Aditya Vijaykumar

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Research Interests

Theoretical Physics

Education

Birla Institute of Technology and Science (BITS), Pilani
M.Sc. (Hons.) Physics and B.E. (Hons.) Mechanical Engineering 2013 - 2018 (Expected)

High School - **St. Vincent's High School, Pune** (Maharashtra HSC) - 94.27% 2011 - 2013
Secondary School - **Rosary High School, Pune** (Maharashtra SSC) - 93.27% 1999 - 2011

Research Experience

Visiting Student (Masters Thesis)
Centre for High Energy Physics (CHEP), Indian Institute of Science (IISc), Bengaluru, India
Mentored by Prof. Chethan Krishnan July 2017 - Present
Complexity in context of Locality, Entanglement and Quantum Gravity - We aim to extract lessons for quantum gravity by studying the interplay of entanglement and locality in a few physical systems. We reviewed the various conjectures on complexity and related concepts, and attempted calculating complexity for different field theories.

Project Student
International Centre for Theorectical Sciences (ICTS-TIFR), Bengaluru, India
Mentored by Prof. P. Ajith and Dr. Sumit Kumar January 2018 - Present
Cosmology using Binary Black Hole Mergers - We attempt to understand how the distribution of binary black hole mergers in future detections can be used to constrain cosmology using correlation functions and the power spectrum of these mergers.

Summer Research Intern
The Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, India
Mentored by Prof. Raghunathan Srianand May 2016 - July 2016
Analysis of Quasar Absorption Lines from SDSS Photometric Data - Using photometric data of quasars with absorbers in their line of sight taken from the Sloan Digital Sky Survey (SDSS), we used some image processing techniques such as stacking to establish a correspondence between the results already obtained from the spectral data also taken from SDSS. We used some statistical methods to establish this result.

Summer Research Intern
The National Centre for Radio Astrophysics (NCRA-TIFR), Pune, India
Mentored by Prof. Yashwant Gupta May 2015 - July 2015
Testing and Debugging the Transient Detection Pipeline of GMRT - Squashed crucial bugs and tested the transient pipeline using test data from known and reliable transient sources such as pulsars. Also reviewed key concepts of radio astronomy and pulsar astrophysics in the process.

Selected Projects

Gauge Theory in Particle Physics
Mentored by Prof. Biswanath Layek, BITS Pilani Aug 2016 - Dec 2016
A brief introduction to gauge theory and its applications in particle physics. We started off by studying gauges, their properties, and usage, and went on to apply these concepts to electromagnetism, QED, QCD and some other cases.

Entanglement Production in Coupled Chaotic Systems
Mentored by Prof. J N Bandyopadhyay and Prof. Tapomoy G Sarkar, BITS Pilani Aug 2016 - June 2017
A computational study of chaotic properties of a coupled chaotic system. We considered a coupled top, and using some approximation methods to the Hamiltonian, found the chaotic properties within some parameter ranges. A statistical analysis of the properties followed, with results.

Black Holes
Mentored by Prof. Tapomoy G Sarkar, BITS Pilani Jan 2017 - June 2017
An in-depth study on black holes and their various aspects. Starting with a review of black holes with

different metrics, we also conducted a brief review of naked singularities and paths to quantum gravity. We also revised a fair bit of general relativity in the process.

Relevant Courses

Classical Mechanics, Electromagnetic Theory, Quantum Mechanics, Mathematical Methods in Physics, Statistical Mechanics, Computational Physics, Particle Physics, General Theory of Relativity and Cosmology (did not credit), Quantum Field Theory (did not credit), Introductory Astronomy and Astrophysics

Conferences, Schools and Talks

- ICTS Summer School on Gravitational Wave Astronomy, ICTS, Bengaluru, India, July 2017
- Presented a paper titled *Gravitational Lensing from Orbiting Binary* at APOGEE 2017, BITS Pilani
- IISc Journal Club talk titled *Teleportation Through the Wormhole*, based on arXiv:1707.04354

Technical Skills

Programming Languages - Python, C, C++, Shell Script
Softwares - MATLAB, Maple
Tools/Frameworks - LaTeX, Git

Scores and Awards

- Scored 960/990 on the Subject GRE in Physics, October 2017
- Secured all-India rank 21 in the Joint Entrance Screening Test (JEST), 2018 for admission into Physics PhD programmes in India
- Awarded the ICTS S.N. Bhatt Memorial Excellence Fellowship, 2018
- Selected for the Summer Research Fellowship of the Indian Academy of Sciences in 2016
- Recepient of the INSPIRE-DST Scholarship for Higher Education for the period 2013 to 2018

Co-Curricular Achievements

- Contributor to SciPy
- Captain (Head) of the Clock Tower Restoration Team, BITS Pilani for academic year 2016-17.
- Chief Coordinator of APOGEE 2016, the 34th edition of BITS Pilani's official annual technical festival
- Founding Head of the Student Academic Cell, BITS Pilani, a think-tank responsible for improving the academic environment in BITS, Pilani
- Founded Papyrus Trails, BITS, Pilani's official Literary Festival