

# Aashish Gupta

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## RESEARCH PROJECTS

- Development of TIPSy, a code to analyse streamer observations**  
*Second Ph.D. project at ESO, Germany with Dr. Anna Miotello; 2022-2023*  
I developed the first of its kind code TIPSy (Trajectory of Infalling Particles in Streamers around Young stars) to fit molecular-line observations of elongated trails of infalling gas, often called streamers, with theoretically expected trajectories of infalling gas.
- Using reflection nebulae to identify Class II sources undergoing late infall**  
*First Ph.D. project at ESO, Germany with Dr. Anna Miotello; 2021-2022*  
I demonstrated that association with reflection nebulae can be used to identify Class II sources accreting material from surrounding clouds, which further suggests that a significant fraction of Class II sources could be undergoing this phenomena.
- Studying interplay between molecular clouds and young stars in Rho Ophiuchus**  
*Master's thesis at National Central University, Taiwan with Prof. Dr. Chen, Wen-Ping; 2019-2021*  
I diagnosed the spatial and kinematic distribution of the young stellar population with respect to the deepest JCMT continuum emission map in the core of Rho Oph cloud complex.
- Investigating effects of magnetic fields on gas kinematics in protostars**  
*Academia Sinica Institute of Astronomy and Astrophysics (ASIAA), Taiwan internship with Dr. Yen, Hsi-Wei; 2020-2021*  
Using data from JCMT and SMA, I investigated correlations between magnetic field orientations/strengths and gas kinematics for a sample of ~50 protostars in Perseus molecular clouds.
- Examining influence of star-formation environment on protoplanetary disks**  
*Collaborative project; 2020*  
I examined the relation between protoplanetary disk sizes and magnetic field, turbulence, and velocity gradient on core scales; for a sample of protostars in Orion, using measurements from VLA/ALMA/JCMT/GBT.
- Pipeline for detection and analysis of stellar flares**  
*Internship at Aryabhata Research Institute of Observational Sciences (ARIES), India with Dr. Jeewan Pandey; 2018*  
I developed a pipeline to detect and analyze flaring signatures in Kepler's lightcurves.
- Fourier analysis of RR Lyrae variable stars**  
*ARIES summer internship with Dr. Sneha Lata; 2017*  
I developed a program to analyse time series data of RR Lyrae Variables and estimate their physical parameters.
- Development of sugar-based additive manufacturing machine**  
*Bachelor's research project at IIITDMJ, India with Prof. Puneet Tandon; 2016*  
I assisted in the design and fabrication of a machine for 3D printing objects out of pure sugar.

## EDUCATION

Year	Qualification	Institute	Grade
2021-present	Doctor of Philosophy (Astronomy)	European Southern Observatory and Ludwig Maximilian University, Germany	-
2019-2021	Master of Science (Astronomy)	National Central University, Taiwan	89.6/100
2015-2019	Bachelor of Technology (Mechanical Engineering)	PDPM Indian Institute of Information Technology, Design and Manufacturing, Jabalpur, India	8.1/10

## Other Courses:

1. "Intermediate Machine Learning" by Kaggle
2. "Intro to Deep Learning" by Kaggle
3. "Computer Vision" by Kaggle
4. "Using Python for Research" by Harvard University ( edx.org )
5. "Machine Learning" by Stanford University (coursera.org)
6. "Data-driven Astronomy" by University of Sydney ( coursera.org )
7. "Astrophysics: Cosmology" by Australian National University ( edx.org )
8. "Analyzing the Universe" by Rutgers the State University of New Jersey ( coursera.org )
9. "Confronting The Big Questions: Highlights of Modern Astronomy" by University of Rochester ( coursera.org )
10. "Applied Machine Learning in Python" by University of Michigan ( coursera.org )
11. "Understanding Einstein: The Special Theory of Relativity" by Stanford University ( coursera.com )
12. "From the Big Bang to Dark Energy" by The University of Tokyo ( coursera.com )
13. "Philosophy and the Sciences: Introduction to the Philosophy of Physical Sciences" by University of Edinburgh ( coursera.com )
14. "Using Databases with Python" by University of Michigan ( coursera.com )
15. "AstroTech: The Science and Technology behind Astronomical Discovery" by The University of Edinburgh ( coursera.com )

## SKILLS

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- *Programming Languages:* Python, C/C++, Octave, HTML, Shell scripting
- *Softwares:* LaTeX (Typesetting), CASA (Radio data processing), IRAF (Optical data reduction), Git (Software management), DS9 (Imaging), CARTA (Radio imaging)
- *Languages:* Hindi (Native), English (Proficient, IELTS score 8), Mandarin (Basic speaking and listening), German (Basic, A1)

## PUBLICATIONS

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### First author papers:

- "Reflections on nebulae around young stars. A systematic search for late-stage infall of material onto Class II disks"  
**Gupta A.**, Miotello A., Manara C. F., Williams J. P., Facchini S., Beccari G., Birnstiel T., Ginski C., Hacar A., Küffmeier M., Testi L., Tychoniec L., Yen H.-W., 2023, A&A, 670, L8. doi:10.1051/0004-6361/202245254
- "Effects of Magnetic Field Orientations in Dense Cores on Gas Kinematics in Protostellar Envelopes"  
**Gupta A.**, Yen H.-W., Koch P., Bastien P., Bourke T. L., Chung E. J., Hasegawa T., Hull C. L. H., Inutsuka S., Kwon J., Kwon W., Lai S.-P., Lee C. W., Lee C.-F., Pattle K., Qiu K., Tahani M., Tamura M., Ward-Thompson D., 2022, ApJ, 930, 67. doi:10.3847/1538-4357/ac63bc
- "Interplay between Young Stars and Molecular Clouds in the Ophiuchus Star-forming Complex"  
**Gupta A.**, Chen W.-P., 2022, AJ, 163, 233. doi:10.3847/1538-3881/ac5cc8

### Co-author papers:

- "A dusty streamer infalling onto the disk of a class I protostar. ALMA dual-band constraints on grain properties and mass infall rate."  
Cacciapiuoti L., Macias E., **Gupta A.** et al., 2023, A&A (accepted), arXiv:2311.13723
- "The VLT MUSE NFM view of outflows and externally photoevaporating discs near the orion bar"  
Haworth T. J., Reiter M., ...**Gupta A.** et al., 2023, A&A, 670, L8. doi:10.1051/0004-6361/202245254
- "The JCMT Transient Survey: Four-year Summary of Monitoring the Submillimeter Variability of Protostars"  
Lee Y.-H., Johnstone D., ...**Gupta A.** et al., 2021, ApJ, 920, 119. doi:10.3847/1538-4357/ac1679
- "No Impact of Core-scale Magnetic Field, Turbulence, or Velocity Gradient on Sizes of Protostellar Disks in Orion A"  
Yen H.-W., Zhao B., Koch P. M., **Gupta A.**, 2021, ApJ, 916, 97. doi:10.3847/1538-4357/ac0723
- "VR CCD Photometry of Variable Stars in the Globular Cluster NGC 4147"  
Lata S., Pandey A. K., ...**Gupta A.** et al., 2019, AJ, 158, 51. doi:10.3847/1538-3881/ab22a6

### Submitted papers:

- "TIPSY: Trajectory of Infalling Particles in Streamers around Young stars. Dynamical analysis of streamers around S CrA and HL Tau" (Preprint available upon request)  
**Gupta A.**, Miotello A., Williams J. P., Birnstiel T., Küffmeier M., Yen H.-W.
- "Anatomy of the Class I protostar L1489 IRS with NOEMA: disk, streamers, outflow(s) and bubbles at 3mm"  
Tanious M., Le Gal R., ...**Gupta A.** et al.

## PARTICIPATION IN MEETINGS

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### Invited talks:

- Core2disk III workshop, Paris, France, October 2023
- Origins seminar at Chalmers University, Gothenburg, Sweden, August 2023
- ESO star and planet formation seminar, Garching, Germany, February 2023

- ECOGAL seminar, Online, February 2023
- MPE-CAS journal club on star and planet formation, Garching, Germany, July 2022

#### Contributed talks:

- European Astronomical Society annual meeting (EAS), Krakow, Poland, July 2023
- Meeting of ALMA Young Astronomers (MAYA), Online, March 2023
- Annual Meeting of Astronomy Society of the Republic of China (ASROC), Taipei, Taiwan, September 2020

#### Posters:

- Star@Lyon conference, Lyon, France, June 2023
- Protostars and Planets VII, Kyoto, Japan, April 2023
- Annual Meeting of Astronomy Society of the Republic of China (ASROC), Taipei, Taiwan, September 2020
- Annual Meeting of the Physical Society of Taiwan (TPS), Pingtung, Taiwan, February 2020
- Exploring the Universe: Near Earth space science to extragalactic astronomy (EXPUNIV2018), Kolkata, India, Nov 2018

#### Workshops and schools:

- "DUSTBUSTERS school on protostellar discs and planet formation", Italy, February 2022
- "7th KAGRA International Workshop", NCU, Taiwan, December 2020
- "ALMA Imaging Workshop", ASIAA, Taiwan, September 2020
- "ASIAA Summer Student Program", ASIAA, Taiwan, July/August 2020
- "RAD@home Discovery Camp", Nehru Planetarium, India, December 2018

### AWARDS AND ACHIEVEMENTS

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- DFG funding for Ph.D. position at ESO, Germany
- Invitation to write an SMA Newsletter article on "Effects of Magnetic Field Orientations in Dense Cores on Gas Kinematics in Protostellar Envelopes"
- MOST scholarship grant for master's program at NCU, Taiwan
- Award for good academic performance at NCU, Taiwan
- Poster presentation award in TPS 2020
- Certificate of Merit for academic excellence at IIITDM Jabalpur, India
- Winner of Astronomy Hackathon in Techkriti 2019; Winner of Cosima in Abhikalpan 2019; First runners up in Astronomy Quiz in Abhikalpan 2018 and 2019
- Got prizes in various technical (automotives, fabrication), cultural (poetry, drama) and sports (swimming, football/soccer) events.

### OBSERVING EXPERIENCE

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- Co-I of ALMA project "Chasing streamers: Unveiling the connection between disk growth and infall channels in embedded protostars" (project code: 2023.1.00572.S)
- Co-I of ALMA project "Compact or large? CO observations of the faintest planet-forming disks." (project code: 2023.1.00428.S)
- Co-I of VLT project "Discovery of the first accretion streamer in a massive star forming region" (project code: 110.259E)
- Member of ALMA large program "The ALMA Disk-Exoplanet C/Onnection" (project code: 2022.1.00875.L)
- Former member of "The JCMT Transient Survey"
- Submitted proposals for ALMA and VLT observations
- Assisted in optical observations at ARIES, India and Lulin Observatory, Taiwan

### MENTORING EXPERIENCE

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- I supervised Alessandro Ruzza for the ESO Summer Research Programme (2023). We quantified the frequency of Class II sources that are surrounded by clouds and thus, likely undergoing late-infall of material.
- Academic Helper for Physics and Mathematics at IIITDMJ Counseling Services (2016-2018)
- Student guide for the first year students at IIITDMJ (2016)

### OUTREACH AND COMMUNITY SERVICE

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- Co-organizer of Wine & Cheese seminars at ESO, Germany (2023-present)
- Co-chaired Hypatia Colloquium 2022 at ESO, Germany (2023)
- Started CodesX, a competitive coding group in NCU, Taiwan (2020-2021)
- Coordinator and member of [The Astronomy and Physics Society of IIITDM Jabalpur](#), India. We organized events like telescope nights, exhibitions, quizzes, etc. to promote astronomy among a variety of audiences. (2016-2019)
- E-Astronomer at [RAD@home](#) Astronomy Collaboratory, an Indian citizen-science research programme (2018-2019)