Jesús M. Rueda-Becerril | PhD

Astrophysicist – Data Scientist – Software Engineer

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Profile

I am a trained astrophysicist, with experience in industry. I have expertise in programming, data science, data analysis, and problem-solving and I am creative, innovative, analytical, and hard worker. I am efficient working both individually and collaboratively and I am an effective communicator both in Spanish and English. I have extensive experience debugging, testing, and maintaining sophisticated code, both scientific and business. I have strong programming skills in multiple languages like Python, Fortran, C/C++, Shell, Julia, Java, SQL, and I am experienced in managing version control systems (e.g., git). Additionally, I have experience in high-performance computing (HPC) and data science, and a strong foundation in data analysis, machine learning, and statistical modeling. In my free time, I like to catch up with the most recent discoveries about the mysteries of our universe, and climbing.

Education

Ph.D. in Physics   **Oct. 2011 – Jul. 2017**
Universitat de València, Valencia, Spain   Excellent *Cum Laude*
Developed optimized numerical integration and fitting to add low energy particles in the Internal Shocks model for blazar flares.

M.Sc. in Physics   **Aug. 2009 – Sep. 2011**
Universidad Michoacana de San Nicolás de Hidalgo, Michoacan, Mexico
Developed a relativistic hydrodynamics code, using the SPH approach, to simulate Neutron Stars.

B.Sc. in Physics   **Aug. 2004 – Dec. 2008**
Universidad Autónoma del Estado de México, State of Mexico, Mexico
Developed a numerical solver of differential equations to predict the observability of Boson Stars through gravitational lensing.

Skills

Programming Languages: Fortran, Python, Shell Scripting, C/C++, R, Java, Julia, SQL (PL/SQL, PostgreSQL)

Python Ecosystem: Numpy, Pandas, Matplotlib, Scipy, Astropy, Tensorflow, PyTorch, Scikit-learn, Assertpy, Jupyter

Miscellaneous: Git, LaTeX, MPI, OpenMP, OpenACC, HDF5, Mathematica, Maple, Docker, Jenkins, Splunk, Jira, Kafka, Visit, Paraview, Job Scheduling (SLURM, PBS)

Research Scientist: Fellowships: 4 Federal from Mexico, 1 from Spain; Grants: 1 from NASA; Publications: 3 first author, 6 co-author, 6 Conference Proceedings (ORCID profile).

Communication: Gave academic presentations at national and international meetings, organized career advancement workshops for graduate students, gave invited departmental seminars, presented talks on careers in Physics for undergraduates.

Professional Experience

Software Engineer (Remote)   **Apr 2022 – Present**
Paychex (on contract through Mindex), Rochester NY, USA; based in Seattle, WA, USA

- Contributed on building the essential blocks of the infrastructure of QTC+ Process by performing data analysis and develop sophisticated PL/SQL scripts.
- Collaboration on developing, and deploying Spring boot services in Java to transfer large volumes of data with Kafka.
- Expertise on using Jenkins automation server, Docker and Podman containers, and OpenShift orchestration tool.
- Expertise on continuous integration by being involved at the different stages of the process: developing micro-services, developing building tools, and developing automated test tools.
- Continuously communicating with stakeholders to ensure developers efforts are aligned with requirements and standards.
- Member of a Scrum team, following the Agile methodology using Jira.
- Mentoring junior developers and helped grow the team.

Postdoctoral Research Associate   **Feb 2021 – Apr 2022**

Rochester Institute of Technology, Rochester, NY, USA

- Led a team of specialists on a NSF-sponsored project to upgrade the HPC code PatchworkMHD, using state-of-the-art numerical techniques to model supermassive black hole binaries.
- Added a new feature (spin) to `PatchworkMHD`, making a more realistic binary black hole simulations, without impacting runtime.
- Debugged, benchmarked, and tested the scalability of PatchworkMHD.
- Version control (git) administrator of PatchworkMHD.
- Worked alongside a graduate student to develop a modified gradient descent (deep learning) algorithm on top of the Paramo code to model observations from Fermi-LAT telescope with.
- Mentored graduate students.

Postdoctoral Research Fellow   **Oct 2018 – Nov 2020**

Purdue University, West Lafayette, IN, USA

- Authored and co-authored 3 publications by designing, and developing the open-source code `Paramo`, a numerical code in Fortran, optimized with OpenMP.
- Obtained a NASA grant to explain the origin and nature of radiation from active galaxies. In this project I led a small team to develop numerical and statistical models for objects observed with NASA Fermi-LAT space telescope.
- Mentored three graduate students (1 M.S. and 2 Ph.D.).
- Calculate the loss of energy due of high-energy particles due to interactions spectrum and evolution in the context of gamma-ray burst afterglows by developing sophisticated, and OpenMP optimized, numerical method.
- Contributed to the development of statistical models of the COVID-19 outbreak at the beginning of the pandemic along with scientific infographics and blogposts for Spanish-speaking populations to stop the spread of misinformation.

Postdoctoral Research Fellow   **Jan – Sep 2018**

Universidad Michoacana de San Nicolás de Hidalgo, Morelia, Michoacan, Mexico

- Generated training data for a support vector machine by developing Python tools to process over 1,000 output images generated by the numerical code `GRTrans`.
- Developed an open-source data analysis and visualization tool for radiative astrophysics.
- Organized a workshop to train graduate students in the use of the high-volume data storage tool HDF5.

Graduate Research Assistant   **Oct 2011 – Jul 2017**

Universitat de València, Burjassot, Valencia, Spain

- Published 2 first-author papers, participated in international meetings and co-authored several papers/proceedings, by running and upgrading the scientific numerical code `C–SPEV` to apply the *internal-shocks* (IS) model to simulate blazar flares.
- Analyzed simulations with data from NASA telescopes by performing exploratory data analysis on data from the telescopes.
- Identified spectral signatures of magnetization in blazar spectra by employing data analysis skills, statistics and machine learning (linear and non-linear regression).
- Developed analysis tools in Julia. Version control (git) administrator of C-SPEV.
- Both cyclotron and synchrotron radiation from non-relativistic to ultra-relativistic charged particles were considered in my simulations by implementing in C-SPEV a sophisticated numerical tool that could calculate both discrete and continuous spectra.
- Included low energy particles to the statistical system in the IS model, without impacting simulation runtime, by implemented complex numerical integration methods and fitting into C-SPEV.

Certifications and Credentials

Mathematical Foundations of Machine Learning
Udemy, Credential ID: UC-605df108-ae80-4297-8c8f-6bc15b967511

Python for Statistical Analysis
Udemy, Credential ID: UC-e8557ac8-13f9-41bf-ab46-f196a041b725

Python Fundamentals
DataCamp, Statement of Acomplishment #403,521

Data Manipulation with Python
DataCamp, Statement of Acomplishment #409,710

Importing & Cleaning Data
DataCamp, Statement of Acomplishment #409,699