Dr. rer. nat. Sac Nicté Medina

ASTROPHYSICIST & DATA SCIENTIST

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Sac Medina

Bonn, Germany

Profile

I am an Astrophysicist (Dr. rer. nat.) with a Data Science training. I am looking for a position in an institution to combine my experience **analyzing radio images** with my programming skills as Data Scientist. I have experience with **Python** and *SQL* to manage databases, in the use of Python libraries for data analysis and visualization, and in *Machine Learning* and *Deep Learning* (e.g., Artificial Neural Networks with *TensorFlow).*

Areas of Expertise

- Physics
- Radio Astronomy
- Data Analysis
- Analysis of images
- Python Programming

Work Experience

- **Guest researcher**
  Max-Planck-Institut für Radioastronomie
  Bonn, Germany
  April 2021- Now

  Continuation of the GLOSTAR-VLA survey catalogue.
  Details: https://glostar.mpifr-bonn.mpg.de/glostar/

- **Postdoctoral researcher**
  Max-Planck-Institut für Radioastronomie
  Bonn, Germany
  Dec 2019 - April 2021

  Leader to create the catalog (> 10 000 sources) of the full radio map GLOSTAR-VLA survey that contains 116 square degrees of the Galactic plane.

Education

- **Data Science Certification**
  SPICED Academy
  Hamburg, Germany
  Aug 2021 - Nov 2021

  480 hours of online learning using Python to **collect, analyze and visualize** data with different scientific package libraries.

- **Doctorate in Astrophysics**
  Magna Cum Laude
  Rheinische Friedrich-Wilhelms-Universität
  Bonn, Germany
  Jun 2015 - Dec 2019

  In my doctoral thesis, *Radio emission from massive Young Stellar Objects and their surroundings: characterization and feedback*, I worked on the characterization of radio emission using Python programs.

  Award: International Max Planck Research Schools fellowship.

- **Master in Astrophysics**
  Universidad de Guanajuato
  Guanajuato, Mexico
  Feb 2011 - June 2013

  In my master thesis, *Turbulence in simulated HII regions*, I investigated the turbulence dynamics of ionized emision from a hydrodynamic simulation of an HII region.

  Award: Best Mexican Astronomy Master Thesis Award 2013-2014 & CONACyT scholarship.

- **Bachelor in Physics**
  Universidad Autónoma del Estado de Morelos
  Morelos, Mexico
  Aug 2005 - Dec 2010

  My bachelor thesis work, *Size Effects on the Entropy Production in Oscillatory Flow between Parallel Plates,* was with data of a **simulated Maxwell flow.**

Languages

SPANISH	Mother tongue.
ENGLISH	B2-C1 Level. Doctoral studies performed in English.
GERMAN	B2 TELC Cetificate.

Skills

COMPUTATIONAL SKILLS

WORK RELATED WITH MACHINE LEARNING AND DEEP LEARNING

Space craters detector App

https://github.com/Sac-Medina/Data_Science_Projects/tree/master/Final_Project

- Web scraping of lunar surface images using *Requests* and *Beautiful soup* and label the craters using *LabelImg*.
- Train the Artificial Neuronal Network model *Yolov5* for object recognition in *Google collab*.
- Use the results from Yolov5 and create the app using *Streamlit* to detect craters on Moon loaded images.

Image classifier

https://github.com/Sac-Medina/Data_Science_Projects/tree/master/week9_project

- Build a neural network using *Tensorflow-keras* and train it using a pre-built image dataset of hand written digits.
- Read and process the images to be used in a *Machine Learning* model.

Time Series Analysis

https://github.com/Sac-Medina/Data_Science_Projects/tree/master/week7_project

- Get and clean temperature data from ECAD to build a baseline trend and seasonality model with *Sklearn*.
- Plot and inspect the different components of a time series using *matplotlib*, *pandas*, and *numpy*.
- Model time dependence of the remainder using an *Auto-regression* model.

SCIENTIFIC SKILLS

- **Technical work** — Experiences with the recording of instrument measurements due to my work at **radio telescopes**, e.g. at the Effelsberg and APEX radio telescopes.
- **Project management** — Doctoral thesis organized by myself. Leader of observational proposals for telescopes. Several seminars on organization and management of projects.
- **Physics of radiation** — My doctoral thesis focused on the analysis of observational data from radio telescopes. Experience in **physics of radiation** as wells in **antenna theory**.
- **Scientific Publications** — **26 peer-reviewed** scientific publications, as collaborator and first author.
- **Team work and independently** — Part of several international consortiums the Max Planck Institute for Radio Astronomy, I work very well as a team member as well as independently.

SOFT SKILLS

- **Comunication** — I have given 8 talks in international conferences and presented 9 posters in countries such as the Czech Republic, Greece, UK, and Chile, as well as in Germany.
- **Multicultural sensitivity** — I work very well with colleagues from different cultural backgrounds and I had an *Intercultural Training* from the University of Bonn.
- **Organization and time management** — I participated in several seminars at the Interdisciplinary Qualification Program for Doctoral Candidates of the Bonn University, on efficient time management and organization of projects, knowledge that I implemented to manage and finish on time my own doctoral studies.
- **Passion for knowledge** — I am in constant search of new knowledge and challenges. During my doctoral studies, I participated in more than **30 workshops** to acquire new knowledge. During my Data Science training, I got a lot of motivation for **self-learning** of new computational tools.

List of scientific publications

- **Medina S.-N. X.**; Urquhart J. S.; Dzib, S. A.; Brunthaler, A.; Cotton, B.; Menten, K. M.; Wyrowski, F.; Beuther, H.; GLOSTAR team; et al., 2022. GLOSTAR — Radio Source Catalogue II: 2 ◦ < l <60 ◦ and |b|<1 ◦ . **In Prep.**

Peer-reviewed publications

- Neralwar, K. R.; Colombo, D.; Duarte-Cabral, A.; et al.; **included Medina S.-N. X.** 2022. The SEDIGISM survey: Molecular cloud morphology. II. Integrated source properties. Accepted for publication in A&A.

- Yanza, V.; Masqué, J. M.; et al.; **included Medina S.-N. X.** 2022. The population of compact radio sources in M17. Accepted for publication in the Astrophysical Journal.

- Neralwar, K. R.; Colombo, D.; Duarte-Cabral, A.; et al.; **included Medina S.-N. X.** 2022. The SEDIGISM survey: Molecular cloud morphology. I. Classification and star formation. Accepted for publication in A&A.

- De Sarkar, A; Roy, N.; et al.; **included Medina S.-N. X.** 2022. Possible TeV Gamma-Ray Binary Origin of HESS J1828-099. The Astrophysical Journal Letters, Vol. 927.

- Yang, A. Y.; Urquhart, J. S.; Wyrowski, F.; et al.; **included Medina S.-N. X.** 2022. The SEDIGISM survey: a search for molecular outflows. Astronomy & Astrophysics, Vol. 658.

- Colombo, D.; Duarte-Cabral, A.; Pettitt, A. R.; et al.; **included Medina S.-N. X.** 2022. The SEDIGISM survey: The influence of spiral arms on the molecular gas distribution of the inner Milky Way. Astronomy & Astrophysics, Vol. 658.

- Nguyen, H.; Rugel, M. R.; Menten, K. M.; et al.; **included Medina S.-N. X.** 2021 A global view on star formation: The GLOSTAR Galactic plane survey. IV. Radio continuum detections of young stellar objects in the Galactic Centre region. Astronomy & Astrophysics, Vol. 651.

- Ortiz-León, Gisela N.; Menten, Karl M.; Brunthaler, Andreas, et al.; **included Medina S.-N. X.**; 2021. A global view on star formation: The GLOSTAR Galactic plane survey. III. 6.7 GHz methanol maser survey in Cygnus X. Astronomy & Astrophysics, Vol. 651

- Dokara, R.; Brunthaler, A.; Menten, K. M. et al.; **included Medina S.-N. X.**; 2021. A global view on star formation: The GLOSTAR Galactic plane survey. II. Supernova remnants in the first quadrant of the Milky Way. Astronomy & Astrophysics, Vol. 651

- Brunthaler, A.; Menten, K. M.; Dzib, S. A. et al.; **included Medina S.-N. X.**; 2021. A global view on star formation: The GLOSTAR Galactic plane survey. I. Overview and first results for the Galactic longitude range 28° < l < 36°. Astronomy & Astrophysics, Vol. 651.

- Masqué, J. M.; Rodríguez, L. F.; Dzib, S. A.; **Medina, S.-N. X.**; et al. 2021. Exploring the nature of compact radio sources associated to UCHII regions. Revista Mexicana de Astronomía y Astrofísica Vol. 57.

- Duarte-Cabral, A.; Colombo, D.; Urquhart, J. S.; et al.; **included Medina S.-N. X.**; 2021. The SEDIGISM survey: Molecular clouds in the inner Galaxy. Monthly Notices of the Royal Astronomical Society, Vol. 500.

- Schuller, F.; Urquhart, J. S.; Csengeri, T.; et al. **included Medina S.-N. X.**; 2021. The SEDIGISM survey: first data release and overview of the Galactic structure. Monthly Notices of the Royal Astronomical Society, Vol. 500.

- Urquhart, J. S.; Figura, C.; Cross, J. R.; et al. **included Medina S.-N. X.**; 2021. SEDIGISM-ATLASGAL: Dense Gas Fraction and Star Formation Efficiency Across the Galactic Disk. Monthly Notices of the Royal Astronomical Society, Vol. 500.

List of peer-reviewed publications

- Rebolledo, D.; Guzman, A.; Contreras Y.; Garay G.; **Medina, S.-N.X.**; et al 2020. Effect of feedback of massive stars in the fragmentation, distribution and kinematics of the gas in two massive clumps in the Carina region. The Astrophysical Journal, Vol. 891.

- Chakraborty, A.; Roy, N.; Datta, A.; et al.; **included Medina S.-N. X.**, 2020. Characterization of unresolved and non-classified sources detected in THOR and GLOSTAR. Astronomy & Astrophysics, Vol. 492.

- **Medina S.-N. X.**; Urquhart J. S.; Dzib, S. A.; Brunthaler, A.; Cotton, B.; Menten, K. M.; Wyrowski, F.; Beuther, H.; GLOSTAR team; et al., 2019. GLOSTAR — Radio Source Catalogue I: 28 ◦ < l <36 ◦ and|b|<1 ◦ . Astronomy & Astrophysics, Vol. 627.

- Dzib, S. A.; Rodríguez, L. F.; Karupussamy, R.; Loinard, L.; and **Medina, S.-N. X.**, 2018. The Enigmatic compact radio source coincident with the energetic X-ray pulsar PSR J1813-1749 and HESS J1813-178. The Astrophysical Journal, Vol. 866.

- Dzib, Sergio A.; Ortiz-León, Gisela N.; Loinard, L.; Mioduszewski, A. J.; Rodríguez, L.F.; **Medina, S.-N. X.**; Torres, R. M., 2018. VLBA Determination of the Distance to Nearby Star-forming Regions. VIII. The LkHα101 Cluster. The Astrophysical Journal, Vol. 853.

- **Medina, S.-N. X.**; Dzib, S. A.; Tapia, M.; et al.; 2018. The richness of compact radio sources in NGC 6334D to F. Astronomy & Astrophysics, Vol. 610A.

- Schuller, F.; Csengeri, T.; Urquhart, J. S.; Duarte-Cabral, A.; Barnes, P. J.; Giannetti,A.; Hernandez, A. K.; Leurini, S.; Mattern, M.; **Medina, S.-N. X.**; Agurto, C.; et al.; 2017. SEDIGISM: Structure, excitation, and dynamics of the inner Galactic interstellar medium. Astronomy & Astrophysics, Vol. 610A.

- Arthur, S. J.; **Medina, S.-N. X.**; and Henney, W. J.; 2016. Turbulence in the ionized gas of the Orion nebula. Monthly Notices of the Royal Astronomical Society, Vol. 463.

- Dzib, S. A.; Loinard, L.; **Medina, S.-N. X.**; et al. 2016. Deep VLA observations of nearby star forming regions I: Barnard 59 and Lupus 1. Revista Mexicana de Astronomía y Astrofísica.

- **Medina, S.-N. X.**; Arthur, S. J.; Henney, W. J.; Mellema, G.; and Gazol, A., 2014. Turbulence in simulated HII region. Monthly Notices of the Royal Astronomical Society, Vol. 445.

- Dzib, S. A.; Rodríguez, L. F.; **Medina, S.-N. X.**; et al. 2014. High angular resolution 7 mm images toward the UC HII region W3(OH). Astronomy & Astrophysics, Vol. 567.

- Vazquez, Federico; Olivares-Robles, M. A.; and **Medina, S.** 2011. Size Effects on the Entropy Production in Oscillatory Flow between Parallel Plates. Entropy, Vol. 13.