Ankan Sur | Curriculum Vitae

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Education

Nicolaus Copernicus Astronomical Center, Warsaw, PL
Doctoral studies in Astrophysics, Polish Academy of Sciences *2018–Present*
Supervisors: Prof. Brynmor Haskell, Prof. Michal Bejger

Anton Pannekoek Institute for Astronomy, Amsterdam, NL
MSc in Physics and Astronomy, University of Amsterdam *2016–2018*
Supervisors: Prof. Chris Van Den Broeck, Dr. Archisman Ghosh

St. Xavier's College (Autonomous), Kolkata, IND
BSc Physics Honours, University of Calcutta *2013–2016*
Supervisor: Prof. Sarbari Guha

Academic Positions

Virgo Collaboration: LIGO-Virgo Collaboration, *CBC Cosmology*, *POLGRAW* *2017–Present*
National Institute for Subatomic Physics, Amsterdam, NL: Gravitational Waves dept. *2017–2018*
Saha Institute of Nuclear Physics, Kolkata, IND: Undergraduate Associate *2014–2016*

Research

Research Interests

Neutron stars, magnetic fields, MHD simulations, accreting millisecond pulsars, gravitational waves, continuous waves, LIGO, data anaylsis, cosmology

PhD (Brief)

Neutron stars in binaries accrete matter from the companion star and could build mountains leading to a non-axisymmetric time varying quadrupole moment. The matter gets pushed to higher densities where they undergo different reactions. This would release energy and cause asymmetric heating of the crust. The star would eventually emit gravitational waves (GW). Such waves are sinusoidal in nature, have extremely weak amplitude and are difficult to detect. We search for continuous waves from neutron stars with the data from the LIGO and Virgo observatory. Once detected, we would learn about such extreme compact objects and the underlying physics governing their evolution. I am also studying magnetic field instabilities by performing magnetohydrodynamical simulations of neutron stars. This study would help to get an estimate on the ellipticity of the star.

Other

Hubble constant measurement using gravitational wave standard sirens
CBC-Cosmology project *2017–Present*
I am part of a team that developed the pipeline, **gwcosmo**, which allows for a counterpart/statistical measurement of the Hubble constant H_0. This is possible by extracting the distance from the gravitational-wave (GW) data and redshift information using a galaxy catalog (in the absence of electromagnetic counterpart). I have mainly worked in the GW selection effects and ways to tackle incompleteness of galaxy catalogs. We have tested our method on Mock Data Challenges and also on all the eleven detected GW events from O1 and O2 .

Awards/ Fellowships

Scholarship on neutron star physics: NCN Opus Grant, PL *2019-Present*
CAMK Scholarship: €6600: CAMK, PL *2018-2019*
Amsterdam Excellence Scholarship: €50000: University of Amsterdam, NL *2016-2018*
INSPIRE Scholarship: €2400 (₹180000): DST, Govt of India, IND *2013-2016*
Junior Research Fellowship (declined): Tata Institute of Fundamental Research, Bom, IND *Jul 2016*
All India Rank 9: Joint Entrance Screening Test (JEST), IND *Mar 2016*
Certificate of Merit: Top 1 % in National Graduate Physics Examination, IAPT, IND *Mar 2016*
Certificate of Merit: Ranked 1st in year 2013-2014, St. Xavier's College Kolkata, IND *Jan 2015*

Publications

[1] Abbott, B. P. et al. (2019). "A gravitational-wave measurement of the Hubble constant following the second observing run of Advanced LIGO and Virgo". In: arXiv: 1908.06060 [astro-ph.CO].

[2] Fishbach, M., R. Gray, I. Magaña Hernandez, H. Qi, and A. Sur (2019). "A standard siren measurement of the Hubble constant from GW170817 without the electromagnetic counterpart". In: *Astrophysical Journal Letters* 871.1, p. L13. DOI: 10.3847/2041-8213/aaf96e. arXiv: 1807.05667 [astro-ph.CO].

[3] Gray, Rachel et al. (2019). "Cosmological Inference using Gravitational Wave Standard Sirens: A Mock Data Challenge". In: arXiv: 1908.06050 [gr-qc].

[4] Das, Sangeeta et al. (2015). "Silicon PIN Diode for detection of electrons, alphas, X-rays and gamma rays". In: *DAE Symp. Nucl. Phys.* 60, pp. 976–977.

Talks, Seminars, Colloquia

Talk at 1^{st} Conference of Young Researchers: CAMK, Warsaw, PL *13/06/2019*
Contributed Talk at PHAROS Conference 2019: Platja d'Aro, near Barcelona, ESP *23/04/2019*
Group meeting talk: CAMK, Warsaw, PL *31/10/2018*
Colloquium, Department of Theoretical Physics: IACS Kolkata, IND *05/09/2018*
7th Belgium-Dutch Gravitational Waves Meeting: Groningen, NL *29/05/2018*
Group meeting talk: Nikhef, Amsterdam, NL *09/02/2018*
Talk on Life of stars: St.Xavier's College (Autonomous), Kolkata, IND *21/08/2017*
Chat with a Scholar program: Bangabasi College, University of Calcutta, Kolkata, IND *16/08/2017*
Nuclear Physics seminar: Saha Institute for Nuclear Physics, Kolkata, IND *08/07/2015*

Summer Schools and Conferences

Astrophysics with GW Detections: Warsaw, PL *Sep 2019*
LIGO Scientific Collaboration-Virgo Meeting: Warsaw, PL *Sep 2019*
PHAROS Conference 2019: Platja d'Aro, near Barcelona, ESP *Apr 2019*
PHAROS PhD Training School: FSU Jena, Jena, DEU *Mar 2019*
Gravitational-Wave Astronomy: International Centre for Theoretical Sciences, Bengaluru, IND *Aug 2018*
7th Belgium-Dutch Gravitational Waves Meeting: Groningen, NL *May 2018*
LIGO Virgo Collaboration Town Hall Meeting: Amsterdam, NL *Apr 2018*
11th INTEGRAL Conference: Gamma-Ray Astrophysics in Multi-Wavelength Perspective: Ams, NL *Oct 2018*

Past Research Experience

- **How initial conditions shape the evolution of star clusters**
  Computational Astrophysics project (course instructor : Selma De Mink), University of Amsterdam *Jun 2017*
  Stars were evolved using SeBa code and dynamical interaction of the stars in the cluster was studied. This project was done using AMSUE software. The main goal was to see how many stars get ejected from the system based on the initial configuration.

- **Simulating the Kirkwood Gaps**
  Computational Astrophysics project (course instructor: Selma De Mink), University of Amsterdam *Jan 2017*
  This project was done using Python where we simulated the Sun, Jupiter and the asteroids and saw how their mutual gravitational interaction produced 2:1 and 3:1 resonances. We ran the simulation for 1 million asteroids for 50,000-time iterations in LISA computer cluster. The codes were written from scratch.

- **Multiwavelength study of a bright TeV blazar.**
  Supervisor: Dr. Pratik Majumdar, SINP, Kolkata *Summer 2016*
  Data analysis was done using C++. Light curves were plotted and Pearson's Correlation coefficient was calculated for various combination of wavebands to extract information about different physical processes that drive the evolution of the blazar.

- **Project on Nuclear Physics**
  Supervisor: Dr. Maitreyee Saha Sarkar, SINP, Kolkata *Summer 2015*
  Identification of the peaks in the energy spectra of different radioactive samples using silicon PIN diode: Silicon PIN diode was used in the laboratory to detect electrons, alphas and gamma rays for different radioactive samples and the data was calibrated for identification of peaks in the emission spectra.

- **Experimental High Energy Physics project**
  Supervisor: Dr.Subir Sarkar, SINP, Kolkata *Summer 2014*
  Analysing the Compact Muon Solenoid (CMS) data for the detection of muons from Z Boson decay and studying its physical properties: The working of CMS was studied and data analysis was done using ROOT Cern. Resonant peak at around 90 GeV was obtained for the muons that decayed from Z Bosons in the collider.

Technical skills

Programming Languages: Python, C/C++
Softwares: LaTeX, PLUTO, Visit, Mathematica, MS Powerpoint, Word, Git
Operating systems: Linux, Windows

Other Activities

Amsterdam Excellence Scholars Program: Amsterdam, NL *2016-2018*
Observation nights: Amsterdam, NL *2016*
Physics Quiz, St. Xavier's College: Kol, IND *2014-2016*

References

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Chris Van Den Broeck
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