Edmar Egidio Purcino de Souza

7 L Bd Jourdan, Cité Internationale Universitaire de Paris, Fr.
Zip Code: 75014

+33 7 67 42 75 77 • edmar.egidio@cern.ch | Skype: edmar.egidio
ORCID: https://orcid.org/0000-0001-5370-8377
Nationality: Brazilian. Birth date: 12/25/1988

Professional Profile

I am an Electronic Engineer working with experimental particle physics at the ATLAS Experiment of the Large Hadron Collider (LHC) at CERN. Working with machine learning and signal processing frameworks, especially for online efficient selection of electrons and photons signatures. Over the years I have contributed to the ATLAS mainly in trigger, signal reconstruction, data quality, monitoring, and physics analysis dedicated to the search for Long Lived Axion Like Particles. I have experience in teaching, research and development and leadership of multidisciplinary teams.

Education

- **PhD in Electrical Engineering** — **Bahia/Brazil**
  Federal University of Bahia - UFBA, Machine Learning and Signal Processing — *2016–2021*
  PhD Thesis: Ensemble Neural Classifiers Fed by Expert Information for Online Filtering in a Particle Detector.
  Advisor: Eduardo Furtado de Simas Filho

- **Master in Electrical Engineering** — **Bahia/Brazil**
  Federal University of Bahia - UFBA, Machine Learning and Signal Processing — *2012–2015*
  Master Thesis: Efficient Pre-processing for an Online Classification System Based on Artificial Neural Networks
  Advisor: Eduardo Furtado de Simas Filho

- **Electrical and Electronics Engineering** — **Bahia/Brazil**
  Área1 - Science and Technology University — *2006–2011*

Employments

- **Laboratoire de Physique Nucléaire et des Hautes Énergies - LPNHE/CNRS** — **Paris/Fr**
  Postdoctoral Fellow — *2022–Now*
  Postdoctoral researcher in the LPNHE/Sorbonne Université working on ATLAS Experiment/LHC at CERN.

- **Federal University of Recôncavo da Bahia** — **Bahia/Brazil**
  Assistant Professor — *2021–2022*
  Teaching for the undergraduate course in Electrical Engineering. Main components: Electrical and Magnetic Circuits, Alternating Current Circuits, Programming Language.

- **Area1 - Science and Technology University** — **Bahia/Brazil**
  Assistant Professor — *2017–2021*
  Teaching for undergraduate courses in Electrical and Computer Engineering. Main components: Electrical and Magnetic Circuits, Electronics, Programming Language.

- **Federal University of Bahia** **Bahia/Brazil**
  Assistant Professor - Teaching Internship *2016–2016*
  Teaching for the undergraduate course in Computer Engineering. Main component: Scientific Methodology.
- **Bahia Broadcast Television** **Bahia/Brazil**
  Electronics Engineer *2011–2017*
  As an electronic systems engineer, the main activities were related to the design, planning and implementation of digital audio and video systems, radio frequency coverage analysis of TV stations, specification of software and equipment for capturing and processing of audio and video signals.

Scientific Research Experience

ATLAS Experiment. Active Author Since: 11/06/2020

- **Doctoral Thesis Context:**
  During my PhD, I worked on performance improvements of the Ringer algorithm, which acts in the fast step of High Level Trigger (HLT), for electron signatures in the ATLAS experiment. A strategy based on the shower lateral information combined with concentric rings was investigated, to highlight the differences of the electron showers between hadronic jets. An ensemble of neural networks was designed to act on phase space segments in η and E_T, showing good results when compared to the cut-based method using shower shapes variables.

- **Qualification Task:** *11/01/2019 – 11/06/2020*
  In my qualification task I worked on the implementation of online monitoring for electron and photon signatures, for the reconstruction algorithms used in the HLT precision step. Algorithms for monitoring shower shapes and superclusters were developed to allow the online reconstruction step to be monitored and validated by the Data Quality and monitoring tools in Run3.

  - **Local Supervisor**: Dr. José Manoel de Seixas, Federal Universitity of Rio de Janeiro, COPPE/Poli/ UFRJ. Rio de Janeiro/Brazil.
  - **Technical Supervisor**: Dr. Fernando Gabriel Monticelli, La Plata National University, Physics Institute. La Plata/Argentina.

Nominations

- **Trigger EGamma Signature Coordinator** - Egamma Trigger Signature Group - *10/2022 - Now*
  Coordination of the EGamma Trigger group, responsible for the filtering, reconstruction, monitoring and data quality algorithms of ATLAS for electron and photon signatures. Leading the team of scientists involved in the maintenance, improvement and operation of the trigger to meet the rate constraints and efficiencies required for different physical channels of interest.

- **Data Quality Contact Person** - Egamma Trigger Signature Group - *01/2020 - 09/2022*
  Responsibilities: As Data Quality Contact for the egamma signature trigger, I work in the development, update and maintenance of the online and offline monitoring framework for TrigEgamma. Responsible for data quality reprocessing checks, updating and maintenance of webdisplays to show distributions and efficiency plots of the egamma trigger steps.

Computer Systems and Robotics Applications

- **Digital Systems Lab | Robotics Lab - UFBA**

  In this research group at the Federal University of Bahia, I have contributed to the development of algorithms and expert systems, for the design and implementation of industrial decision support systems and specific applications for mobile robots. The main contributions include the application of machine learning techniques to classify defects in industrial equipment, and the design of swarm intelligence algorithms for locating mobile robots.

Technical Skills

- **Programming Languages:** Experienced: C/C++, Python, Matlab, Bash Shell. Familiar: R Program.
- **Software Development:** Experienced: GIT, Docker, CLI, Linux environments. Agile methodologies for software engineering.
- **Machine Learning and Computing Libraries**: Experienced: Matplotplib, Numpy, Pandas, Scikit-learn, Keras and Tensorflow.

Machine Learning Skills

Strong background in machine learning methods to classification problems. The main research topics that I have experience are (but not limited to):

- **Data pre-processing**: data cleaning and organization, data transformation, outlier detection techniques, dimensionality reduction. Statistical and digital signal processing (Principal Components Analysis, Independent Components Analysis, Discrete Wavelet Transform);
- **Supervised Machine Learning Methods**: Statistical learning models, Artificial Neural Networks, Support Vector Machines (SVM), Ensemble learning.
- **Deep Learning Methods**: Architectures - CNN and RNN models.
- **Evolutionary Algorithms and Meta-heuristics**: Genetic Algorithms, Particle Swarm Optimization, Differential Evolution and Evolutionary Strategies;