Curriculum Vitae – Preshanth Jagannathan

Personal Information

Preshanth Jagannathan
1003, Lopezville Road, Socorro, New Mexico, USA, 87801
Cell : +1 (575) 418-3334, Office +1 (575) 835-7095
Email : preshanthj@gmail.com, pjaganna@nrao.edu

Education

Ph.D Astronomy Jan 2015 - present
Department of Astronomy, University of Cape Town, South Africa
Proposed Title : μJy Polarization of Radio Sources in the ELAIS N1 Deep Field
Supervisor : Dr. A.R.Taylor, Co-Supervisor : Dr. Sanjay Bhatnagar

MSc Astrophysics Sept 2011 - Feb 2014
Department of Physics and Astronomy, University of Calgary, Canada
Title : Alignments of Radio Sources in the ELAIS N1 Deep Field
Supervisor : Dr. A.R.Taylor

MSc Atmospheric and Space Sciences Aug 2005 - June 2007
Department of Atmospheric and Space Sciences, University of Pune, India
Title : Non-Parametric Estimation of the CMB Power Spectrum
Supervisor : Dr. Tarun Souradeep, Co-Supervisor : Dr. Mihir Arjunwadkar

Research Experience

Reber Doctoral Fellow - Full Mueller A-Projection
Sep 2014 - present
NRAO, Socorro, New Mexico, USA

- Carried out simulations to understand the levels at which image fidelity and dynamic range were affected in polarized imaging in the absence of A-Projection based correction during image deconvolution.
- Wrote the convolution function production code to produce ray-traced full Mueller convolution functions, extending beyond just total intensity terms.
- Extended A-Projection within the CASA CLEAN task framework to include all the diagonal terms in Mueller matrix during imaging.
- Tested the diagonal Mueller imaging via a single imaging run on AWS cluster node with 256GB RAM, running 8 processes in parallel for 30 hours.
- The need for full Mueller convolution function production also led to python level image analysis tools in CASA to be complex image compatible. A feature that I requested and tested extensively upon being incorporated into CASA.
- Tested the ray traced primary beams used to produce convolution functions against the holography data at L-Band and found discrepancies in flux at the first side-lobe.
- Reduced holography data taken with the VLA independently in CASA as one in a team of three and compared with the AIPS and OBIT reductions to ensure that the results were identical.
- Modeled the frequency dependent variations in the primary beam size as a frequency dependent aperture blockage and feed illumination taper function within the ray tracing code in CASA.
- Determined the values of aperture blockage and feed illumination taper functions using a large scale massively parallel framework in python.
- Wrote a standalone C++ routine within the CASA framework to produce the convolution functions given aperture blockage and antenna illumination taper parameters.
- Helped run the minimization in AWS in 5.5 hours utilizing 1024 cores, 32x faster than what we could achieve on a single cluster node.

Graduate Intern - Time based parallelization of the PCLEAN task in CASA for A-Projection
Feb 2013 - Aug 2013
NRAO, Socorro, New Mexico, USA

- Worked on testing the feasibility of running large datasets within the PCLEAN task of CASA to carry out A-Projection on a wideband continuum data set.
- Determined that the required speedup can be obtained by parallelizing the data in terms of time and worked on modifying the PCLEAN task within python to parse and determine the time chunks into which the data were to be split.

Graduate Student - Alignments of Radio Sources in the GMRT EN1 Deep Field
Sept 2011 - Feb 2014
Department of Physics & Astronomy, University of Calgary, Canada

- Created a simple scripted pipeline for flagging, calibration, imaging and self calibration of GMRT 610MHz data
- Compared the efficacy of AOFLAGGER, with the TFCROP & RFLAG algorithms.
- Created the deepest GMRT image till date of a 7 pointing mosaic of ELAIS N1 Deep field
- Demonstrated alignment of FRI and FRII jet position angles in the ELAIS N1 Deep field (Taylor & Jagannathan 2016).

Graduate Student - Non-Parametric Estimation of the CMB Power Spectrum
June 2006 - May 2007
Inter-University Centre for Astronomy & Astrophysics (IUCAA), Pune, India

- Determined the number of free parameters required to fit the CMB power spectrum out to $\ell = 2500$, using various orthogonal basis functions.
- Compared the resulting fits by computing the likelihood ratio of the fitted model being the true sky model.
- The non-parametric model results were better fits to the power spectrum than those generated by the 13 parameter Bayesian fits generated by the WMAP team for the 3yr and 5yr data releases.
- The non-parametric model suggested that only 8 free parameters could be truly derived from the data suggesting that the 13 parameters in the Bayesian model were not truly independent parameters.
- Attempted to show the cosmological parameter dependence of the non-parametric model coefficients.

Graduate Student - Scattering of Light due to Interstellar Dust
June 2005 - June 2006
Inter-University Centre for Astronomy & Astrophysics (IUCAA), Pune, India

- Modified dust radiative transfer and shape modeling code to determine the optical Stokes parameters produced by spheroidal dust particles.
- Compared the results of the measured Stokes parameters from optical data of dust aligned along magnetic fields to measure the amount of deviation from spheroidal dust particles.
- Required intensive programming work with radiative transfer code written in Fortran 77.

Skills

Programming languages : Python, C++, C, Fortran, R.

Operating systems : Mac OS, Linux.

Languages : English, Hindi, Tamil.

Teaching Experience

Head Teaching Assistant Physics 369 (Electricity and Magnetism for Engineers) - Fall 2012, University of Calgary, Calgary, Alberta.

Teaching Assistant Astrophysics 307 (Introduction to Observational Astrophysics) - Fall 2013, University of Calgary, Calgary, Alberta.

Teaching Assistant Physics 223 (Introductory Electromagnetism, and Thermal Physics) - Winter 2012, University of Calgary, Calgary, Alberta.

Instructor - Sept 2012 - Jan 2014 Devon Academic Resource Centre, School of Engineering, University of Calgary, Calgary, Alberta

Awards

- NRAO Grote Reber Pre-Doctoral Fellow, Sept 2014 - Feb 2017
- AAS Travel Grant, October 2015
- Departmental Scholarship, Department of Physics and Astronomy, 2014
- Best Student, Dept. Atmospheric and Space Sciences, May 2007
- Best Thesis, Departmental award, Dept. Atmospheric and Space Sciences, May 2007

Thesis Publications In Preparation

Jagannathan, P ; Bhatnagar, S ; Taylor, A. R ; Rau, U. *Direction Dependent Corrections in Deep Radio Polarimetric Imaging*, to be submitted to ApJ Dec 2016.

Jagannathan, P ; Bhatnagar, S ; & Brisken, W ; *Semi-Empirical modeling of the Antenna Aperture Illumination Pattern*, to be submitted to ApJ Jan 2017.

Jagannathan, P ; Bhatnagar, S ; Taylor, A. R ; et.al. *Polarization of Source in the VLA 5GHz ELAIS N1 Deep Field*, to be submitted to ApJ June 2017.

Publications

Tingay, S. J. ; Hancock, P. J. ; Wayth, R. B. ; Intema, H. ; **Jagannathan, P.** ; Mooley, K. *A Multi-resolution, Multi-epoch Low Radio Frequency Survey of the Kepler K2 Mission Campaign 1 Field*, AJ, Volume 152, Issue 4, article id. 82, 8 pp. (2016).

Frail, D. A. ; Mooley, K. P. ; **Jagannathan, P.** ; Intema, H. T. *Pulsar candidates towards Fermi unassociated sources*, MNRAS, Volume 461, Issue 1, p.1062-1067

Rujopakarn, W. ; Dunlop, J. S. ; Rieke, G. H. ; Ivison, R. J. ; Cibinel, A. ; Nyland, K. ; **Jagannathan, P.** ; et.al. *VLA and ALMA Imaging of Intense, Galaxy-Wide Star Formation in z 2 Galaxies*, ApJ in press. arXiv :1607.07710

Taylor, A. R. ; **Jagannathan, P**. *Alignments of radio galaxies in deep radio imaging of ELAIS N1*, MNRAS : Letters, Volume 459, Issue 1, p.L36-L40.

Frail, D. A. ; **Jagannathan, P**. ; Mooley, K. P. ; Intema, H. T. *Known Pulsars Identified in the GMRT 150 MHz All-Sky Survey*, ApJ in press. arXiv :1606.00449

Intema, H. T. ; **Jagannathan, P.** ; Mooley, K. P. ; Frail, D. A. *The GMRT 150 MHz All-sky Radio Survey : First Alternative Data Release TGSS ADR1*. AA in press. arXiv :1603.04368

Conference Publications

Jagannathan, P. ; Bhatanagar, S. ; Rau, U. ; Taylor, R. *Direction-Dependent Effects In Wide-Field Wideband Full-Stokes Radio Imaging*. ASP, 2015., p.379

Taylor, A. R. ; Bhatnagar, S. ; Condon, J. ; Green, D. A. ; Stil, J. M. ; **Jagannathan, P.** ; Kantharia, N. ; Kothes, R. ; Perley, R. ; Wall, J. ; Willis, T. *The Deep Full-Stokes Radio Sky*. arXiv :1405.0117

Professional Organizations

American Astronomical Society (AAS)
Society for Industrial and Applied Mathematics (SIAM)

Employment History

Business Development Office *Oct 2010 - Aug 2011*
AP Optics Pvt, Ltd.
Development of governmental, institutional and retail business for telescopes and accessories.

Scientific Officer *Nov 2008 - July 2010*
Space Technology and Education Pvt, Ltd.
Worked towards the creation and dissemination of the popular astronomy syllabus for Grades 8-10, working with educators and teachers in various schools. As an additional responsibility managed travel and associated services for students and educators traveling to visit dark sky locations and observatories. Also developed astronomy based tourism products to be marketed to educators and students in Grades 8-12.