

AYUSH MOHARANA

Doctoral Candidate at Nicolaus Copernicus Astronomical Center

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Interested in observations of eclipsing binaries and low-mass stars.

EXPERIENCE

Doctoral Candidate

📍 Nicolaus Copernicus Astronomical Center, Polish Academy of Sciences
📅 December 2019 - Present **Supervisor: Dr. hab. K.G. Hełminiak**

Junior Research Fellow

📍 National Institute of Technology, Rourkela, India
📅 August 2019 - October 2019 **Supervisor: Dr. A.C. Pradhan**

Research Intern

📍 Manipal Centre for Natural Science, India
📅 May 2017 - July 2017 **Supervisor: Dr. D. Bhattacharya**

PUBLICATIONS

📄 Journal Articles

- F. Kahraman Aliçavuş, T. Pawar, K. G. Hełminiak, *et al.*, "Comprehensive spectroscopic and photometric study of pulsating eclipsing binary star AI Hya," vol. 520, no. 2, pp. 1601–1612, Apr. 2023. DOI: 10.1093/mnras/stad137. arXiv: 2301.04409 [astro-ph.SR].
- A. Moharana, K. G. Hełminiak, F. Marcadon, *et al.*, "Detached eclipsing binaries in compact hierarchical triples: triple-lined systems BD+442258 and KIC 06525196," vol. 521, no. 2, pp. 1908–1923, May 2023. DOI: 10.1093/mnras/stad622. arXiv: 2303.05272 [astro-ph.SR].
- A. Moharana, K. G. Hełminiak, F. Marcadon, *et al.*, "Solaris photometric survey: Search for circumbinary companions using eclipse timing variations," 2023. arXiv: 2310.05890 [astro-ph.SR].
- M. Rozyczka, I. B. Thompson, A. Dotter, *et al.*, "The Cluster Ages Experiment (CASE) - IX. Analysis of four detached eclipsing binaries in the globular cluster NGC 3201," vol. 517, no. 2, pp. 2485–2501, Dec. 2022. DOI: 10.1093/mnras/stac2751.
- K. G. Hełminiak, A. Moharana, T. Pawar, *et al.*, "Orbital and physical parameters of eclipsing binaries from the ASAS catalogue - XII. A sample of systems with K2 photometry," vol. 508, no. 4, pp. 5687–5708, Dec. 2021. DOI: 10.1093/mnras/stab2963. arXiv: 2110.05961 [astro-ph.SR].
- J. Korth, A. Moharana, M. Pešta, D. R. Czaulinga, and K. E. Conroy, "Consequences of parameterization choice on eclipsing binary light curve solutions," *Contributions of the Astronomical Observatory Skalnaté Pleso*, vol. 51, no. 1, pp. 58–67, Jan. 2021. DOI: 10.31577/caosp.2021.51.1.58.
- R. Kumar, A. C. Pradhan, A. Mohapatra, *et al.*, "Ultraviolet Imaging Telescope (UVIT) observation of the Galactic globular cluster NGC 7492," vol. 502, no. 1, pp. 313–327, Mar. 2021. DOI: 10.1093/mnras/staa4032. arXiv: 2012.13712 [astro-ph.GA].

👥 Conference Proceedings

EDUCATION

Integrated M.Sc. in Physics

📍 National Institute of Technology, Rourkela
📅 August 2014 – June 2019

PROJECTS

- ★★★ **Evolution of Tight Triple Systems**
Extracting accurate parameters of all three stars in a close (<5AU) triple system and using them to study stellar and dynamical evolution. On-going.
- 🕒 **Eclipse timing variations using Solaris network**
Developed the photometric pipeline to generate lightcurves for 100+ targets spanning 5 years and 4 telescopes to look for tertiary companions to eclipsing binaries through the Solaris network of robotic telescopes. On-going.
- 🌌 **UV photometry from UVIT-Astrosat**
Study of properties of hot stars in the globular clusters with UV observations from Ultraviolet Imaging Telescope and estimating the structural parameters of the Milky Way disk and halo using theoretical star counts from the Besancon model. 2017-2021.
- ✳️ **Constraining physical parameters of Blazar Jets**
Constraining the parameters of a leptonic blazar jet by using an inverse-problem solver code and broadband observations. 2017-2018.

FELLOWSHIPS AND GRANTS

- 🏆 **NCN PRELUDIUM**
PI of a 3yr (40k EUR) grant from National Science Center, Poland
- 🎓 **NCN OPUS Fellow**
Additional fellowship for PhD studies
- 🎓 **ISRO Junior Research Fellow**
Fellowship for 1yr project funded by Indian Space Research Organisation. 2019.

- F. Marcadon, **A. Moharana**, T. Pawar, *et al.*, “Search for low-mass star companions around short-period eclipsing binaries: the case of RX Gru,” in *American Astronomical Society Meeting Abstracts*, ser. American Astronomical Society Meeting Abstracts, vol. 55, Jan. 2023, 302.02, p. 302.02.
- K. G. Hełminiak, F. Marcadon, **A. Moharana**, T. Pawar, and M. Konacki, “TESS photometry of crème de la crème of Eclipsing Binaries,” in *XL Polish Astronomical Society Meeting*, E. Szuszkiewicz, A. Majczyna, K. Małek, *et al.*, Eds., vol. 12, Oct. 2022, pp. 163–166.
- **A. Moharana**, K. G. Hełminiak, F. Marcadon, T. Pawar, and M. Konacki, “Evolution and Dynamics of Tight Triple Systems,” in *XL Polish Astronomical Society Meeting*, E. Szuszkiewicz, A. Majczyna, K. Małek, *et al.*, Eds., vol. 12, Oct. 2022, pp. 198–201.
- T. Pawar, K. G. Hełminiak, R. Singh Rathour, **A. Moharana**, and M. Konacki, “AI Hydrae: Revisiting our pulsator friend,” in *XL Polish Astronomical Society Meeting*, E. Szuszkiewicz, A. Majczyna, K. Małek, *et al.*, Eds., vol. 12, Oct. 2022, pp. 189–192.
- S. P. Ghosh, K. C. Das, N. Tripathy, *et al.*, “Synthesis of copper doped Zinc oxide nanowires with enhanced ultraviolet photore-sponse behavior,” in *Materials Science and Engineering Conference Series*, ser. Materials Science and Engineering Conference Se-ries, vol. 178, Feb. 2017, p. 012021. DOI: 10.1088/1757-899X/178/1/012021.

TALKS AND POSTERS

- **Contributed talk** at Polish Astronomical Society meeting, Torun, September 2023
- Poster at Polish Astronomical Society meeting, Torun, September 2023
- **Contributed talk** at European Astronomical Society meeting, Krakow, July 2023. Session: LS11- Evolving Observations of Binary Stars
- **Contributed talk** at European Astronomical Society meeting, Krakow, July 2023. Session: S11- Stellar interactions
- **Contributed talk** at Alpha Cen Systems: Towards new worlds, Nice, June 2023
- Poster at PLATO Stellar Science Conference, Milazzo, June 2023
- **Contributed talk** at Science highlights from SALT, Warsaw, June 2023
- Poster at Impact of Binaries on Stellar Evolution (ImBaSE), Munich In-stitute for Astro, Particle and Bio-physics, Munich, Germany, November 2022.
- **Contributed talk** at STARS 2020, Institute of Astronomy, University of Cambridge, UK. August 2022.
- Poster at 40th Meeting of the Polish Astronomical Society, Online- Szczecin, Poland. September 2021.
- Poster at the TESS Science Conference 2, MIT, Online. August 2021.

OUTREACH

- Talk at Young Astronomers meet, Warsaw, March 2022.
- Talk on “Measuring Stars with Eclipsing Binaries” at Astronomy Students’ Scientific Association, NCU Torun, May 2021.
- Popular science talk on “Multiple Star systems” at National Institute of Technology, Rourkela, 2020.
- Astronomy workshop for rural kids, Chandbali, November 2019.
- Organising team of WARPED (Astronomy and Space Science fair for school children), Rourkela, August 2017.

OBSERVING RUNS

S CHIRON, CTIO
PI for 60hrs of spectroscopic obser-
vations obtained using PRELUDIUM
funding. Ongoing.

S HRS, SALT
PI of a 4-semester monitoring pro-
gramme. Ongoing.

P TESS GIP
Co-PI of TESS Guest Investigator Pro-
grammes. 2020, 2022, 2023.

P TESS DDT
Co-PI of 1 TESS Director’s Discre-
tionary Time run. 2020.

CODES AND TECHNIQUES

Python FORTRAN TOPCAT PHOEBE2
ISPEC REBOUND JKTEBOP

Eclipsing Binary Lightcurve Modelling
Radial Velocity Modelling Spectral Analysis
Spectral Disentangling Numerical Integration

LANGUAGES

English
Odia (Native)
Hindi
Sanskrit
Polish

ADDITIONAL SKILLS

Graphic Designing Video Editing

REFERENCES

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