Matteo Barbetti

Ph.D. student in Smart Computing

Department of Physics and Astronomy, University of Florence

Room 183, Via Sansone 1, 50019 Sesto Fiorentino (FI), Italy

✉ matteo.barbetti@unifi.it | 🌐 https://mbarbetti.github.io

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 $B^+ \to p\bar{p}K^+$ and $B^+ \to p\bar{p}\gamma K^+$ 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.*

<u>Mentors:</u> Lucio Anderlini, Giacomo Graziani

CERN
Geneva, Switzerland

STUDENT RESEARCHER (LHCb Experiment)   Jul 2017

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

<u>Host:</u> 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.*

<u>Mentors:</u> 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

<u>Presentation:</u> *"Simulating the LHCb detector with Generative Adversarial Networks"*   🌐

8th Thematic CERN School of Computing   online

CERN School of Computing   Jun 2021

<u>Theme:</u> *Scientific Software for Heterogeneous Architectures*   🌐

Workshop della Commissione Calcolo e Reti dell'INFN   online

INFN Computing and Network Service   May 2021

<u>Presentation:</u> *"Simulating the LHCb detector with Generative Adversarial Networks"*   📄🌐

1st CloudBank EU Workshop   online

CERN IT and IPT Departments   Apr 2021

<u>Presentation:</u> *"LHCb deployment in AWS"* (restricted access)   🎞📄🌐

2nd Summer School in Physical Sensing and Processing   online

University of Bologna   Jul 2020

<u>Theme:</u> *Sensing devices, DAQ systems and data processing strategies*   🌐

Artificial Intelligence in Health and Well-Being   Firenze, Italy

IFAC-CNR & University of Florence   May 2019

<u>Theme:</u> *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

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
- 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   Jun 2021
Preparation of a paragraph dedicated to Artificial Intelligence

Live interview "Fisica del Clima" with Daniele Visioni   online
AISF & Cornell University   Mar 2021
Organization of an interview about Climate Physics

Live interview "Women in Science" with Anna Gregorio   online
AISF & University of Trieste   Feb 2021
Organization of an interview on the occasion of Women in Science International Day

Live interview "COVID19" with Eugenio Valdano   online
AISF & INSERM   Apr 2020
Organization of an interview about statistical models for COVID-19 pandemic

Outreach event "Tra clima e cocktail"   Firenze, Italy
AISF, Italian Climate Network, CNR & University of Florence   May 2019
Organization of an event aimed to raise awareness about climate change problem

Outreach event "Viaggio al Polo"   Firenze, Italy
AISF, Caffè-Scienza, INFN & University of Florence   May 2019
Organization of an event about intelligence according to various scientific domains

Outreach event "Luminoscienza"   Firenze, Italy
AISF, LENS, University of Florence, INRIM & Caffè-Scienza   May 2018
Organization of three scientific evenings on the occasion of International Day of Light

Seminar "The new particles of LHCb" by L. Anderlini   Firenze, Italy
AISF & LHCb Florence Group   Oct 2017
Organization of a seminar to discuss latest LHCb discoveries

Blog post "Quei ragazzacci di via Panisperna"   online
Fisici Senza Palestra   Jan 2017
Writing of a post about Via Panisperna boys

LEADERSHIP & COMMUNITY SERVICES

National Institute for Nuclear Physics (INFN)
- PhD Student Member   Nov 2020 – present
- Master Student Member   Sep 2019 – Jun 2020

LHCb Collaboration
- PhD Student Author   May 2021 – present
- PhD Student Member   Nov 2020 – present
- Master Student Member   Sep 2019 – Jun 2020
- Bachelor Student Member   Jul 2017 – Sep 2017

Italian Association of Physics Students (AISF)
- Deputy-President   Oct 2020 – present
- Secretary   Oct 2019 – present
- President of the Florence Local Committee   Nov 2018 – May 2019
- Editorial Board Member of "Sistemi di Riferimento"   May 2018 – present
- Deputy-President of the Florence Local Committee   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*