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Gabriel Wendell Celestino Rocha

SKILLS

1. **Programming Languages** : Python, Julia, C/C++/C#, Fortran, Rust, Ruby, Perl, Git, R ;
2. **Typographic Languages** : LaTeX, HTML, CSS, Markdown ;
3. **Tech Skills** : Unity, Visual Studio Code, Vim/Neovim, GitHub, Linux ;
4. **Languages** : Portuguese (Native), English (Intermediate), Spanish (Intermediate), German (Intermediate), French (Basic) ;
5. **Research Skills** : Physics, Mathematics, Programming, Data Science, Machine & Deep Learning, Artificial Intelligence ;
6. **Learning Skills** : LLM (Intermediate) & Streamlit (Basic) .

EXPERIENCE

UFRN, Natal — *Academic Research*

AUG 2019 - PRESENT

I started my academic research career early on. I have experience in the following areas:

1. **Astronomy & Astrophysics**
    a. *Modeling Stellar Convection*
    b. *Asteroseismology of Solar-Type Stars and Red Giants*
    c. *Stellar Limb Darkening via Bayesian Inference*
    d. *Magnetohydrodynamic Modeling*
    e. *Data-Drive Astronomy*
2. **Fluid Dynamics**
    a. *Computational Fluid Dynamics (CFD)*
    b. *Unsteady Aerodynamics*
    c. *Turbulence Modeling*
    d. *Vortex Dynamics*
    e. *Stability/Control Analysis*
    f. *Data-Driven Modeling*
3. **Other Fields**
    a. *Machine Learning applied to Physics*
    b. *Topological Data Analysis*
    c. *Statistical Modeling and Inference*
    d. *Statistical Physics of Quantum Systems*
    e. *Numerical Simulations in Astrophysics*

UFRN, Natal — *PET Física UFRN*

JUNE 2020 - DEC 2022

I was a member of PET Physics (Tutorial Teaching Program) where I actively worked on the following projects: PET.py, OlimPET, EducaPET.

- **PET.py** : Development of Jupyter Notebooks whose objective was to solve Physics problems using Python.
- **OlimPET** : Development of articles covering content aimed at the Physics Olympiads.
- **EducaPET** : Resolution of the Enem Physics test from the 2011 to 2021 editions.

I also taught mini-courses and seminars during his participation in PET:

- Minicourses
  - Introdução à modelagem física em Dinâmica dos Fluidos (2023)
  - Uma breve introdução ao Machine Learning (2022)
  - Introdução ao Python para Engenharia Química (2022)
  - Curso de Nivelamento : Matrizes e Números Complexos (2022)
- Seminars :
  - Asterosismologia em ação: um passeio asterosísmico pelo diagrama HR e novos insights do TESS (2022)

UFRN, Natal — *Scientific Research*

AUG 2019 - JULY 2020

I was a Scientific Initiation scholarship holder from PIBIC CNPq (IC) in the project : “ExoPlanetas, ExoLuas, planetas circumbinários, traços de atividade, rotação e fenômenos transientes nos dados do CoRoT, KEPLER e TESS.”

EDUCATION

UFRN, Natal — *D.S. in Physics*

JAN 2025 - PRESENT

PhD in Physics in progress through the Postgraduate Program in Physics at the Federal University of Rio Grande do Norte.

- **Advisor :** Prof. Dr. Madras Viswanathan Gandhi Mohan.

UFRN, Natal — *M.S. in Physics*

FEB 2023 - FEB 2025

Master in Physics from the Postgraduate Program in Physics at the Federal University of Rio Grande do Norte.

- **Title :** *Mathematical and Computational Modelling of Magnetohydrodynamics*
- **Advisor :** Prof. Dr. Madras Viswanathan Gandhi Mohan.
- **Co-Advisor :** Prof. Dr. Leonardo Andrade de Almeida.

UFRN, Natal — *B.S. in Physics*

FEB 2019 - DEC 2022

Graduated in Physics from the Federal University of Rio Grande do Norte.

- **Title** : *Análise asterosísmica de estrelas do tipo solar e gigantes vermelhas.*
- **Advisor** : Prof. Dr. José Dias do Nascimento Jr.

COURSES

I have participated in the following specialization courses :

1. *Deep Learning Application for Earth Observation*
   - **(2024, 10h, Remote)**
2. *Seismic Data Processing: Basic to Advance*
   - **(2024, 8h, Remote)**
3. *Accelerating AI Applications with NVIDIA RAPIDS*
   - **(2023, 7h, Remote)**
4. *Object Detection with YOLO, Darknet, OpenCV and Python*
   - **(2023, 12h, Remote)**
5. *Natural Language Processing with Deep Learning*
   - **(2023, 10h, Remote)**
6. *Algoritmos de Inteligência Artificial Bioinspirados*
   - **(2023, 10h, Remote)**
7. *Desenvolvimento Web com PHP e Banco de Dados MySQL*
   - **(2022, 8h, Remote)**
8. *Data-Drive Astronomy*
   - **(2022, 23h, Remote)**
9. *Introdução à Ciência de Dados Astronômicos com Python*
   - **(2020, 30h, Presential)**
10. *Introdução à Física dos Buracos Negros*
    - **(2020, 15h, Remote)**

PROJECTS

AI Gen and RAG for Bibliographic Review Assistant — *2025*

An automated assistant for literature review using Generative AI (Gen AI) and Retrieval Augmented by Generation (RAG) techniques. The project searches for articles in the arXiv database and generates automatic abstracts with two method options: BARD (local) and OpenAI GPT.

QML for Flood Forecasting — *In Progress*

I participate in a project that aims to compare the efficiency of Statistical Inference, Classical Machine Learning and Quantum Machine Learning methods for the task of predicting floods using time series.

Statistical Analysis of Cepheids Stars — *In Progress*

I participate in a project that aims to compare the efficiency of Statistical Inference, Classical Machine Learning and Quantum Machine Learning methods for the task of predicting floods using time series.

STORM Code — *2024/2025*

I developed a Python library called STORM (Simulations Toolkit for Open-source Research in Magnetohydrodynamics) that performs numerical simulations of Hydrodynamics and Magnetohydrodynamics for 1D, 2D and 3D systems. It consists of my master's thesis in Physics. Both the manuscript and the code should be officially published soon.

Classification of Galaxies using DL — *2022*

During my participation in the PET.py project, I developed several types of Python projects applied to Physics problems (the repository with all my projects can be found at this link). One of the projects in particular was the development of Deep Learning-based methods for classifying galaxies using images.

PyMoS2 — *2021/2022*

I developed a Python code called PyMoS2 (Python Modules for a Static Star) that performs a numerical simulation of a non-magnetic static star model. I submitted an article to RBEF (Revista Brasileira de Ensino de Física) explaining how the code works.
