Poruri Sai Rahul

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Research Experience

- **Generation and evolution of tensor perturbations during Inflation.** Chennai, India.
  Dr. L. Sriramkumar, Dept. of Physics, IIT Madras. May 2015 – Jun 2015
  - Studied the theory of cosmological perturbations and the theory of Inflation.
  - Derived the analytic expressions for the evolution of the scalar field driving inflation and the evolution of tensor perturbations during two models of inflation, namely power law inflation and inflation driven by small field potential model.
  - Developed a python code to numerically estimate the evolution of the scalar field and the tensor perturbations. We also estimated the power spectrum of tensor perturbations in the super-Hubble limit.

- **Constructing a Tully-Fisher relationship for SAMI galaxies.** Melbourne, Australia.
  Prof. Jeremy Mould, CAS, Swinburne University of Technology. Dec 2013 – Jan 2014
  - Extracted Hα emission line widths from 3-dim Integra Field Spectra of galaxies observed by the SAMI Survey.
  - Constructed a Tully-Fisher relation for SAMI galaxies using SDSS r, i & z band absolute magnitudes and inclination corrected Hα emission line-widths.
  - Sources of scatter in the TF reln. were studied. Errors in galaxy inclination were observed to be a major source of scatter along side peculiar velocity corrections. Error due to incompleteness of the sample is also a major source of error, especially in our case as the sample size is relatively small.
  - 'Star formation rates in SAMI Early Data Release galaxies.' was presented as a poster at the conference 'The Role of Hydrogen in the Evolution of Galaxies'.

- **Colors of 146,659 Quasars in the SDSS DR9.** Trivandrum, India.
  Prof. Anand Narayanan, Indian Institute of Space science & Technology. June 2013 – July 2013
  - Reproduced and extended the results of Richards et al. 2001 on the 'Colors of 2625 Quasars from the SDSS DR3' to 146,659 quasars from the SDSS DR9.
  - The color-color and color-redshift plots for the quasars were reproduced and the dependence of mean-color on redshift was studied along with it's variance.
  - Discovered anomalous objects in the raw data set which are mostly low SNR objects and late-M type stars. Coincidentally, these objects were also clustered spatially and in the color-redshift plots.

- **Observation of the pulsar PSR B1749-28.** Ooty, India.
  Ooty Radio Telescope, NCRA-TIFR. July 2013.
  - Observed the pulsar PSR B1749-28 using the Ooty Radio Telescope at 326.5 MHz with a bandwidth of 16 MHz, as part of the Pulsar Observatory for Students program.
  - Raw data was analysed using SIGPROC and properties of the pulsar such as it's period, it's strength/flux and the dispersion measure were estimated and compared with catalogued data.
  - During data analysis, the spectral response of the calibrator was discovered to be non-uniform and reported to the authorities. Coincidentally, it was a problem the observatory was working to fix.

- **Polarimetric study of the star-forming region Stock 8.** Nainital, India.
  Aryabhatta Research Institute for Observational Sciences. March 2013.
  - Analyzed polarimetric data corresponding to the star forming region Stock 8 in the constellation Auriga. Data was acquired using the ARIES Imaging Polarimeter AImPol at the Sampurnanand 104cm telescope.
  - The amount of polarization caused by dust particles in the star-forming cloud was estimated and the average size of the dust grains in the star forming region was inferred to be 0.58 μm, which is the galactic average.
  - The magnetic field orientation in the molecular cloud was also studied and found to be parallel to the galactic equator. Probable cluster members were also distinguished from foreground and background stars. Data analysis was done primarily in IRAF.

- **IIST Astronomy & Astrophysics School.** Trivandrum, India.
  Indian Institute of Space science & Technology. Dec 2012.
  - Attended lecture series on stellar formation & evolution, observational astronomy, galactic & extra-galactic astronomy and techniques in astronomy i.e astrometry, photometry, spectroscopy, polarimetry & interferometry by professors at the Earth & Space Sciences department, IIST.

Education

- **BS. & MS. in Physics** **CGPA: 5.99/10** — Chennai, India
  Indian Institute of Technology, Madras — Aug. 2009 – Present
  - Major: **Physics**; Minor: **Chemistry**
  - **GRE**: 315/340 (Quantitative: 161/170 Verbal: 154/170 Writing: 3.5/6)
  - **TOEFL**: 110/120 (Reading: 27/30 Listening: 27/30 Speaking: 30/30 Writing: 26/30)
  - Key Courses: Computational methods in Physics, Mathematical Modelling in Industry, Introduction to Atmospheric Sciences, Electromagnetic Theory, Optics & Photonics, Laser Physics and Applications, Introduction to Engineering Optics, Waves & Oscillations, Mathematical Physics II, Atomic & Molecular Physics.
- **12th Grade, Board of Intermediate Education : 92%** — Hyderabad, India
  Narayana Junior College, Hyderabad, Andhra Pradesh. — Jun. 2007 – May 2009
  - Majored in Mathematics, Physics & Chemistry with English & Sanskrit as language subjects.
- **10th Grade, Board of Secondary Education : 91.5%** — Andhra Pradesh, India
  Montessori Public School, Ongole, Andhra Pradesh. — Jun. 1997 – May 2007

Positions of Responsibility

- **Head, Astronomy Club** — Chennai, India
  IIT Madras — Academic years 2012 – 2014
  - Handled the organization of talks on amateur astronomy & observation sessions. Started outreach programs to introduce school children in and around Chennai to Astronomy.
  - Under my leadership, the club acquired funds worth 80,000 INR from the Alumni Association of IITM and 90,000 INR through the IC & SR[1] Innovative Student Program to setup an autonomous astronomical observatory on campus.
- **Co-Ordinator, Astronomy Workshops** — Chennai, India
  Shaastra, IIT Madras — Oct. 2010 & Oct. 2011
  - Organized workshops on how-to build telescopes and on astrophotography during Shaastra[2] 2010 and 2011.
  - Guiding club members to organize a workshop on astronomical data as part of Shaastra 2015.

Skills

- **Languages:** C, Python, LaTeX, Bash, HTML, CSS.
- **Scientific tools:** git, Matlab, Mathematica, GNUPlot, SQLquery
- **Computational Methods:** Monte carlo methods using gibbs, umbrella & entropic sampling, Parallel Programming using OpenMP, numerical methods in programming.

Achievements & Awards

- **SimChamp 2012:** Placed 1st in an Intra-IIT M programming contest. Entries were ranked based on how realistic their simulation of an ant colony behaviour was, by taking into consideration factors such as ant age, speed, load bearing capacity, avg. time spent without food etc.
- **Stress Interview 2012:** Placed 2nd in the event conducted at the Madras Christian College, Chennai as part of their cultural festival Deep Woods.
- Attended Vijyoshi Camp (Vigyan Jyoti Shibir) '09 held by KVPY during Oct 10-12 '09.
- Ranked **2944 in IIT-JEE '09**, among the top 3% applicants that year.
- Ranked **12009** in AIEEE B.E/B.Tech 09, among the top 5% and **324** in AIEEE B.Arch/B.Planning 09, among the top 1%.

[1] Industrial Consulting and Sponsered Research
[2] Annual technical festival, IITM