

# MATTEO BARBETTI

Ph.D. student in Smart Computing

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## INTERESTS

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

## EDUCATION

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### 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

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### 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 Generative Adversarial Networks*”

**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 Generative Adversarial Networks*”

**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 &amp; University of Florence

May 2020

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 Firenze



## TEACHING & TUTORING

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

- B015862: Physics Laboratory III – *Lab Tutor and TA for Vitaliano Ciulli* 2021 – 2022
- B015862: Physics Laboratory III – *Lab Tutor and 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 &amp; INFN

*Preparation of a paragraph dedicated to Artificial Intelligence*

Jun 2021



### Live interview “Fisica del Clima con Daniele Visioni”

AISF &amp; Cornell University

*Live interview with Daniele Visioni about Climate Physics*

online

Mar 2021



### Live interview “Women in Science con Anna Gregorio”

AISF &amp; University of Trieste

*Live interview with Anna Gregorio on the occasion of Women in Science International Day*

online

Feb 2021



### Live interview “COVID19 con Eugenio Valdano”

AISF &amp; INSERM

*Live interview with Eugenio Valdano about statistical models for COVID-19 pandemic*

online

Apr 2020



### Outreach event “Tra clima e cocktail”

AISF, Italian Climate Network, CNR &amp; 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 &amp; 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 &amp; 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”**

AISF &amp; LHCb Florence Group

*Organization of a seminar to discuss latest LHCb discoveries*

Firenze, Italy

Oct 2017

**LEADERSHIP & COMMUNITY SERVICES**

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**Italian Association of Physics Students (AISF)***The Italian Association of Physics Students promotes collaborations among Italian physics students in an international and global context. Its members are Local Committees and individual members, that gather together regularly in conferences and local, national and international events.*

- Deputy-President 2020 – 2021
- Secretary 2019 – 2021
- Member of the Editorial Board of “Sistemi di Riferimento” 2018 – 2021
- President of the Florence Local Committee 2018 – 2019
- Deputy-President of the Florence Local Committee 2017 – 2018

**COMPUTER SKILLS**

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

**LANGUAGES**

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