

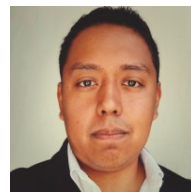
# Juan de Dios Rojas Olvera, PhD Candidate

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🌐 Juan de Dios Rojas

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## Summary

PhD candidate in Astrophysics at UNAM and the University of Groningen, specialized in cosmology, gravitational lensing, and deep learning. Passionate about applying artificial intelligence to astrophysical research and the extraction of physical and cosmological information from large-scale surveys. Member of the LSST collaboration and currently joining the Euclid mission. Published in the journal Universe-MDPI on the use of neural networks in observational cosmology. Participated in international seminars and schools hosted by ICTP, ESA, and Leiden Observatory. Experienced as a physics lecturer at UNAM.

## Education

- 2025 – Present     **Ph.D. in Astrophysics, Astronomy Institute – UNAM & University of Groningen.**  
Thesis project: *Deep learning methods for the reconstruction and inference of strong gravitational lenses.*  
Supervisors: Dr. José A. de Diego (UNAM), Dr. Leon Koopmans (Groningen).
- 2022 – 2024     **M.Sc. in Astrophysics, Astronomy Institute – UNAM.**  
Thesis: *Optimization of astrophysical and cosmological systems using Physics-Informed Neural Networks.*
- 2021 – 2022     **Professional Internship, Institute of Physical Sciences – UNAM.**  
Focus: Computational Physics and early applications of neural networks in cosmology.
- 2016 – 2021     **Bachelor's Degree in Physics, Faculty of Sciences – UNAM.**  
Thesis: *Observational Cosmology with Artificial Neural Networks.*

## Experience

My research journey in cosmology and machine learning began during my undergraduate internship at the Institute of Physical Sciences – UNAM, where I co-authored a peer-reviewed paper on artificial neural networks for observational cosmology. This early work led to my bachelor's and master's theses, focused on machine learning for cosmological inference and the application of Physics-Informed Neural Networks (PINNs) to solve differential systems in astrophysics. These efforts culminated in a publication within the official proceedings of the UNAM Summer School in Physics 2024. Currently, as a PhD candidate, I am developing generative models and simulation-based inference techniques for the reconstruction and analysis of strong gravitational lenses. My work is closely tied to international collaborations such as LSST and Euclid.

### Selected Conferences and Seminars

- **ICTP – Youth in High Dimensions**, Trieste, Italy. Selected participant in a workshop on machine learning and high-dimensional inference. 23/03/2024
- **LEAPS 2023 Program – ESA & Leiden University**. Neural networks vs. conventional solvers in hydrodynamic galaxy simulations (project with Mojtaba Raouf and Serena Viti). 05/06/2023

- *Galaxy classification with CNNs* – Cosmo Meeting IV, Institute of Physical Sciences – UNAM. 12/12/2022
- *Artificial intelligence: an ally for observational astrophysics and cosmology* – Cosmology 4 Students. 31/08/2022
- *Convolutional neural networks: an introduction* – Cosmo Meeting III, Institute of Physical Sciences – UNAM. 27/11/2021
- Participant – **First Latin American School of Relativity and Astrophysics (ELRA)**. 12/2021
- *Neural networks in cosmology* – VI Meeting on Mathematical Modeling in Physics and Geometry, UAM. 07/08/2021
- *Machine Learning Basics* – Masterclass collaborator, IV Mexican AstroCosmoStatistics School (MACS). 28/06/2021

## Research Publications






### Journal Articles

- 1 J. de Dios Rojas Olvera, I. Gómez-Vargas, and J. A. Vázquez, “Observational cosmology with artificial neural networks,” *Universe*, vol. 8, no. 2, 2022, ISSN: 2218-1997. [DOI: 10.3390/universe8020120](https://doi.org/10.3390/universe8020120).

### Proceedings and Other Publications




- 1 J. de Dios Rojas Olvera and J. A. Vázquez, “Optimización de sistemas astrofísicos y cosmológicos con redes neuronales físicamente informadas,” in *Memorias de la Escuela de Verano en Física, UNAM*, Primera edición electrónica. Instituto de Física & Instituto de Ciencias Físicas, UNAM, Ciudad Universitaria, México: Universidad Nacional Autónoma de México, 2025.

## Skills

Scientific Background	 Strong foundation in mathematics, statistics, probability, Bayesian inference, physics, and modern astrophysics — with a focus on observational cosmology and data-driven modeling.
Programming	 Proficient in Python (including PyTorch, TensorFlow, NumPy, SciPy), R, C, SQL, and $\text{\LaTeX}$ .
Software Tools	 Microsoft Office Suite (Word, Excel, PowerPoint), Git, Jupyter Notebooks.
Machine Learning	 Experience in deep learning techniques and architectures, including convolutional networks, autoencoders, variational models, and physics-informed neural networks (PINNs).
Languages	 English: B2 level (speaking and writing). Native Spanish speaker.

## Courses Taught

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| 2024 – Present        |  <b>Adjunct Professor</b> , Faculty of Sciences – UNAM.<br>Instructor for the course <i>Atomic Physics and Condensed Matter</i> . |
| Second Semester, 2023 |  <b>Adjunct Professor</b> , Faculty of Sciences – UNAM.<br>Instructor for the course <i>Nuclear and Subnuclear Physics</i> .      |
| First Semester, 2023  |  <b>Adjunct Professor</b> , Faculty of Sciences – UNAM.<br>Instructor for the course <i>Analytical Mechanics</i> .                |

## References

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- **Dr. José A. de Diego Onsurbe**  
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Professor and Scientific Director  
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