Rohan Dahale — Curriculum Vitae

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Research Interests

I am interested in understanding black hole accretion, spin and perform tests of General Relativity through direct modeling of supermassive black holes. I am also keen to understand how relativistic jets are launched and how the accretion disk connects to the relativistic jets. To understand these problems, I am interested in developing and using tools that use machine learning, Bayesian inference, to measure physical properties of black holes and jets through mm-VLBI observations (eg. Event Horizion Telescope).

Education

Instituto de Astrofísica de Andalucía (IAA-CSIC) 01 Sep 2022–25 July 2025
PhD in Physics and Space Sciences – with highest grade Summa Cum Laude *Granada, Spain*
Thesis: Inferring Black Hole Physics through Image and Video Reconstructions with the Event Horizon Telescope
Supervisor: Dr. José L. Gómez

Indian Institute of Science Education and Research Kolkata Aug 2017–Jul 2022
Bachelor and Master of Science in Physical Sciences *GPA: 9.52/10.0*
MS Thesis: Magnetic Fields of Relativistic Jets of Supermassive Black Holes
Supervisor: Dr. José L. Gómez

Research and Teaching Experience

Postdoctoral fellow, University of Toronto 01 Oct 2025-present
- Supervisors: Prof. Aviad Levis & Prof. Bart Ripperda
- Funding: Schmidt AI in Science Postdoctoral Fellowship
- Affiliation 1: Canadian Institute for Theoretical Astrophysics
- Affiliation 2: Department of Computer Science, University of Toronto

Member, Event Horizon Telescope Collaboration Jun 2022–present
- Core contributor of imaging, modeling and feature extraction efforts
- Led three projects leading to two first author papers (one published, one in prep)

PhD Candidate, Instituto de Astrofísica de Andalucía 01 Sept 2022–25 July 2025
- Supervisor: Dr. José L. Gómez
- Focused on developing Bayesian modeling and testing theory of general relativity
- Led three EHT Collaboration papers: 1) Bayesian Imaging of M87* with Comrade *(published)* 2) Origin of ring ellipticity in black hole images of M87* *(published)* 3) Validation and evaluation of horizon-scale Sagittarius A* video reconstructions.

Visiting Scholar Jul–Aug 2024
Black Hole Initiative, Harvard (Supervisor: Dr. Paul Tiede) *Cambridge, USA*
MIT Haystack Observatory (Supervisor: Dr. Kazu Akiyama) *Westford, USA*
- Project: Time and frequency resolved Bayesian imaging with `Comrade.jl`
- Added auto-differentiable NFFT for images at different times and/or frequency
- Optimized the code for time ($\mathcal{O}(N)$ but can be parallelized) and memory allocations
- Added unit tests for the new code and had a code review
- Working on adding a spatio-temporal Gaussian Random Field (GRF) prior

Master Thesis Student, Instituto de Astrofísica de Andalucía Oct 2021–Jun 2022
- Supervisor: Dr. José L. Gómez
- Mapped the 3D structure of magnetic fields in blazar jets of supermassive black holes to understand jet launching *Granada, Spain*

Graduate Teaching Assistant, IISER Kolkata Aug 2020–Jul 2021
- Autumn 2020: Mathematical Methods for Physics *Kolkata, India*
- Autumn 2020: Mechanics I
- Spring 2021: Electricity and Magnetism

Research Intern, University of California, Santa Barbara May–Jul 2019
- Published a paper on Extended Radio Emission in Narrow-line Seyfert 1 Galaxies with JVLA, supervised by Dr. Emilia Järvelä *Santa Barbara, USA*
- Worked on the Lyman Edge Polarisation of QSO PG 1630+377 using Hubble, supervised by Prof. Robert Antonucci

Honors and Awards

Eric and Wendy Schmidt AI in Science Postdoctoral Fellowship Oct 2025 - Sep 2027
Schmidt Futures - University of Toronto
- 10 fellowships are awarded to postdocs who aim to pursue a research project that includes the application of artificial intelligence (AI) to their domain.
- Duration: 2 years and Total grant: 190,000 CAD [$\sim$ €120,000]

"la Caixa" Doctoral INPhINIT Fellowship Sep 2022 - Aug 2025
Fundación "la Caixa" - Instituto de Astrofísica de Andalucía (IAA-CSIC)
- 35 fellowships (from $\sim$ 1000 candidates) are awarded to pursue PhD studies in research centres accredited with the Spanish Seal of Excellence Severo Ochoa in STEM disciplines
- Duration: 3 years and Total grant: €122,592

JAE Intro 2021 Scholarship Oct 2021 - Jun 2022
Consejo Superior de Investigaciones Científicas (CSIC), Spain
- 250 scholarships (from $\sim$ 3000 candidates) offered to undergraduate students
- Total grant: €5,400 for nine months. Used for the Master Thesis at IAA-CSIC

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 ($\sim$ €4,500) for 5 years

Selected Scientific Talks

Invited Talks

[1] Origin of the Ring Ellipticity in the Black Hole Images of M87* 2 Dec 2024
2024 EHT Virtual Collaboration Meeting Presentation

[2] New imaging techniques: RML, Bayesian, and Neural Networks with `Comrade.jl` 1-2 Oct 2024
European Radio Interferometry School 2024, Granada, Spain

[3] New EHT Results of the M87* Shadow: Observations, Imaging, and Analysis from Multiple Years 1 Jul 2024 Presentation
European Astronomical Society Annual Meeting 2024, Padova, Italy

[4] 2018 M87* Ring Ellipticity — 12 Dec 2023
2023 EHT Virtual Collaboration Meeting — Presentation

Contributed Talks

[1] SgrA* Dynamical Imaging: Validation and Evaluation with `Comrade.jl` — 17 Jul 2025
EHT Summer Collaboration Meeting 2025, Berlin, Germany — Presentation

[2] SSgrA* Dynamical Imaging: Summary of validation ladder results with `Comrade.jl` — 17 Jul 2025
EHT Summer Collaboration Meeting 2025, Berlin, Germany — Presentation

[3] Full Stokes Bayesian Modeling and Imaging of VLBI data with `Comrade.jl` — 2 Jul 2024
European Astronomical Society Annual Meeting 2024, Padova, Italy — Presentation

[4] Measuring the Ring Ellipticity of M87* using 2018 the EHT data — 24 May 2024
EHT Collaboration Meeting Summer 2024, Mexico City, Mexico — Presentation

[5] Full Stokes Snapshot Modeling with `Comrade.jl` — 27 Feb 2024
SgrA Dynamics Workshop, Granada, Spain* — Presentation

[6] Measuring the Ring Ellipticity of M87* using 2018 the EHT data — 27 Jun 2023
EHT Collaboration Meeting 2023 Summer, Taichung, Taiwan — Presentation

[7] A Bayesian Approach to Imaging Supermassive Black Holes and Relativistic Jets — 17 May 2023
Doctoral Conferences (Jornadas de Doctorado), IAA-CSIC — Presentation

[8] Accelerating Bayesian Imaging with `Comrade.jl` — 15 Dec 2022
2022 EHT Winter (Virtual) Collaboration Meeting — Presentation

[9] Accelerating Bayesian Imaging with `Comrade.jl` — 26 Oct 2022
Resolve Workshop 2022, MPIfR, Bonn, Germany — Presentation

Accepted Proposals & Observations

2023.1.01244.V: The Multi-frequency Horizon-scale View of M87 — Apr 2024
Led the Event Horizon Telescope ALMA Cycle 10 Proposal
Observed at the IRAM-30m Telescope for the 2024 EHT Observation Campaign

Outreach

Official Press Release of the EHT through IAA-CSIC for the paper on the origin of M87* ring ellipticity — 10 July 2025
Event Horizon Telescope reveals why M87's black hole ring is not a perfect circle

Official Press Release of the EHT for the 2018 M87* Paper I — 18 Jan 2024
M87 One Year Later: Proof of a persistent black hole shadow*

Official Press Release of IAA-CSIC for the 2018 M87* Paper I — 18 Jan 2024
English version: M87 One Year Later: Proof of a persistent black hole shadow*

Managing Social Media and Website of VLBI Group at IAA — May 2022 - present
X.com, Instagram, Threads, Website

Skills

Imaging: `Comrade.jl`, `eht-imaging`
Programming: Julia, Python, Git, Bash
Languages: English (native), Marathi (native), Hindi (native), Spanish (A2)

References

Dr. José L. Gómez
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Prof. Peter Galison
Professor at Harvard University
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Dr. Kazu Akiyama
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MIT Haystack Observatory
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Prof. Aviad Levis
Assistant Professor at Department of CS
University of Toronto
Toronto, Canada
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First Author Papers

[1], [2] are Event Horizon Telescope Collaboration Official Papers. [2] is ready to be submitted to Astronomy & Astrophysics. [3] has equal contribution first authors where I did half of the analysis and paper writing.

[1] R. Dahale, I. Cho, K. Moriyama, *et al.*, "Origin of the ring ellipticity in the black hole images of M87*,", vol. 699, A279, A279, Jul. 2025. DOI: 10.1051/0004-6361/202555235. arXiv: 2505.10333 [astro-ph.HE].

[2] **R. Dahale** and the Event Horizon Telescope Collaboration, "Validation and evaluation of horizon-scale Sagittarius A* video reconstructions," *(in prep)*, 2024.

[3] Järvelä, E., **R. Dahale**, L. Crepaldi, *et al.*, "Unravelling the origin of extended radio emission in narrow-line Seyfert 1 galaxies with the JVLA," *Astronomy & Astrophysics*, vol. 658, A12, A12, Feb. 2022. DOI: 10.1051/0004-6361/202141698.

Event Horizon Telescope Collaboration Papers

Significant contribution to [1]. I led the Bayesian imaging and analysis and wrote the corresponding part in the paper.

[1] Event Horizon Telescope Collaboration, **(including R. Dahale)**, K. Akiyama, *et al.*, "The persistent shadow of the supermassive black hole of M 87. I. Observations, calibration, imaging, and analysis," *Astronomy & Astrophysics*, vol. 681, A79, Jan. 2024. DOI: 10.1051/0004-6361/202347932.

[2] J. Röder, Event Horizon Telescope Collaboration, **(including R. Dahale)**, *et al.*, "A multifrequency study of sub-parsec jets with the Event Horizon Telescope,", vol. 695, A233, A233, Mar. 2025. DOI: 10.1051/0004-6361/202452600. arXiv: 2501.05518 [astro-ph.HE].

[3] Event Horizon Telescope Collaboration, **(including R. Dahale)**, K. Akiyama, *et al.*, "The persistent shadow of the supermassive black hole of M87: II. Model comparisons and theoretical interpretations," *Astronomy & Astrophysics*, vol. 693, A265, Jan. 2025. DOI: 10.1051/0004-6361/202451296.

[4] A.-K. Baczko, Event Horizon Telescope Collaboration, **(including R. Dahale)**, *et al.*, "The putative center in NGC 1052,", vol. 692, A205, A205, Dec. 2024. DOI: 10.1051/0004-6361/202450898. arXiv: 2501.08685 [astro-ph.HE].

[5] J. C. Algaba, Event Horizon Telescope Collaboration, **(including R. Dahale)**, *et al.*, "Broadband multi-wavelength properties of M87 during the 2018 EHT campaign including a very high

energy flaring episode,", vol. 692, A140, A140, Dec. 2024. DOI: 10.1051/0004-6361/202450497. arXiv: 2404.17623 [astro-ph.HE].

[6] A. W. Raymond, Event Horizon Telescope Collaboration, **(including R. Dahale)**, *et al.*, "First Very Long Baseline Interferometry Detections at 870 μm," *The Astronomical Journal*, vol. 168, no. 3, 130, p. 130, Sep. 2024. DOI: 10.3847/1538-3881/ad5bdb.

[7] Event Horizon Telescope Collaboration, **(including R. Dahale)**, K. Akiyama, *et al.*, "First Sagittarius A* Event Horizon Telescope Results. VIII. Physical Interpretation of the Polarized Ring," *The Astrophysical Journal Letters*, vol. 964, no. 2, L26, p. L26, Apr. 2024. DOI: 10.3847/2041-8213/ad2df1.

[8] Event Horizon Telescope Collaboration, **(including R. Dahale)**, K. Akiyama, *et al.*, "First Sagittarius A* Event Horizon Telescope Results. VII. Polarization of the Ring," *The Astrophysical Journal Letters*, vol. 964, no. 2, L25, p. L25, Apr. 2024. DOI: 10.3847/2041-8213/ad2df0.

[9] G. F. Paraschos, Event Horizon Telescope Collaboration, **(including R. Dahale)**, *et al.*, "Ordered magnetic fields around the 3C 84 central black hole," *Astronomy & Astrophysics*, vol. 682, L3, p. L3, Feb. 2024. DOI: 10.1051/0004-6361/202348308.

[10] P. Torne, Event Horizon Telescope Collaboration, **(including R. Dahale)**, *et al.*, "A Search for Pulsars around Sgr A* in the First Event Horizon Telescope Data Set," *The Astrophysical Journal*, vol. 959, no. 1, 14, p. 14, Dec. 2023. DOI: 10.3847/1538-4357/acf4f2.

[11] F. Roelofs, Event Horizon Telescope Collaboration, **(including R. Dahale)**, *et al.*, "Polarimetric Geometric Modeling for mm-VLBI Observations of Black Holes," *The Astrophysical Journal Letters*, vol. 957, no. 2, L21, p. L21, Nov. 2023. DOI: 10.3847/2041-8213/acff6f.

[12] Event Horizon Telescope Collaboration, **(including R. Dahale)**, K. Akiyama, *et al.*, "First M87 Event Horizon Telescope Results. IX. Detection of Near-horizon Circular Polarization," *The Astrophysical Journal Letters*, vol. 957, no. 2, L20, p. L20, Nov. 2023. DOI: 10.3847/2041-8213/acff70.

Other Papers

[1] T. Toscano, S. N. Molina, **(including R. Dahale)**, *et al.*, "Helical magnetic field structure in 3c 273: A faraday rotation analysis using multi-frequency polarimetric vlba data," *Astronomy amp; Astrophysics*, vol. 698, A210, Jun. 2025. DOI: 10.1051/0004-6361/202453542.

[2] Fuentes, A., J. L. Gómez, **(including R. Dahale)**, *et al.*, "Filamentary structures as the origin of blazar jet radio variability," *Nature Astronomy*, vol. 7, pp. 1359–1367, Nov. 2023. DOI: 10.1038/s41550-023-02105-7.

[3] E. Traianou, T. P. Krichbaum, **(including R. Dahale)**, *et al.*, "Lost in the curve: Investigating the disappearing knots in blazar 3C 454.3," *Astronomy & Astrophysics*, vol. 682, A154, A154, Feb. 2024. DOI: 10.1051/0004-6361/202347267.

[4] G.-Y. Zhao, J. L. Gómez, **(including R. Dahale)**, *et al.*, "Unraveling the Innermost Jet Structure of OJ 287 with the First GMVA + ALMA Observations," *The Astrophysical Journal*, vol. 932, no. 1, 72, p. 72, Jun. 2022. DOI: 10.3847/1538-4357/ac6b9c.

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