

Abderrazaq EL Abassi

PHD STUDENT IN PARTICLE PHYSICS

Kenitra, Morocco

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Summary

I am Abderrazaq EL Abassi, a PhD student in Particle Physics at the University of Ibn Tofail (Kenitra, Morocco), working under supervision of Prof. Mohamed Goughri. My research focuses on atomospheric neutrinos, especially simulation and new reconstruction algorithm using machine learning for upward-going muons for the Hyper-Kamiokande detector.

My research also includes the full simulation of N16 decay as a source for low-energy scale calibration for the Hyper-Kamiokande detector.

Highlights

- PhD researcher in neutrino physics at University Ibn Tofail (2021–present), contributing to Hyper-Kamiokande simulation and analysis efforts.
- Co-authored in the Hyper-Kamiokande Collaboration paper on sensitivity to neutrino oscillation parameters (EPJ C, 2026).
- Presented a conference poster on energy-scale cross-calibration using a Deuterium-Tritium neutron generator (First African Conference of High Energy Physics, 2023).

Field of Interest

MY RESEARCH INTERESTS INCLUDE, BUT ARE NOT CONFINED TO:

- Atmospheric neutrinos oscillation and proton decay
- Detector calibration
- Statistical inference for high-energy physics analyses
- Applied Machine learning and deep learning for Particle Physics
- Quantum computing and Quantum machine learning applications

Education

University Ibn Tofail

Kenitra, Morocco

PHD IN PARTICLE PHYSICS

2021 - Present

- Research mainly focuses on Machine Learning-Based Reconstruction of Upward-Going Muons for the Hyper-Kamiokande Detector.
- Supervisor: Prof. Mohamed Goughri.

University Mohammed V

Rabat, Morocco

MSC IN MATHEMATICAL PHYSICS

2018 - 2020

- Specialized in high-energy physics.
- Thesis titled : statistical combination studies of invisible Higgs decays in vector boson fusion with the ATLAS detector.

University Moulay Ismail

Meknes, Morocco

BACHELOR/LICENCE IN PHYSICS

2015 - 2018

- Bachelor in Material Physics and Applications

Skills

Programming	Python, C++, SQL, Mathematica, MATLAB, Bash
Physics & Analysis	Neutrino physics, collider phenomenology, statistical inference
Simulation & Scientific Tools	GEANT4, ROOT, Monte Carlo simulations
Machine Learning	pandas, numpy, scikit-learn, XGBoost, LightGBM, PyTorch
Software & Data Stack	FastAPI, REST APIs, PostgreSQL, Linux, Git, Docker, CI/CD
Languages	Arabic (native), English (Fluent), French (intermediate), Spanish (basic), Japanese (basic)

Research Project Experience

Upward-going Muons Simulation and Reconstruction for Hyper-Kamiokande

University Ibn Tofail, Kenitra

PHD RESEARCH PROGRAM

2026 - Present

- Developed an Upward-going Muons generator code for Hyper-K geometry.
- Working on Machine Learning-based reconstruction algorithms for Upward-going Muons in the Hyper-Kamiokande detector.
- Keywords: atmospheric muons, upward-going muons, going-through muons, stopping muons, Hyper-Kamiokande.

Energy-Scale Cross-Calibration of Hyper-Kamiokande with N16

First African Conference of High
Energy Physics

CONFERENCE POSTER PROJECT

2023

- Presented a poster describing a calibration strategy using a controlled Deuterium-Tritium neutron source.
- Simulated and reconstructed N16 decay products within the Hyper-Kamiokande detector framework.
- Keywords: detector calibration, neutron generator, low-energy scale, N16.

Statistical Combination studies of Invisible Higgs decays in VBF with ATLAS

University Mohammed V, Rabat

MASTER'S THESIS PROJECT

2019 - 2020

- Developed validation scripts for all contributing channels for combination analysis.
- Contributed to the full combination analysis of the branching ratio of Higgs invisible decays to WIMPs.
- Keywords: Higgs physics, dark matter search, combination analysis, inference.

Publications

List of selected publications, including journal articles and conference posters.

JOURNAL ARTICLE

1. Hyper-Kamiokande Collaboration, "Sensitivity of the Hyper-Kamiokande experiment to neutrino oscillation parameters using accelerator neutrinos," *European Physical Journal C*, vol. 86, no. 2, 2026. DOI: 10.1140/epjc/s10052-025-14938-9.

CONFERENCE POSTER

1. Abderrazaq EL Abassi, Rafik Er-Rabit, and Mohamed Goughri, "Energy scale calibration of Hyper-Kamiokande with N16," Poster presented, and accepted for conference proceedings at the First African Conference of High Energy Physics, 2023. DOI/Proceedings: Springer volume.

Teaching Experience

Ibn Tofail University

Kenitra, Morocco

TEACHING

10 Oct. 2024 - 4 Jan. 2025

- Co-taught the course "C++ course" for master students in nuclear physics.

Honors & Awards

CERTIFICATIONS & ACHIEVEMENTS

- 2025 **ALX Software Engineering Graduate**, ALX Africa
- 2024 **Deep Learning Specialization**, DeepLearning.AI
- 2024 **Machine Learning Specialization**, DeepLearning.AI / Stanford Online

SELECTED RESEARCH MILESTONES

- 2025 **EPJ C Journal Publication**, Hyper-Kamiokande sensitivity paper (collaboration)
- 2023 **Conference Poster Presentation**, First African Conference of High Energy Physics

Rabat/Kenitra, Morocco

Academic Services

- 2021– **Collaboration Member**, Hyper-Kamiokande Collaboration
- 2021– **Departmental Affiliation**, Laboratoire de Physique des Matériaux et Subatomique, Department of Physics, University Ibn Tofail