Harshal Raut

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MS (Research) - Space Science & Engineering ms2204121003@iiti.ac.in
Research Domain - Galaxy Evolution and Data Analytics harshal1908.hr@gmail.com
Indian Institute Of Technology Indore

Education

Degree/Certificate	Institute/Board	CGPA	Year
M.S. (Research)	Indian Institute of Technology Indore	9.78	2022-2025
B.Tech.(Electronics)	Mumbai University (V.J.T.I)	6.84	2015-2019
Higher Secondary	CBSE Board (D.P.S. Nagpur)	8.9	2015
Secondary	CBSE Board (R.G.P.S.)	10.0	2013

Projects

- **The vertical structure of the stellar disk in NGC 551** *Nov. 2022 - May 2025*
  Asst. Prof. Dr. Narendra Nath Patra Github
  – Constructed a 3D model of galaxy using the combined Poisson-Boltzmann equations which combine the surface density and the velocity dispersion of star, Atomic gas and Molecular gas.
  – Developed an iterative method to estimate vertical stellar velocity dispersion from line-of-sight measurements
  – Leveraged advanced statistical techniques, including 2D Gaussian fitting (MGEFit) and Markov Chain Monte Carlo (MCMC), to extract precise measurements of surface density of stars and volume density of dark matter halo respectively.
  – **Discovered that traditional 2D fitting methods systematically underestimate scale length and flattening ratio of stellar disks, particularly in edge-on galaxies.**
- **Developing Visualizing Software for IIT-I Radio Interferometer** *Dec 2022 - Feb 2023*
  Asst. Prof. Dr. Narendra Nath Patra
  – Developed software for demonstration of the IIT-I Radio Interferometer, showcasing the interference patterns.
  – Created plots displaying the cross-correlation, auto-correlation of multiple antenna signals, enabling researchers to observe the interference patterns.
  – **Conducted successful Sun Transit experiments, demonstrating the running of the interferometer.**

Publications

Raut, H. et al. (2025) **The vertical structure of the stellar disk in NGC 551**. Accepted in A&A

Technical Skills

- **Programming**: **Python**, C, C++, Linux, Latex, Matlab
- **Electronics**: $VHDL^*$, Raspberry Pi, Arduino

** Elementary proficiency*

Relevant Coursework

- **MS(R) in Space Science and Engineering**: Detectors and Sensors for Space Observations, Space Engineering System, **Astrophysical fluids & Plasma**
- **B.Tech in Electronics**: Signals and Systems, **Computer Programming and problem Solving**, Probability and Statistics, **Electromagnetic Field and Waves**, Microwave and Optical Communications, Wireless communications

Research Interest

Galaxy Structure and Evolution, Multi-Wavelength Spectroscopy and Photometry, Data Analysis

Conferences

– Poster : Astronomical Society of India Meeting, ASI 2023 (IIT Indore)
"MGEfit & Poisson–Boltzmann solution for NGC 551"
– Oral talk : National Space Science Symposium, NSSS 2024 (Goa University)
"Vertical structure of the stellar disk in NGC 551"

Positions of Responsibility

- **Teaching Assistant**: Astro Labs I & II (Sem 2–3): supervised practical sessions, guided data-reduction exercises, graded lab reports.
- **Conference Operations Volunteer**: URSI 2022 Radio Science Meeting & ASI 2023: managed A/V set-up, ran speaker timing, assisted with delegate registration.
- **Astronomy Outreach**: Organised solar/lunar-eclipse, planetary-conjunction observing sessions, star gazing for students and the public.