Astrophysics, University of Florence

- B015862: Physics Laboratory III – Lab Tutor and Head TA for Vitaliano Ciulli 2021 – 2022
- B015860: Physics Laboratory I – Lab Tutor and TA for Massimo Bongi 2021 – 2022
- B015862: Physics Laboratory III – Lab Tutor and Head TA for Vitaliano Ciulli 2020 – 2021
- B015861: Physics Laboratory II – Lab Tutor for Andrea Stefanini 2020 – 2021

- B015860: Physics Laboratory I – *Lab Tutor and TA for Massimo Bongi* 2020 – 2021
- B005476: Physics I – *TA for Oscar Adriani* 2020 – 2021
- B015860: Physics Laboratory I – *Lab Tutor and TA for Massimo Bongi* 2019 – 2020
- B005476: Physics I – *TA for Oscar Adriani* 2019 – 2020

B.Sc. in Mathematics, University of Florence

- B016237: Physics II – *Lab Tutor and TA for Piergiulio Lenzi* 2020 – 2021

B.Sc. in Biological Sciences, University of Florence

- B019238: Physics Laboratory for Biology – *Lab Tutor and TA for Francesca Intonti* 2019 – 2020
- B019238: Physics Laboratory for Biology – *Lab Tutor and TA for Francesca Intonti* 2018 – 2019
- B019231: Physics – *TA for Diederik Sybolt Wiersma* 2018 – 2019

OUTREACH & DISSEMINATION

Science book “Invenzioni”

Sassi Junior & INFN

Preparation of a paragraph dedicated to Artificial Intelligence

Jun 2021

**Live interview “Fisica del Clima” with Daniele Visioni**

AISF & Cornell University

Organization of an interview about Climate Physics

online

Mar 2021

**Live interview “Women in Science” with Anna Gregorio**

AISF & University of Trieste

Organization of an interview on the occasion of Women in Science International Day

online

Feb 2021

**Live interview “COVID19” with Eugenio Valdano**

AISF & INSERM

Organization of an interview about statistical models for COVID-19 pandemic

online

Apr 2020

**Outreach event “Tra clima e cocktail”**

AISF, Italian Climate Network, CNR & University of Florence

Organization of an event aimed to raise awareness about climate change problem

Firenze, Italy

May 2019

**Outreach event “Viaggio al Polo”**

AISF, Caffè-Scienza, INFN & University of Florence

Organization of an event about intelligence according to various scientific domains

Firenze, Italy

May 2019

**Outreach event “Luminoscienza”**

AISF, LENS, University of Florence, INRIM & Caffè-Scienza

Organization of three scientific evenings on the occasion of International Day of Light

Firenze, Italy

May 2018

**Seminar “The new particles of LHCb” by Lucio Anderlini**

AISF & LHCb Florence Group

Organization of a seminar to discuss latest LHCb discoveries

Firenze, Italy

Oct 2017

**Blog post “Quei ragazzacci di via Panisperna”**

Fisici Senza Palestra

Writing of a post about Via Panisperna boys

online

Jan 2017



LEADERSHIP & COMMUNITY SERVICES

National Institute for Nuclear Physics (INFN)



- PhD Student Member
- Master Student Member

Nov 2020 – present
Sep 2019 – Jun 2020

LHCb Collaboration

- PhD Student Author
- PhD Student Member
- Master Student Member
- Bachelor Student Member

    
May 2021 – present
Nov 2020 – present
Sep 2019 – Jun 2020
Jul 2017 – Sep 2017

Italian Association of Physics Students (AISF)

- Deputy-President
- Secretary
- President of the Florence Local Committee
- Editorial Board Member of “Sistemi di Riferimento”
- Deputy-President of the Florence Local Committee

     
Oct 2020 – present
Oct 2019 – present
Nov 2018 – May 2019
May 2018 – present
Dec 2017 – Nov 2018

COMPUTER SKILLS

GitHub <https://github.com/mbarbetti>
Languages Python, C/C++, TeX
OS Windows, Mac OS, Linux

LANGUAGES

Italian *Native*
English *Advanced*
Spanish *Intermediate*