

# ALLAN MACHADO PAYERAS, PhD

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Portfolio: [allanpayeras.github.io/portfolio/](https://allanpayeras.github.io/portfolio/)

## Technical Skills

- Computational tools: Python, C++, Linux, shell script, git (GitHub, GitLab), LaTeX.
- Data analysis frameworks: Numpy, Pandas, Scipy, Matplotlib, ROOT (Cern).
- Machine learning frameworks: Scikit-learn, TensorFlow.
- Theoretical background: statistics, probability, calculus, linear algebra, mathematical modeling, physics.
- Languages: Portuguese (native), English (fluent), French (basic), German (basic).

I am interested in learning new computational and mathematical tools relevant to achieve the goals of projects I am involved with as well as effectively communicating my findings to stakeholders.

## Professional Experience

*SRI International, United States*

*March 2024 - present*

### Bioscience Research Technician

- Implementing computational pipelines using bioinformatic tools and Python libraries (Numpy, Pandas, Matplotlib) to perform statistical analyses and visualization of data from CRISPR screen experiments.

*University of Campinas, Brazil*

*August 2018 - December 2023*

### Ph.D. Candidate

- Developed a data pipeline with bash scripts and C++ in a high performance computing environment (in Linux) to generate simulated data regarding the detection of high-energy cosmic rays with the AugerPrime Observatory.
- Developed a nonlinear regression model using Python to predict signals due to muons within the AugerPrime detectors. The model exhibits a bias below 5%, validated with Monte Carlo simulations.
- Using Python libraries (Numpy, Pandas, Scipy), the potential of the aforementioned model to identify light and heavy species of cosmic rays was demonstrated, quantified by merit factors above 1. This experimental resolution in composition is the primary aim of the upgrade of the Pierre Auger Observatory, which will facilitate future scientific insights into the astrophysical nature of high-energy cosmic rays.
- These findings were documented in technical notes of the Auger Collaboration and presented in international meetings for leading experts in the field of cosmic rays.

*Karlsruhe Institute of Technology, Germany*

*November 2021 - November 2022*

### Visiting Doctoral Researcher

- Implemented algorithms in C++ to calibrate and process signals of AugerPrime detectors which were included in the official software of the Auger Collaboration (hosted in GitLab). These implementations rendered the framework compatible with data of the upgraded detectors of the Observatory.
- The performance of the implemented calibration algorithm was verified as successful in more than 99.5% of the time.
- Developed a maximum likelihood method in Python which demonstrated that the nonlinearity and bias between the signals of the upgraded and former detectors are below 3%, verifying the stability of the new detectors.
- Applying statistical methods, showed that reconstruction of cosmic ray events using data from the AugerPrime Observatory exhibits less than 5% bias in energy estimation with respect to the pre-upgrade configuration of the detectors. These findings ensure compatibility and a seamless transition between the two operation phases of the Pierre Auger Observatory.

*University of Campinas, Brazil*

*March 2016 - August 2018*

### Master's student

- Using a small-area photomultiplier tube and a cross-calibration procedure in C++, the occurrence of saturation in the AugerPrime detectors was reduced to less than 0.1%. This result enhances the quality of data collected, ultimately leading to more accurate estimations of the properties of detected high-energy cosmic rays.

*Royal Holloway University of London, UK*

*June 2014 - September 2014*

### Summer Research Intern

- Developed a linear regression model in C++ (ROOT) to correlate the invariant mass of the top quark to the corresponding decay particles as measured by the ATLAS detector in the Large Hadron Collider (CERN, Switzerland). This study was relevant for the inference of intrinsic properties of fundamental particles.

List of academic publications can be found on my Google Scholar profile: [Allan Machado Payeras](#).

## Education

*University of Campinas, Institute of Physics Gleb Wataghin*

*São Paulo, Brazil*

### Ph.D. in Physics

*December 2023*

- Full scholarship from the São Paulo Research Foundation.
- Research internship at Karlsruhe Institute of Technology (Germany) funded by the São Paulo Research Foundation.

*University of Campinas, Institute of Physics Gleb Wataghin*

*São Paulo, Brazil*

### Master of Science in Physics

*October 2018*

- Full scholarship from the Federal Agency for Support and Evaluation of Graduate Education (Brazil).

*Federal University of Paraná*

*Paraná, Brazil*

### Bachelor of Science in Physics

*April 2016*

- Academic exchange at *Royal Holloway University of London* (United Kingdom) from September 2013 to September 2014. Funded by the Brazilian program Science without Borders.

*I currently possess an employment authorization document (EAD) from the USCIS to legally work in the USA.*