TANUL GUPTA

Rietwig 1, Deutz TH, Köln – 50679, Germany, +49-15217085401
email: tanulgupta123@outlook.com

Research Interests: (1) Quantum Information Theory (2) Theoretical Physics

EDUCATIONAL QUALIFICATIONS

Exam/Degree	Board/University	Year of Passing	% of Marks /Grade
M.Sc. Physics (Honors)	University of Cologne	**Pursuing**	-
B.Tech (Physical Sciences)	IIST[a]	2012	CGPA 8.85/10
Class XII	CBSE	2008	87.8%
Class X	CBSE	2006	91.3%

TEST SCORES

GRE General Test	**Total: 333/340** | Quantitative: 170 Verbal: 163 Analytical: 4.5
GRE Physics Subject Test	**Scaled Score: 930/990**
TOEFL iBT	**Total: 110/120** | Reading: 29 Listening: 30 Speaking: 28 Writing: 23

PROFESSIONAL RESEARCH EXPERIENCE (2012-2017)

SCIENTIST, SPACE APPLICATIONS CENTRE, ISRO

ASTROSAT CZTI AND SXT SOFTWARE PIPELINE DEVELOPMENT[1] [2] (2012 – 2016)

- Developed level-2 data reduction pipeline for Cadmium Zinc Telluride Imager (CZTI) onboard Astrosat. The pipeline software is responsible for extracting events from raw data, time tagging (Instrument time to UTC), cleaning background and secondary photons, pulse height amplitude to pulse invariant energy conversion, image generation, and light curve and spectrum generation by binning events.
- Contributed in algorithm development and implementation to find the position and orientation of the Soft X-ray Telescope (SXT) onboard Astrosat. This uses satellite aspect and SXT alignment information to compute time dependent pointing direction of SXT axes.

AUTONOMOUS SPACECRAFT NAVIGATION USING X-RAY PULSARS (2017)

- Simulated recursive estimation and correction of spacecraft position and velocity using millisecond X-ray pulsars. The approach uses Extended Kalman Filter (EKF) for propagation and correction of spacecraft state.
- Implemented Barycentric correction algorithm as an independent python program. Validated the algorithm by comparing with correction performed by FXBARY[b] on RXTE crab pulsar data.

MARS ORBITER MISSION (2014)

- Carried out orbit simulations for Martian phase of Mars Orbiter Mission (MOM) on Systems Toolkit (STK).
- Developed and operationalized Methane Sensor for Mars (MSM) data processing software at Indian Space Science Data Center, Bengaluru.

RADIOMETRIC CORRECTION[3] (2015-2017)

- Carried out radiometric quality analysis of Cartosat-2S satellites and performed Photo Response Non-Uniformity Correction by modeling Light Transfer Characteristics (LTC). Striping and banding issues were addressed using both spatial and frequency domain techniques.

UNDERGRADUATE PROJECT

SIMULATION OF YOUNG EMBEDDED CLUSTERS (JAN 2012 – MAY 2012)

Advisor: Dr. Sarita Vig[c] (Associate Professor, IIST, Thiruvananthpuram)

- I carried out simulations of young embedded clusters based on models from Vig et al. (2007).
- We found that there is no significant change in simulated K-Band Luminosity function (KLF) with age. The simulations highlighted the need for considering the distribution of gas with age.

[a]Indian Institute of Space Science and Technology, Thiruvananthpuram, Kerala
[b]FXBARY performs barycentric correction on XTE data
[c]https://www.iist.ac.in/ess/sarita

KEY ACADEMIC WORKS

STUDY AND ANALYSIS OF ANOMALOUS X-RAY PULSARS (JULY 2011 – AUGUST 2011)
Advisor: Dr. Sachindra Naik[d] (Associate Professor, PRL, Ahmedabad)

- Analysis of 1E 1841-045, an anomalous x-ray pulsar at the center of the supernova remnant Kes 73, was carried out using Suzaku data.
- Light curve and spectrum of 1E 1841-045 were generated and it was found that the time period of pulsation is 11.783 seconds. I concluded that the magnetic energy is the possible source of radiation.

IMAGE FUSION (JUNE 2010 – JULY 2010)
Advisor: Dr. Shefali Agarwal[e] (Scientist-SG, IIRS, Dehradun)

- Carried out image fusion of high spatial resolution Panchromatic image and low resolution colored image using Daubechies wavelet transform to obtain high resolution colored image.

RELEVANT COURSES

Quantum Information Theory, Advanced Quantum Mechanics, Computational Many Body Physics, Solid State Theory, Topology for Physicists, Quantum Field Theory

TECHNICAL SKILLS

OPERATING SYSTEMS: VARIOUS UNIX DIALECTS, WINDOWS, OS X
PROGRAMMING LANGUAGES: C/C++, PYTHON, BASH SCRIPTING, IDL,
OTHER TOOLS: MATLAB, DS9, FV, GNUPLOT, STK[f]**, GMAT**[g]

LAURELS AND ACHIEVEMENTS

- Rated outstanding scientist consecutively for 5 years
- 2nd rank holder of 2008-2012, B.Tech Physical Sciences batch, IIST
- Ranked in top 2% among 300,000 students who appeared for All India Joint Entrance Examination (JEE) 2008
- Academic Captain, JP Academy (2006-2008)

EXTRA-CURRICULAR ACTIVITIES AND ACHIEVEMENTS

- Web team coordinator of Conscientia 2011, the annual technical festival of IIST
- Web team coordinator of Dhanak 2010, the annual cultural festival of IIST
- Member of Design and Editorial team of Drishtikon 2011, the annual magazine of IIST
- Stood 1st in Inter-College Optics Competition (Image In) held during Conscientia 2010 at IIST
- Core committee member of Physics Club at IIST responsible for handling short term projects

FELLOWSHIPS

- BCGS scholarship provided by Bonn Cologne Graduate School for Physics and Astronomy
- Department of Space (DoS, Government of India) fellowship for undergraduate studies at IIST which covered tuition fee, residential charges, and medical expenses.

PUBLICATIONS/REPORTS

[1] D. Bhattacharya, A. Vibhute, R. Khanna, T. Gupta, and P. Tahliani, "Level-2 Pipeline Software for Astrosat Cadmium Zinc Telluride Imager (CZTI)," 2016.[h]

[2] K. P. Singh *et al.*, "Soft X-ray Focusing Telescope Aboard AstroSat: Design, Characteristics and Performance," *J. Astrophys. Astron.*, vol. 38, no. 2, pp. 1–11, 2017.

[3] T. Gupta, A. K. Singh, and T. P. Srinivasan, "Approach for image quality improvement for high-resolution sensors," presented in *Asian Conference on Remote Sensing*, 2017.

[d] https://www.prl.res.in/~snaik/
[e] http://www.iirs.gov.in/Shefali-profile
[f] Systems Tool Kit devloped by AGI systems for mission analysis.
[g] General Mission Analysis Tool is an open source mission analysis software developed by NASA.
[h] http://www.iucaa.in/~astrosat/CZTI_level2_software_userguide_v1.1.pdf