

# Matteo Barbetti

MASTER STUDENT IN PARTICLE PHYSICS

## Personal information

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<i>Nationality:</i>	Italian	<i>Telephone:</i>	+39 347 8595002
<i>Birth-place:</i>	Terni (Italy)	<i>Address:</i>	Via Vittorio Emanuele II, 193
<i>Birth-date:</i>	1994-05-06		Firenze (FI) – 50134, Italy

I have completed the Master degree in *Particle Physics* at the University of Florence in June 2020. I have developed a *curriculum* of studies oriented to Physics Data Analysis with a strong focus on modern Computing Technologies, including in my study program the classes of *Algorithms and Data Structures* and *Machine Learning* from the Master course in Computing Engineering.

In September 2017 I discussed a Bachelor Thesis focused on Data Analysis work in High Energy Physics: the study of the decays of *charmonium* states into purely hadronic final states as reconstructed with the LHCb experiment at CERN. A scholarship funded by the University of Florence offered to me the opportunity of carrying out part of the activities at CERN.

In June 2020 I discussed a Master Thesis focused on the development of deep generative models to simulate the high-level response of the Particle Identification system of the LHCb detector. The trained models were then integrated within a new simulation framework designed to outperform the traditional simulation programs, taking full advantage of modern softwares for parallel computing and exploiting efficiently hardware accelerators. A fellowship funded by INFN has offered me the opportunity of passing three months at CERN, and forging new relationships within a stimulant and international environment.

I am a member of AISF, the Italian Association of Physics Students, which promotes and stimulates expanding the professional networks of its members in a national and international context. I held the position of President of the Florence Local Committee until May 2019; now I am the National Secretary of AISF.

## Education

<i>Laurea Magistrale in Fisica (MSc)</i>	<b>Università degli Studi di Firenze</b> Graduation on June 2020 with score 110/110 <i>cum laude</i> “ <i>Techniques for parametric simulation with deep neural networks and implementation for the LHCb experiment at CERN and its future upgrades</i> ” Thesis Advisor: Lucio Anderlini	2017 – 2020
<i>Laurea Triennale in Fisica (BSc)</i>	<b>Università degli Studi di Firenze</b> Graduation on September 2017 with score 110/110 “ <i>Study of the charmonium resonances in <math>B^+ \rightarrow p\bar{p}K^+</math> and <math>B^+ \rightarrow p\bar{p}\gamma K^+</math> decays with the LHCb experiment at CERN</i> ” Thesis Advisor: Lucio Anderlini	2013 – 2017
<i>Previous education</i>	<b>Liceo Scientifico G. Galilei di Terni</b> Graduation on July 2013 with score 100/100 <i>cum laude</i>	2008 – 2013

## Master degree classes

### Algoritmi e strutture dati

*Algorithm theory and analysis (sorting problem).  
Data structures and graph algorithms.*

S. Marinai

[6 CFU] 30/30, 2018-09-14

### Atomi, molecole e fotoni

*Atomic and molecular spectroscopy. Radiation-matter interaction. Cooling and trapping atoms.*

G. M. Tino

[6 CFU] 29/30, 2020-02-21

### Cosmologia

*Cosmology theory and thermal history of universe.  
CMB perturbations and fluctuations.*

A. Marconi

[6 CFU] 30/30 cum laude, 2018-03-14

### Fisica nucleare

*Nuclear force and two-nucleon systems.  
Nuclear structure and reactions ( $\alpha$ ,  $\beta$ ,  $\gamma$ ).*

M. Bini

[6 CFU] 30/30, 2018-02-12

### Fisica teorica

*Lagrangian formulation and Noether's theorem.  
Klein-Gordon, electromagnetic and Dirac fields.*

D. Dominici

[6 CFU] 27/30, 2018-02-08

### Laboratorio subnucleare

*Stopping power and time of flight. Multi-wire proportional chamber and Cherenkov detectors.*

R. D'Alessandro, L. Bonechi, F. Bucci

[9 CFU] 27/30, 2019-03-18

### Analisi dati in fisica subnucleare

*HEP statistics methods and MC simulations.  
Data analysis with ROOT and RooFit.*

P. Lenzi, N. Mori

[6 CFU] 27/30, 2018-07-19

### Complementi di fisica subnucleare

*Discrete symmetries. S-matrix theory.  
Decay width and scattering cross section.*

E. Iacopini

[6 CFU] 30/30 cum laude, 2019-06-17

### Fisica delle alte energie

*Gauge theory. Electroweak interaction.  
SM and CP violation. Collider physics.*

G. Barbagli, C. Civinini

[6 CFU] 28/30, 2019-07-15

### Fisica subnucleare

*Group theory. Relativistic kinematics.  
Elementary particle and weak interaction.*

E. Iacopini

[6 CFU] 29/30, 2019-04-16

### Laboratorio nucleare

*Radiation interactions. Proportional counters, scintillation and semiconductor detectors.*

S. Barlini, A. Stefanini

[9 CFU] 29/30, 2018-07-06

### Machine learning

*Supervised-unsupervised learning. Linear models and support vector machines. Neural networks.*

P. Frasconi

[6 CFU] 30/30, 2019-06-18

## Conferences

- |      |  |                |
|------|--|----------------|
| 2019 | <b>Artificial Intelligence in Health and Well-Being</b><br><i>Workshop on Artificial Intelligence applied to health and well-being.</i>                            | Firenze, Italy |
| 2019 | <b>Italian Conference of Physics Students 2019</b><br><i>Participation with a workshop titled "Dietro l'Articolo SdR".</i>   | Milano, Italy  |
| 2018 | <b>Italian Conference of Physics Students 2018</b><br><i>Representative for the Florence Local Committee of the Italian Association of Physics Student (AISF).</i> | Pisa, Italy    |
| 2017 | <b>Italian Conference of Physics Students 2017</b><br><i>Participation with a poster titled "I ragazzi di via Panisperna".</i>                                     | Bari, Italy    |

## Professional experience

Sep. 2019 – Dec. 2019	<u>INFN fellowship</u>	Istituto Nazionale di Fisica Nucleare <i>Scholarship funded by the National Institute for Nuclear Physics (INFN) for spending three months at CERN.</i>
Nov. 2018 – present	<u>Teaching assistant</u>	Università degli Studi di Firenze <i>Support to teaching activities and Physics laboratories.</i>
June 2018 – Oct. 2018	<u>Student assistant</u>	Università degli Studi di Firenze <i>Welcome and orientation service for Science students.</i>
Sep. 2016 – present	<u>Maths and Physics reps teacher</u>	<i>Private lessons for high-school and university students.</i>
Sep. 2016 – Dec. 2016	<u>Science Library assistant</u>	Università degli Studi di Firenze <i>Support to Science Library workers and book arrangement.</i>
March 2011 – Aug. 2013	<u>Basketball officer</u>	Federazione Italiana Pallacanestro <i>Referee assistant during basketball matches.</i>

## Involvement in Italian Association of Physics Students (AISF)

Oct. 2019 – present	<u>Secretary of the Italian Association of Physics Students</u> <i>Member of the Executive Committee that organizes and coordinates the Italian Local Committees.</i>
June 2019	Participation at Caffè-Scienza event <i>Presentation of the Florence Local Committee vulgarization activities.</i>
May 2019	Organizer of the outreach event “Tra clima e cocktail” <i>In collaboration with Italian Climate Network, CNR and University of Florence.</i>
May 2019	Organizer of the outreach event “Viaggio al Polo” <i>In collaboration with Caffè-Scienza, INFN and University of Florence.</i>
Nov. 2018 – May 2019	<u>President of the Florence Local Committee</u> <i>Organization of events and representative for about 40 members.</i>
May 2018 – present	<u>Member of the Editorial Board of <i>Sistemi di Riferimento</i></u> <i>Vulgarization activity to valorise Italian Physics Departments.</i>
Apr. 2018 – May 2018	Organizer of the Florence International Day of Light 2018 <i>Three Science Evenings focused on light at literary cafe La Cité.</i>
Dec. 2017 – Nov. 2018	<u>Deputy-President of the Florence Local Committee</u> <i>Support to events organization and Local Committee coordination.</i>
Oct. 2017 – Nov. 2017	Organizer for the Florence IAPS School Day <i>Lessons and experiments about acoustics to high-school students.</i>
Oct. 2017	Organizer of the outreach event “The new particles of LHCb” <i>In collaboration with the LHCb Florence Group.</i>

## Outreach and vulgarization

May 2018 Jury member

Premio Galileo

*Premio Galileo is a literary prize for science communication.*

Jan. 2017 – Dec. 2017 Blog author

Fisici Senza Palestra

*Dissemination of science on Fisici Senza Palestra blog.*

## Technical skills

Operating systems: Linux  
Mac OS  
Windows

Programming languages: C/C++ *with ROOT*  
Python *with PyROOT, NumPy and Pandas*  
Bash  
LabVIEW

Machine Learning frameworks: Scikit-Learn  
TensorFlow *with Keras*

Other suites: MS Office *certified with ECDL (May 2012)*  
L<sup>A</sup>T<sub>E</sub>X  
Git

## Languages

Italian *mother tongue*  
English *certificated as B1 (May 2013)*  
Spanish *certificated as B1 (July 2011)*

In compliance with the art. 46 and 47 of D.P.R. 445/2000 and further modifications, and aware of the consequences of making false statements, falsehood of acts and use of false facts, punishable by the law according to art. 76 D.P.R. n. 445/2000 and art. 496 of the Italian Penal Code, under my own responsibility, I declare that the information and facts in this document are truthful.

Firenze, 2020-07-09

Matteo Barbetti

