



# Niccolò Laurenti

PH.D. GRADUATE IN PARTICLE PHYSICS · SOFTWARE DEVELOPER

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## Personal Informations

**Birth** 1997, Rome, Italy  
**Citizenship** Italian  
**Languages** Italian (native language), English (fluent)

## Experience

### Software Developer

Rome, Italy

SOFTWARE DEVELOPER AT NEXT INGEGNERIA DEI SISTEMI S.P.A.

Oct. 2024 - Current

- Worked as a Consultant Software Developer for Next Ingegneria dei Sistemi S.p.A, fully employed in the Defence sector at the client **MBDA** Italy.
- Analyzed requirements to developed softwares and algorithms in **C++** and **Ada** and then designed and performed testing procedures for them.
- Worked in a large team that cooperated with other companies to deliver the final product.

**Technologies:** 🐧 C++, 🏗️ Ada, 🗑️ Qt Creator, 🐞 Gnat Studio, 🐚 Bash, 📄 XML, 🌐 IBM RTC, 🚪 IMB Doors, 📶 Wireshark, 🐧 Linux, 🪟 Windows, 🏢 Microsoft Office

### Ph.D. Researcher

Milan, Italy

RESEARCHER IN THEORETICAL PARTICLE PHYSICS AT THE UNIVERSITY OF MILAN AND INFN

Oct. 2021 - Sept. 2024

- Worked under the supervision of Prof. Stefano Forte in the **NNPDF** collaboration as a developer of the **NNPDF** code 🐞.
- Developed techniques and computational programs that utilize artificial intelligence to investigate the internal structure of the proton analysing experimental data collected at **CERN**.
- Developed programs for solving the so-called DGLAP equations, a linear system of integro-differential equations, with numerical techniques.
- Published research results in various papers and presented them in conferences.

**Technologies:** 🐍 Python, 📐 Numpy, 📊 Scipy, 📉 Matplotlib, 📦 Keras, 🚀 Tensorflow, 📈 Numba, 📡 Fortran, 🐚 Bash, 📦 Git, 🐙 Github, 🌪️ Slurm, 📺 PBS, 📐 Mathematica, 🐧 Linux, 🍏 MacOS, 📄 VS Code, 🐞 Vim, 📄 LaTeX, 📄 SQLite

### Undergraduate Researcher

Rome, Italy

RESEARCHER IN THEORETICAL PARTICLE PHYSICS AT THE UNIVERSITY OF ROME "LA SAPIENZA"

Mar. 2021 - Oct. 2021

- Worked under the supervision of Dr. Marco Bonvini to develop theoretical methods and computational programs for producing high-precision theoretical predictions in particle physics.
- Focused on describing experimental data of electron-proton collisions, collected at the particle accelerators **HERA** and **SLAC**.
- Wrote from zero the **C++** library **Adani** 🐞, with the **Python** bindings available in the PyPI and in conda-forge, resulting in a published paper and presentations at conferences.

**Technologies:** 🐧 C++, 📺 GSL, 📐 Mathematica, 🐧 Linux, 🐚 Bash, 📄 CMake, 📺 Emacs, 📄 LaTeX, 📄 SQLite

## Skills

<b>Programming</b>	C, C++, Python, Ada, Fortran, Bash, XML, CMake
<b>Operating systems</b>	Linux, MacOS, Windows
<b>Code editors</b>	VS Code, Qt Creator, Gnat Studio, Emacs, Vim, Nano
<b>Version control systems</b>	Git, Github, Gitlab, IBM RTC
<b>C++ libraries</b>	STL, GSL, Pybind11, Boost
<b>Python packages</b>	Numpy, Scipy, Matplotlib, Multiprocessing, Numba, Pandas, Keras, Tensorflow, SQLite
<b>Jobs schedulers</b>	Slurm, PBS
<b>Scientific programs</b>	Matlab, Wolfram Mathematica
<b>Writing</b>	Latex, Markdown, Microsoft Office

## Education

### Ph.D. in Physics

UNIVERSITY OF MILAN

Milan, Italy

Oct. 2021 - Nov. 2024

- Field of study: Theoretical Particle Physics, Computational Physics.
- Thesis: *Advancements in PDFs determination: Incorporation of QED effects and new theoretical improvements in a modern deep learning fitting framework.* [link](#)

### M.S. in Physics

UNIVERSITY OF ROME "LA SAPIENZA"

Rome, Italy

Sep. 2019 - Oct. 2021

- Field of study: Theoretical Particle Physics.
- Grade: 110/110 (cum laude).
- Thesis: *Construction of a next-to-next-to-next-to-leading order approximation for heavy flavour production in deep inelastic scattering with quark masses.* [Inspire](#)

### B.S. in Physics

UNIVERSITY OF ROME "LA SAPIENZA"

Rome, Italy

Sep. 2016 - Nov. 2019

- Grade: 110/110 (cum laude).
- Thesis: *Particle identification with the time of flight method and applications to the CMS experiment.*

## Publications

- |      |   |                         |
|------|---|-------------------------|
| 2024 | <b>LO, NLO, and NNLO Parton Distributions for LHC Event Generators</b> , J. Cruz-Martinez, S. Forte, N. Laurenti, T. R. Rabemananjara, J. Rojo, <i>JHEP</i>   | <a href="#">Inspire</a> |
| 2024 | <b>NNPDF4.0 <math>\alpha^3</math> LO PDFs with QED corrections</b> , A. Barontini, N. Laurenti, J. Rojo, <i>Contribution to DIS2024</i>   | <a href="#">Inspire</a> |
| 2024 | <b>The Path to <math>N^3</math> LO Parton Distributions</b> , The NNPDF Collaboration, R. D. Ball et al., <i>Eur. Phys. J. C</i>  | <a href="#">Inspire</a> |
| 2024 | <b>Determination of the theory uncertainties from missing higher orders on NNLO parton distributions with percent accuracy</b> , The NNPDF Collaboration, R. D. Ball et al., <i>Eur. Phys. J. C</i> | <a href="#">Inspire</a> |
| 2024 | <b>Photons in the proton: implications for the LHC</b> , The NNPDF Collaboration, R. D. Ball et al., <i>Eur. Phys. J. C</i>   | <a href="#">Inspire</a> |
| 2023 | <b>Inclusion of QED corrections in PDFs fits</b> , N. Laurenti, <i>Nucl. Part. Phys. Proc.</i>  | <a href="#">Inspire</a> |
| 2022 | <b>Approximating missing higher-orders in transverse momentum distributions using resummations</b> , N. Laurenti, T. R. Rabemananjara, and R. Stegeman, <i>Contribution to DIS2022</i>              | <a href="#">Inspire</a> |

## Talks

- |      |   |                                   |
|------|---|-----------------------------------|
| 2024 | <b>The inclusion of QED corrections in the NNPDF4.0 fitting framework</b> , Prague, Czech Republic                          | <a href="#">ICHEP2024</a>         |
| 2024 | <b>The inclusion of QED corrections in the NNPDF4.0 fitting framework</b> , National Laboratory of Frascati, Italy          | <a href="#">IRN Terascale@LNF</a> |
| 2023 | <b>Evidence of intrinsic charm quarks in the proton</b> , Mainz, Germany  | <a href="#">MENU23</a>            |
| 2023 | <b>Including QED corrections in PDF fits: The NNPDF4.0QED PDF set</b> , Durham, UK  | <a href="#">QCD@LHC23</a>         |
| 2023 | <b>Inclusion of QED corrections in PDFs: The NNPDF4.0QED PDF set</b> , Montpellier, France                                  | <a href="#">QCD23</a>             |
| 2021 | <b>Construction of a third order approximation for heavy flavour production in deep inelastic scattering</b> , Milan, Italy | <a href="#">MCM 2021</a>          |

## Teaching activity

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|------|--|-------------------------------------|
| 2024 | <b>Co-supervisor of a Bachelor thesis</b> , Thesis title: <i>On the fitting scale dependence of the Parton Distributions</i> | <a href="#">University of Milan</a> |
| 2024 | <b>TA for the course of Quantum Physics I</b> , Introduction to Quantum Mechanics  | <a href="#">University of Milan</a> |
| 2024 | <b>TA for the course of Physics</b> , Basics of Classical Mechanics and Thermodynamics                                       | <a href="#">University of Milan</a> |
| 2024 | <b>TA for the course of Quantum Physics II</b> , Advanced course on Quantum Mechanics  | <a href="#">University of Milan</a> |
| 2023 | <b>TA for the course of Theoretical Physics I</b> , Introduction to Quantum Field Theory                                     | <a href="#">University of Milan</a> |
| 2023 | <b>TA for the course of Physics</b> , Basics of Classical Mechanics and Thermodynamics                                       | <a href="#">University of Milan</a> |
| 2023 | <b>TA for the course of Quantum Physics II</b> , Advanced course on Quantum Mechanics  | <a href="#">University of Milan</a> |
| 2023 | <b>Exercise classes for the course of Quantum Physics II</b> , Advanced course on Quantum Mechanics                          | <a href="#">University of Milan</a> |
| 2022 | <b>TA for the course of Quantum Physics I</b> , Introduction to Quantum Mechanics  | <a href="#">University of Milan</a> |