Niccolò **Laurenti**

Ph.D. Researcher in Particle Physics · Scientific Software Developer

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Summary

Ph.D. researcher at the University of Milan specialised in applying artificial intelligence to particle physics. I have experience working with different programming languages, in particular with C++ and Python. I have hands-on experience with various machine learning tools like Keras and Tensorflow. Passionate about the field of computer science and open to opportunities in industry to further improve my skills.

Personal Informations

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

Experience

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, Fortran, Bash, Git, Github, 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

Skills

Programming C, C++, Python, Fortran, Bash, Git, Github, CMake, VS Code, Emacs, Vim, Nano, Docker
Operating systems Linux, MacOS, Windows
C++ libraries STL, GSL, Pybind11, Boost
Python packages Numpy, Scipy, Matplotlib, Multiprocessing, Pandas, Keras, Tensorflow, SQLite
Scientific programs Matlab, Mathematica
Writing Latex, Markdown, Microsoft Office

Education

Ph.D. in Physics

Milan, Italy

University of Milan — *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*.

M.S. in Physics

Rome, Italy

University of Rome "La Sapienza" — *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 *Rome, Italy*

University of Rome "La Sapienza" *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 **LO, NLO, and NNLO Parton Distributions for LHC Event Generators**, J. Cruz-Martinez, S. Forte, N. Laurenti, T. R. Rabemananjara, J. Rojo, *JHEP* **Inspire**

2024 **NNPDF4.0 aN^{3}LO PDFs with QED corrections**, A. Barontini, N. Laurenti, J. Rojo, *Contribution to DIS2024* **Inspire**

2024 **The Path to N^{3}LO Parton Distributions**, The NNPDF Collaboration, R. D. Ball et al., *Eur. Phys. J. C* **Inspire**

2024 **Determination of the theory uncertainties from missing higher orders on NNLO parton distributions with percent accuracy**, The NNPDF Collaboration, R. D. Ball et al., *Eur. Phys. J. C* **Inspire**

2024 **Photons in the proton: implications for the LHC**, The NNPDF Collaboration, R. D. Ball et al., *Eur. Phys. J. C* **Inspire**

2023 **Inclusion of QED corrections in PDFs fits**, N. Laurenti, *Nucl. Part. Phys. Proc.* **Inspire**

2022 **Approximating missing higher-orders in transverse momentum distributions using resummations**, N. Laurenti, T. R. Rabemananjara, and R. Stegeman, *Contribution to DIS2022* **Inspire**

Talks

2024 **The inclusion of QED corrections in the NNPDF4.0 fitting framework**, Prague, Czech Republic *ICHEP2024*

2024 **The inclusion of QED corrections in the NNPDF4.0 fitting framework**, National Laboratory of Frascati, Italy *IRN Terascale@LNF*

2023 **Evidence of intrinsic charm quarks in the proton**, Mainz, Germany *MENU23*

2023 **Including QED corrections in PDF fits: The NNPDF4.0QED PDF set**, Durham, UK *QCD@LHC23*

2023 **Inclusion of QED corrections in PDFs: The NNPDF4.0QED PDF set**, Montpellier, France *QCD23*

2021 **Construction of a third order approximation for heavy flavour production in deep inelastic scattering**, Milan, Italy *MCM 2021*

Teaching activity

2024 **Co-supervisor of a Bachelor thesis**, Thesis title: *On the fitting scale dependence of the Parton Distributions* *University of Milan*

2024 **TA for the course of Quantum Physics I**, Introduction to Quantum Mechanics *University of Milan*

2024 **TA for the course of Physics**, Basics of Classical Mechanics and Thermodynamics *University of Milan*

2024 **TA for the course of Quantum Physics II**, Advanced course on Quantum Mechanics *University of Milan*

2023 **TA for the course of Theoretical Physics I**, Introduction to Quantum Field Theory *University of Milan*

2023 **TA for the course of Physics**, Basics of Classical Mechanics and Thermodynamics *University of Milan*

2023 **TA for the course of Quantum Physics II**, Advanced course on Quantum Mechanics *University of Milan*

2023 **Exercise classes for the course of Quantum Physics II**, Advanced course on Quantum Mechanics *University of Milan*

2022 **TA for the course of Quantum Physics I**, Introduction to Quantum Mechanics *University of Milan*