Jesús M. Rueda-Becerril — Ph.D.

3902 S Ferdinand St – Seattle, 98118 WA
+1 (765) 430-2330 • jm.ruebe@gmail.com • altjerue.github.io
jeruebe • jerue103 • altjerue • DataCamp
0000-0003-1988-1912 • jm.ruebe

Education

Ph.D. in Physics **Oct. 2011 – Jul. 2017**
Universitat de València, Valencia, Spain Excellent *Cum Laude*

M.Sc. in Physics **Aug. 2009 – Sep. 2011**
Universidad Michoacana de San Nicolás de Hidalgo, Morelia, Mexico

B.Sc. in Physics **Aug. 2004 – Dec. 2008**
Universidad Autónoma del Estado de México, Toluca, Mexico *"Dr. Juan Josafat Pichardo" Award*

Experience

Software Engineer **Apr 2022 – Jan 2024**
Paychex

- Conducted data preparation, validation, and analysis in SQL from Oracle EBS datasets.
- Developed Java Kafka consumers for the streamlined transfer of large volumes of client data across databases. Developed high quality code using Java, Spring Boot, Kafka, PL/SQL, and deployed into production using Jenkins and OpenShift, following software development best practices.
- Collaborated with stakeholders, other software developers and engineers, and senior leadership to assess product needs and meet code standards for continuous integration model.
- Created Splunk dashboards and alerts for analysis of production data.
- Developed and deployed Python tests to ensure software quality and continuous integration.

Postdoctoral Research Scientist **Jan 2018 – Apr 2022**
UMSNH (Mexico), Purdue University, Rochester Institute of Technology

- Led a team of specialists on a NSF-sponsored project and successfully upgraded a scientific code to perform HPC simulations of supermassive black hole binaries. Designed the experiments and evaluated state-of-the-art mathematic and numerical algorithms implemented in a scientific code by running simulations at *Frontera* supercomputer (TACC, UT at Austin). Worked in a detail-oriented manner to successfully benchmark and identify performance optimization opportunities of the scientific code.
- Worked in a highly collaborative environment with multi-institutional, cross-functional teams developing large-scale HPC simulations of neutron star mergers. This collaboration produced 2 papers with high impact results.
- Successfully applied and obtained a $68,000 NASA grant for one year as primary researcher. Managed 3 Ph.D. researchers to study the nature of radiation from active galaxies with state-of-the-art mathematical and numerical methods. This work produced 3 papers and 2 proceedings with high impact results, and 5 presentations to technical audiences.
- Designed the experiments to apply mathematical and numerical methods to prove a hypothesis about the origin and nature of radiation from active galaxies. Used Python to run regressions on observations from NASA telescopes.
- Participated in weekly paper discussion and knowledge sharing at the Purdue Astronomy Journal Club.
- Developed a Python script that processed images for a machine learning (SVM) training framework.
- Conducted a workshop to train and share knowledge with graduate students on creating and manipulating high-volume datasets in HDF5 format.

Graduate Research Assistant **Oct 2009 – Jul 2017**
UMSNH (Mexico), Universitat de València (Spain)

- Developed Shell and Python tools for automation and pipelines for data processing and curation of large volume datasets in HDF5 format from large-scale simulations, ensuring data quality and integrity for downstream analysis.
- Implemented sophisticated numerical tools and data handling to calculate both discrete and continuous spectra from particle distribution functions with arbitrary shape, without impacting simulation runtime.
- Used Python and R for exploratory data analysis on datasets from NASA telescopes, performing linear and non-linear regression, pattern recognition, and forecasting. This work produced 2 papers and communicated my results to technical audiences in multiple international meetings.
- Successfully developed a scientific code using a fourth order Runge-Kutta solver to study the behavior of light near black holes. This work produced one scientific paper with high impact results.
- Attended workshops on Data Analysis and Machine Learning with Python.

Skills

Proficient: Python, Unix/Linux, Shell, git, HPC, Slurm, LaTeX, Fortran 95, HDF5

Familiar: Java, SQL, R, C/C++, Julia, Docker, Splunk, Jenkins, OpenShift

Basic: MongoDB, Rust

Projects

Paramo **Oct 2018 – Apr 2022**

Open Source Code for Radiative Transfer Simulations in Relativistic Astrophysics *GitHub*

- Independently developed this code for distributed settings to perform HPC simulations of radiative transfer in relativistic astrophysics.
- Optimized the code with OpenMP to reduce simulation time from 2 minutes to 5 seconds.
- Researched and applied mathematical concepts of machine learning (gradient descent) to adjust the parameters of the code to classify observations from NASA telescopes.
- This code has been used for at least 5 scientific publications and also for graduate pedagogical purposes.
- Developed data analysis and data visualization tools in Python.

Co-Founder, Mexican Scientists Abroad **Aug 2019 – Feb 2021**

Group of Mexican Scientists narrowing the gap between science and common knowledge *Homepage*

- Collaborated with a group of multidisciplinary scientists to develop Python scripts for statistically modeling and forecasting the COVID-19 outbreak in Mexico.
- Wrote blogposts and infographics for non-technical Spanish-speaking populations to reduce the spread of misinformation.

Certifications and Credentials

Data Analyst with Python **Complete**

Data Maniputalion, Data Visualization, Importing & Cleaning Data *DataCamp*

Exploratory Data Analysis, Statistics, Sampling, Hypothesis Testing, Python, Pandas, Matplotlib, Seaborn

Data Scientist Professional with Python **79% Complete**

Python Programming, Data Science, Data Communication, Machine Learning *DataCamp*

Data Analysis, EDA, Supervised Learning, Unsupervised Learning, SQL, Python, Pandas, Matplotlib, Seaborn, Scikit-Learn

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

Publications

Articles

[8] Davis, Z., **Rueda-Becerril, J. M.**, & Giannios, D. *Balancing Turbulent Heating with Radiative Cooling in Blazars*, MNRAS **513**, 5766–5779, (2022), arXiv:2201.07790.

[7] Lopez-Armengol, F. G., Etienne, Z. B., [. . .], **Rueda-Becerril, J. M.**, [. . .] *Handing off the outcome of binary neutron star mergers for accurate and long-term postmerger simulations*, Phys. Rev. D **106**, 083015, (2022), arXiv:2112.09817

[6] Murguia-Berthier, A., Noble, S., [. . .], **Rueda-Becerril, J. M.**, [. . .] *HARM3D+NUC: A New Method for Simulating the Post-merger Phase of Binary Neutron Star Mergers with GRMHD, Tabulated EOS, and Neutrino Leakage*, ApJ **919**, 95, (2021), arXiv:2106.05356

[5] **Rueda-Becerril, J. M.**, Harrison, A. O. & Giannios, D. *Blazar jets launched with similar energy per baryon, independently of their power*, MNRAS **501**, 4092–4102, (2021), arXiv:2009.02273.

[4] Zhang, H., Christie, I., Petropoulou, M., **Rueda-Becerril, J. M.** & Giannios, D. *Inverse Compton Signatures of Gamma-Ray Burst Afterglows*, MNRAS **496**, 974–986, (2020), arXiv:1910.14049.

[3] **Rueda-Becerril, J. M.**, Mimica, P. & Aloy, M. A. *On the influence of a hybrid thermal–non-thermal distribution in the internal shocks model for blazars*, MNRAS **468**, 1169–1182, (2017), arXiv:1612.06383.

[2] **Rueda-Becerril, J. M.**, Mimica, P. & Aloy, M. A. *The influence of the magnetic field on the spectral properties of blazars*, MNRAS **438**, 1856–1869 (2014), arXiv:1310.5441.

[1] Guzmán, F. S. & **Rueda-Becerril, J. M.** *Spherical boson stars as black hole mimickers*, Phys. Rev. D **80**, 084023 (2009), arXiv:1009.1250.

Proceedings

5. **Rueda-Becerril, J. M.** *A numerical approach for radiative cooling in relativistic outflows*, Astron. Nachr., 9th International Workshop on Astronomy and Relativistic Astrophysics: from Quarks to Cosmos **342**, 277–282, (2021), arXiv:2011.13797.

4. **Rueda-Becerril, J. M.**, Harrison, A. O. & Giannios, D. *The blazar sequence revised*, Astron. Nachr., 9th International Workshop on Astronomy and Relativistic Astrophysics: from Quarks to Cosmos **342**, 147–152, (2021), arXiv:2011.13805.

3. **Rueda-Becerril, J. M.**, Mimica, P. & Aloy, M. A. *Numerical simulations of the internal shock model in magnetized relativistic jets of blazars*, PoS(SWIFT 10) **233**, 159 (2014), arXiv:1502.07882.

2. **Rueda-Becerril, J. M.**, Mimica, P., Aloy, M. A. & Aloy, C. *Numerical study of broadband spectra caused by internal shocks in magnetized relativistic jets of blazars*, EPJ Web Conf. **61**, 02007 (2013), arXiv:1309.4612.

1. Mimica, P., Aloy, M. A., **Rueda-Becerril, J. M.**, Tabik, S. & Aloy, C. *Numerical simulations of dynamics and emission from relativistic astrophysical jets*, J. Phys.: Conf. Ser **42**, 012001 (2013), arXiv:1211.1794.