

Rohan Dahale

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EDUCATION

Department of Physical Sciences

5 year BS-MS Dual Degree Programme

Indian Institute of Science Education and Research Kolkata

Class Rank: 2 out of 60

CGPA : 9.46 out of 10

Aug 2017 - present

Relevant Coursework: Fluid and Magneto-hydrodynamics, Independent Study: Computational Magneto-hydrodynamics, General Theory of Relativity, Stellar Astrophysics, Data Analysis in Astronomy

RESEARCH INTERESTS

Active Galactic Nuclei (AGN), Jets in AGN, VLBI imaging, Blazars, Quasars, NLS1 galaxies

In particular, I am interested in studying how jets in AGN are formed, what their **magnetic field structure** is and how it affects the **jet formation**. I am curious to find out how these jets stay **collimated at large scales**. I want to focus on these questions by analysing and studying radio **observations**. I also intend to learn and perform **simulations** of the jets to compare them with the observations.

PUBLICATIONS

Unravelling the origin of extended radio emission in narrow-line Seyfert 1 galaxies with JVLA

Accepted for publication in Astronomy & Astrophysics. DOI: [10.1051/0004-6361/202141698](https://doi.org/10.1051/0004-6361/202141698)

E. Järvelä, **R. Dahale**, L. Crepaldi, M. Berton, E Congiu, R. Antonucci.

RESEARCH EXPERIENCE

Magnetic fields in relativistic jets of supermassive black holes

Master Thesis supervised by Dr. José L. Gómez

Funded by JAE Intro 2021 Scholarship

Jun 2021 - present

Instituto de Astrofísica de Andalucía (CSIC), Granada, Spain

- Analysing **multi-frequency VLBA polarimetric** observations from the BG216 program to determine magnetic field structure in the jet of the AGN and hence understand the jet formation and stability
- The initial phase and amplitude calibration are performed on the **AIPS** using **ParselTongue** following the standard procedure for polarimetric observations. The data is cleaned, self-calibrated, and imaged both in total and polarized intensity with **Difmap** and **eht-imaging**.

Extended radio emission in narrow-line Seyfert 1 galaxies with JVLA

Supervised by Dr. Emilia Järvelä

May 2019 - Jun 2021

University of California, Santa Barbara

- Publication in Astronomy & Astrophysics, DOI: [10.1051/0004-6361/202141698](https://doi.org/10.1051/0004-6361/202141698)
- Determined the predominant sources of radio emission in a sample of **44 NLS1** galaxies, selected based on their extended kpc-scale radio morphologies at **5.2 GHz**
- Calibrated the data using the EVLA pipeline and produced the radio maps and spectral index maps using the **CASA tclean** task to do multi-term (multi-scale) multi-frequency synthesis, **mt-mfs**
- Additionally produced tapered maps to enhance the sensitivity to extended structures. Post-imaging, several correction steps were performed to achieve the final spectral index maps.

QSO PG 1630+377 Lyman edge polarisation

May 2019 - Jun 2021

University of California, Santa Barbara, Manuscript in Preparation

- **Collaboration:** Prof. Robert Antonucci, Dr. Dean Hines, Prof. Makoto Kishimoto, Anshuman Acharya
- The polarisation of the quasar measured with the HST/FOS showed a steep rise below the Lyman edge, reaching above $\sim 20\%$, never seen before in non-blazar active galaxies (**Koratkar A. et al., 1995**).
- Used the HST/FOS observations to determine the polarisation on both sides of the Lyman edge using the **photutils** of **AstroPy** and followed up with the same set of FOS observations to find that the results of Koratkar A. et al., 1995 are incorrect.

Polarisation of Cygnus A at different wavelengths

Jun 2021 - present

University of California, Santa Barbara, Manuscript in Preparation

- **Collaboration:** Prof. Robert Antonucci, Dr. Dean Hines, Prof. Makoto Kishimoto, Anshuman Acharya
- Measured the polarisation at Optical-UV range using the **HST/FOC** data and **photutils** of **AstroPy**.
- Since the polarimetric results for the Cygnus A at IR using the NICMOS are already published, percent polarisation at different wavelength ranges is now available.

Characterisation of wineglasses with respect to Young's modulus as a function of temperature using laser interferometry

Jun - Dec 2019

VISION 2019, Physical Research Laboratory, Ahmedabad, India

- Used laser interferometry setup to measure the harmonic frequencies of wineglasses and hence calculate the Young's modulus from the verified A. P. French model.

Detection of H1 21cm line and its astrophysical significance

Dec 2018

Radio Astronomy Winter School (RAWSC), NCRA-IUCAA Pune, India

Determination of surface tension by diffraction of light on capillary waves

May - Jul 2018

Summer Research Project. Supervisor: Prof. Rangeet Bhattacharyya, IISER Kolkata

ACADEMIC ACHIEVEMENTS

Extension to the JAE Intro 2021 Scholarship

Mar - Jun 2022

Consejo Superior De Investigaciones Científicas (CSIC), Spain

- Extension of 4 months with **2400 EUR** is awarded to **top 100** beneficiaries of the JAE Intro Scholarship

JAE Intro 2021 Scholarship

Oct 2021 - Feb 2022

Consejo Superior De Investigaciones Científicas (CSIC), Spain

- **250** scholarships offered to students interested in starting a research career that may lead to the realization of their PhD thesis.
- This grant is used for the Master Thesis supervised by **Dr. José L. Gómez** at the **Instituto de Astrofísica de Andalucía (IAA-CSIC)**. The scholarship amounts to **3000 EUR** for five months.

Vikram Sarabhai Innovation competition (VISION) 2019

Jun - Dec 2019

Physical Research Laboratory, Ahmedabad, India

- Received a grant of **300,000 INR** (~ 3500 EUR) and got selected among the **Top 6** teams in **India**.

Radio Astronomy Winter School (RAWSC) 2018

Dec 2018

National Centre for Radio Astrophysics (NCRA), Pune, India

Inter University Centre for Astronomy and Astrophysics (IUCAA), Pune, India

- Among the **Top 30** students selected in **India**.

Vijyoshi National Science Camp 2017

Dec 2017

Department of Science and Technology (DST), India - INSPIRE

INSPIRE Scholarship

Aug 2017 - Jul 2022

Department of Science and Technology (DST), India

- Offered to **top 1%** students in 12th grade exams, undertaking Bachelor and Masters level education in the Natural Sciences. The scholarship amounts to **400,000 INR (~ 4500 EUR) for 5 years**.

TEACHING ASSISTANTSHIPS

Spring 2021: PH1201: Electricity and Magnetism

Apr - Jul 2021

Level: First Year BS-MS, IISER Kolkata

Autumn 2020: PH1101: Mechanics I

Dec 2020 - Mar 2021

Level: First Year BS-MS, IISER Kolkata

Autumn 2020: PH3103: Mathematical Methods for Physics

Aug - Dec 2020

Level: Third Year BS-MS, IISER Kolkata

SKILLS

Astronomy	AIPS, ParselTongue, Difmap, <code>eht-imaging</code> , CASA, AstroPy
Programming	Python: Matplotlib, NumPy, SciPy, Pandas; Jupyter Notebook, C++
Softwares	MATLAB, L ^A T _E X, Inkscape, ImageJ
Languages	Proficient in English, Hindi, Marathi, Beginner in Spanish

ATTENDED CONFERENCES

Looking at the polarized Universe: past, present, and future

24 - 28 May 2021

The RoboPol Collaboration

ngEHT November 2021 Meeting

1 - 5 Nov 2021

From Vision to Instrument: Designing the Next-Generation EHT to Transform Black Hole Science

- Participating in SWGs: Black Holes & their cosmic context and Jet Launching and Accretion

EXTRACURRICULARS

Class Representative, Department of Physical Sciences

Aug 2019 - Dec 2020

Indian Institute of Science Education and Research Kolkata

Convener of Science Club

Aug 2018 - May 2019

Indian Institute of Science Education and Research Kolkata

REFERENCES

Dr. José L. Gómez

Research Scientist, Instituto de Astrofísica de Andalucía (IAA - CSIC), Granada, Spain

✉ jlgomez@iaa.es

Dr. Emilia Järvelä

Research Fellow at European Space Agency, European Space Astronomy Centre, Spain

✉ ejarvela@sciops.esa.int

Prof. Robert Antonucci

Professor at Department of Physics, University of California, Santa Barbara

✉ antonucci@physics.ucsb.edu

Prof. Ayan Banerjee

Professor at Indian Institute of Science Education and Research Kolkata

✉ ayan@iiserkol.ac.in

Dr. Guang-Yao Zhao

Post-doctoral fellow at Instituto de Astrofísica de Andalucía (IAA - CSIC), Granada, Spain

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