

LORENZO VALENTE

PhD Student

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📞 LorenzoValente3



ABOUT

The physical sciences are my main area of interest. As part of my Bachelor's and Master's degrees in physics, I have gained a deep understanding of the working principle of Radiation Detectors in High Energy Physics. My interests include Particle Physics, Software and Computing for High Energy Physics, Statistical Data Analysis and Electronic devices used in these fields, specifically Field Programmable Gate Arrays. Additionally, I am particularly passionate about the Machine and Deep Learning techniques emerging in recent years and their applications in physics. Besides these, I also studied Classical Piano.

SKILLS

Python C++ ROOT L^AT_EX

TensorFlow Keras QKeras Numpy Sklearn

Matplotlib hls4ml TMVA Git

Machine/Deep Learning Data Science Data Visualization

Windows Linux macOS

EXPERIENCE

Internship Trainee

Instituto de Astrofísica de Canarias (IAC)

📅 April 2023 – July 2023 📍 La Laguna, Spain

Development of various machine learning techniques for the heavy nuclei identification problem, specifically the Iron spectrum, with MAGIC telescopes.

Research student for Master's thesis

Alma Mater Studiorum - University of Bologna

📅 September 2022 – March 2023 📍 Bologna, Italy

Development of a Joint Variational Autoencoder architecture for detecting anomalies in image data in the context of the CMS experiment at CERN. The ultimate goal was to assess the feasibility of implementing the model on an FPGA for real-time data processing.

Research student for Bachelor's thesis

Alma Mater Studiorum - University of Bologna

📅 April 2020 – July 2020 📍 Bologna, Italy

Development of a Boosted Decision Trees-based software for reconstructing the Λ_c baryon in the ALICE experiment at CERN.

EDUCATION

Master's Degree in Physics

University of Bologna

📅 September 2020 – March 2023

Thesis title: **A Variational Autoencoder Application for real-time Anomaly Detection at CMS**

Supervisor : Prof. Daniele Bonacorsi (UniBO)

Erasmus+

Ludwig Maximilian University of Munich

📅 April 2021 – August 2021

Bachelor's Degree in Physics

University of Bologna

📅 September 2016 – July 2020

Thesis title: Reconstruction of non-prompt charmed baryon Λ_c with Boosted Decision Trees technique

Master's Degree in Classical Piano

Conservatory of Music Pescara

📅 September 2009 – October 2018

LANGUAGES

Italian Native Speaker
English Full professional proficiency

RECENT PROJECTS

JointVAE for Anomaly Detection in HEP

📍 LorenzoValente3/JointVAE4AD

JointVAE QAT AD

Collection of basic Generative Models

📍 LorenzoValente3/Deep-Learning-Models

AE VAE GANs WGAN

Autoencoder for FPGA-target

📍 LorenzoValente3/Autoencoder-for-FPGA

AE QAT Pruning hls4ml FPGA-target

PUBLICATION

Joint Variational Auto-Encoder for Anomaly Detection in High Energy Physics

(conference proceeding, under review)

International Symposium on Grids & Clouds (ISGC) 2023

📅 19-31 March 2023

📍 Taipei, Taiwan

A JointVAE machine learning model is proposed for finding new physics signatures at higher luminosity runs in CERN's multi-purpose experiments. This work studies the feasibility of implementing the JointVAE model in real-time using FPGAs to reduce the model size, latency, and energy consumption. The JointVAE model allows for the identification of anomalous events in an unsupervised manner, complementing traditional search tactics and expanding the discovery potential of the LHC.

🔗 [LorenzoValente3/JointVAE4AD](#)

EXTRACURRICULAR ACTIVITIES

Theoretical and Practical Course

Machine learning techniques with FPGA devices for particle physics experiments

📅 2-4 November 2022

📍 Bologna, Italy

Summer School

Quantum Sensing, Information Processing and Computing

📅 14-20 July 2022

📍 Bologna, Italy