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Marco Rossi

Research Interests

Broad interest in deep learning techniques.
PhD research fields: machine learning and AI applications to particle physics, especially high-energy and neutrino physics. Computational tools in high-energy physics.

Education

2019 → 2023 **Doctoral Student**, *Università degli Studi di Milano*, Milan, Italy.
Applications of ML and DL techniques to physics.

2016 → 2019 **M.Sc in Physics**, *Università degli Studi di Milano*, Milan, Italy.
Particle physics and quantum field theory

2012 → 2016 **B.Sc in Physics**, *Università degli Studi di Milano*, Milan, Italy.
Physics and matter sciences.

Professional Experience

2019 → 2023 **Doctoral Student**, *CERN*, Geneva, Switzerland.
Applications of ML and DL techniques to physics.

May-Jun 2019 **Internship and master thesis**, *CERN, Geneva*.
Thesis Investigating Anomaly Effects in HEP with GANs.
Supervisors Dr. Stefano Carrazza, Dr. Maurizio Pierini, Dr. Andrea Wulzer.

Jan-Mar 2016 **Bachelor thesis**, *Università degli Studi di Milano*, Milan, Italy.
Thesis Struttura Analitica della Distribuzione in Rapidità per la Produzione di un Bosone di Higgs.
Supervisors Prof. Stefano Forte.

Teaching

2020 → 2022 **Corso di Informatica**, *Università degli Studi di Milano*.
Teaching assistant for the course

Partecipation in Conferences and Workshops

Nov 2021 **ACAT 2021**, Daejeon (virtual).
Jul 2021 **Offshell-2021**, CERN (virtual).
May 2021 **vCHEP2020**, CERN (virtual).
Oct 2020 **IML2020**, CERN (virtual).
Sep 2020 **iSCS-2020**, CERN (virtual).
Sep 2020 **OpenPOWER**, North America (virtual).
Sep 2020 **SIF2020**, Italy (virtual).
Aug 2020 **SSI2020**, Los Angels (virtual).
Aug 2020 **ICHEP2020**, Prague (virtual).

Talks

Nov 2021 **ACAT 2021**, Slicing with DL models at ProtoDUNE-SP.

Jul 2021 **Offshell-2021**, MadFlow: automating Monte Carlo simulation on GPU for particle physics processes.

May 2021 **vCHEP2021**, Deep Learning strategies for ProtoDUNE raw data denoising.

Oct 2020 **IML2020**, Hit-reco: ProtoDUNE denoising with DL models.

Sep 2020 **OpenPOWER**, Hit-reco: ProtoDUNE denoising with DL models.

Sep 2020 **SIF2020**, PDFFlow: parton distribution functions on GPU.

Aug 2020 **ICHEP2020**, PDFFlow: hardware accelerating parton density access.

Research Outcome

Articles

[1] Stefano Carrazza, Juan M. Cruz-Martinez, and Marco Rossi. "PDFFlow: Parton distribution functions on GPU". In: *Computer Physics Communications* (Apr. 2021), p. 107995. DOI: 10.1016/j.cpc.2021.107995. URL: https://doi.org/10.1016%2Fj.cpc.2021.107995.

[2] Stefano Carrazza et al. "MadFlow: automating Monte Carlo simulation on GPU for particle physics processes". In: *Eur. Phys. J. C* 81.7 (July 2021), p. 656. DOI: 10.1140/epjc/s10052-021-09443-8. arXiv: 2106.10279 [physics.comp-ph].

[7] Marco Rossi and Sofia Vallecorsa. "Deep Learning Strategies for ProtoDUNE Raw Data Denoising". In: *Computing and Software for Big Science* 6.1 (Jan. 2022). ISSN: 2510-2044. DOI: 10.1007/s41781-021-00077-9. URL: https://doi.org/10.1007/s41781-021-00077-9.

Miscellanea Papers

[3] Stefano Carrazza et al. *Towards the automation of Monte Carlo simulation on GPU for particle physics processes*. May 2021. arXiv: 2105.10529 [physics.comp-ph].

Proceedings

[6] Marco Rossi, Stefano Carrazza, and Juan Cruz-Martinez. "PDFflow: hardware accelerating parton density access". In: *Proceedings of 40th International Conference on High Energy physics — PoS(ICHEP2020)*. Vol. 390. Apr. 2021, p. 921. DOI: 10.22323/1.390.0921.

Software

[4] Juan Cruz-Martinez, Marco Rossi, and Stefano Carrazza. *N3PDF/pdfflow*. Version v0.0.1b1. July 2020. DOI: 10.5281/zenodo.3964191. URL: https://doi.org/10.5281/zenodo.3964191.

[5] Marco Rossi. *marcorossi5/DUNEdn: 1.0.1*. Version 1.0.1. Jan. 2022. DOI: 10.5281/zenodo.5841986. URL: https://doi.org/10.5281/zenodo.5841986.

Computer Skills

Computing
- Operating Systems: Linux, Windows, MacOS.
- Versioning-control: Git, GitHub.
- Languages: Python, C++, BASH, LaTeX, HTML5, CSS, PHP
- Data libraries: NumPy, SciPy, Pandas, Scikit-learn, Matplotlib.
- ML Libraries: TensorFlow, PyTorch

Deep Learning
- Computer vision: image classification, image denoising.
- Clustering techniques.
- Reinforcement Learning.

Languages

Italian Mother tongue.

English	IELTS Academic Proficiency Test, CEFR level equivalent: C1.
French	Basic understanding and spoken production.