Srinivasan Raghunathan
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Education:

- Doctor of Philosophy in Astronomy, Universidad de Chile, Chile: Conferred in Mar 2016.
  - Awarded graduate student of 2013 prize, Department of Astronomy.
  - Awarded CONICYT PhD fellowship by the Chilean National Commission for Scientific and Technological Research.
- MSc by research in Astrophysics, University of Central Lancashire, UK: Conferred in Jan 2010.
- Bachelor of Engineering, Electronics and Communication, Anna University, India: Conferred in Jun 2006.
  - 85% + distinction.
  - Awarded class topper of 2006 prize.

Appointments:

- National Centre for Supercomputing Applications, University of Illinois at Urbana-Champaign, USA (*Current*): Survey Science Fellow at the Centre for AstroPhysical Surveys.
- University of California, Los Angeles, USA (2018 - 2021): Postdoctoral scholar.
- University of Melbourne, Australia (2015 - 2018): Postdoctoral scholar.
- Universidad de Chile, Chile (2011 - 2014): Masters and undergraduate co-lecturer: Cosmology and general astronomy (4 hours per week).
- Electronic Data Systems (EDS), India (2006 - 2008): Software Engineer: Technology - IBM mainframes and UNIX.

Grants / Academic Credentials:

- 2024: PI - Fermi National Accelerator Laboratory - Universities Research Association's Visiting Scholars Program (VSP): 20,000 USD towards cosmological inference from SPT-3G data.
- 2021: Survey Science Fellowship, Centre for AstroPhysical Surveys, National Centre for Supercomputing Applications.
- 2017: Laby-Betty travel grant, University of Melbourne.
- 2015: Simons foundation grant, Aspen centre for Physics.
- 2013: Research student of the year, Department of Astronomy, UChile.
- 2013: Universidad de Chile scholarship to carry out PhD thesis work at Princeton University for three months.
- 2010 - 2015: CONICYT PhD fellowship, National Commission of Scientific Research and Technology, Chile.
- 2006: Graduate student of the year prize, Sri Sairam Engineering College, India.

Student supervisions:

- Kevin Levy, MSc, "Mass calibration of X-ray clusters from eROSITA using CMB lensing". Co-supervision with Dr. Kaustuv Basu, University of Bonn, Germany (2020 - 2021). **No. of publications: 1** (One first author article).
- Dr. Sanjay Patil, PhD, "Weighing the giants with CMB lensing". Co-supervision with Dr. Christian Reichardt, University of Melbourne, Australia (2015 - 2020). **No. of publications: 4** (One first author; and three second author articles).
- Dr. Tracey Friday, PhD, "Correlations between multiple tracers of the cosmic web". Co-supervision with Dr. Roger Clowes, University of Central Lancashire, UK (2015 - 2020). **No. of publications: 2** (Two first author articles).
- Alexia Lopez, MSc, "Assessing the Potential of Intervening MgII Absorbers for Cosmology". Co-supervision with Dr. Roger Clowes, University of Central Lancashire, UK (2018 - 2019). **No. of publications: 1** (One first author article).

Collaborations:

Present: South Pole Telescope (SPT), CMB-S4, South Pole Observatory (BICEP+SPT), Terahertz Intensity Mapper (TIM) and CMB-HD.
Past: Atacama B-mode Search (PhD thesis project).

Professional activities:

- **Reviewer:**
  - **Journals:**
    - Physical Review Letters (May 2021 - to date).
    - Physical Review D. (Sep 2020 - to date).
    - Journal of Cosmology and Astroparticle Physics (Feb 2024 - to date).
    - Monthly Notices of the Royal Astronomical Society (May 2024 - to date).
    - Galaxies, Multidisciplinary Digital Publishing Institute (MDPI) (Sep 2021 - to date).
  - **Others:**
    - NSF 2025 Graduate Research Fellowship Program (GRFP) (Nov 2024 - to date).
- **Telescope Allocation Committee:**
  - Member of the National Radio Astronomy Observatory (NRAO) Science Review Panel (Nov 2021 - Nov 2023).
- **Collaboration responsibilities:**
  - Co-ordinator of SPT CMB secondaries and cross-correlations analysis working group (Oct 2024 - to date).
  - Co-ordinator of CMB-S4 galaxy clusters analysis working group (May 2021 - to date).
  - Co-ordinator of SPT data analysis working group calls (Jan 2021 - to date).
- **Tutorials:**
  - Tutor at the computing boot camp (August 2023) - Organised by Centre for AstroPhysics Surveys, UIUC.

- **Colloquium / Seminars:**
  - Colloquium organiser, Centre for AstroPhysics Surveys, UIUC (Jan 2022 - Aug 2023).
  - Astrophysics colloquium organiser, School of Physics, U. of Melbourne (Feb 2017 - April 2018).
  - Cosmology journal organiser, School of Physics, U. of Melbourne (Feb 2016 - Feb 2017).
  - Journal club organiser, Department of Astronomy, U. of Chile (Feb 2012 - Feb 2013).

Publications

As top-tier author: arXiv repo. (Papers led by Students / Junior Postdocs are marked with [★] and also highlighted in red.)

1. [★] E. Schiappucci, **S. Raghunathan**, C. To et al., "Constraining cosmological parameters using the pairwise kinematic Sunyaev-Zel'dovich effect with CMB-S4 and future galaxy cluster surveys", submitted to PRD, **2024**, arXiv: 2409.18368.
2. [★] B. Ansarinejad, **S. Raghunathan**, T. M. C. Abbott et al., "Mass calibration of DES Year-3 clusters via SPT-3G CMB cluster lensing", JCAP, **07**, 024, **2024**, arXiv: 2404.02153.
3. [★] K. Prabhu, **S. Raghunathan**, M. Millea et al., "Testing the ΛCDM Cosmological Model with Forthcoming Measurements of the Cosmic Microwave Background with SPT-3G", ApJ, **973**, 1, **2024**, arXiv: 2403.17925.
4. **S. Raghunathan**, P. Ade, A. Anderson et al., "First Constraints on the Epoch of Reionization Using the non-Gaussianity of the Kinematic Sunyaev-Zel'dovich Effect from the South Pole Telescope and *Herschel*-SPIRE Observations", PRL, **1133**, 12, **2024**, arXiv: 2403.02337.
5. D. Jain, T. Choudhury, **S. Raghunathan** et al., "Probing the Physics of Reionization Using kSZ Power Spectrum from Current and Upcoming CMB Surveys", MNRAS, **530**, 1, **2023**, arXiv: 2311.00315.
6. [★] K. Levy, **S. Raghunathan**, K.Basu, "A Foreground-Immune CMB-Cluster Lensing Estimator", JCAP, **08**, 020, **(2023)**, arXiv: 2305.06326.
7. **S. Raghunathan**, Y. Omori, "A Cross-Internal Linear Combination Approach to Probe the Secondary CMB Anisotropies: Kinematic Sunyaev-Zel'dovich Effect and CMB Lensing", ApJ, **954**, 17, (**2023**), arXiv: 2304.09166.
8. **S. Raghunathan**, "Assessing the Importance of Noise from Thermal Sunyaev-Zel'dovich Signals for CMB Cluster Surveys and Cluster Cosmology", ApJ, **928**, 16 **(2022)**, arXiv: 2112.07656.
9. **S. Raghunathan**, N. Whitehorn, M. Alvarez et al., "Constraining Cluster Virialization Mechanism and Cosmology using Thermal-SZ-selected clusters from Future CMB Surveys", ApJ, **926**, 172 **(2022)**, arXiv: 2107.10250.
10. **S. Raghunathan**, S. Nadathur, B. Sherwin et al., "The Gravitational Lensing Signatures of BOSS Voids in the Cosmic Microwave Background", ApJ, **890**, 168 **(2020)**, arXiv: 1911.08475.
11. **S. Raghunathan**, S. Patil, E. Baxter et al., "A Detection of CMB-Cluster Lensing using Polarization Data from SPTpol", Phys. Rev. Letters, **123**, 181301 **(2019)**, arXiv: 1907.08605. (Also elected as editor's suggestion by Phys. Rev. Letters.)
12. [★] S. Patil, **S. Raghunathan**, C. Reichardt, "Suppressing the thermal SZ-induced variance in CMB-cluster lensing estimators", ApJ, **888**, 9 **(2020)**, arXiv: 1905.07943.

13. **S. Raghunathan**, G. Holder, J. Bartlett et al., "An Inpainting Approach to Tackle the Kinematic and Thermal SZ Induced Biases in CMB-Cluster Lensing Estimators", JCAP, **11**, 037 **(2019)**, arXiv: 1904.13392.
14. E. Baxter, B. Sherwin, **S. Raghunathan**, "Constraining the Rotational Kinematic Sunyaev-Zel'dovich Effect in Massive Galaxy Clusters", JCAP, **6**, 001 **(2019)**, arXiv: 1904.04199.
15. K. Aylor, M. Joy, ... **S. Raghunathan** et al., "Sounds Discordant: Classical Distance Ladder & ΛCDM -based Determinations of the Cosmological Sound Horizon', ApJ, **874**, 4 **(2019)**, arXiv: 1811.00537.
16. **S. Raghunathan**, S. Patil, E. Baxter et al., "Mass Calibration of Optically Selected DES clusters using a Measurement of CMB-Cluster Lensing with SPTpol Data", ApJ, **872**, 170 **(2019)**, arXiv: 1810.10998.
17. **S. Raghunathan**, F. Bianchini, C. Reichardt, "Imprints of gravitational lensing in the Planck CMB data at the location of WISExSCOS galaxies", Phys. Rev. D, **98**, 4 **(2018)**, arXiv: 1710.09770.
18. [★] T. Friday, R. Clowes, **S. Raghunathan** et al., "Accidental deep field selection bias in CMB temperature and SNe redshift correlation", MNRAS, **479**, 1137 **(2018)**, arXiv: 1805.09581.
19. A. Kusaka, T. Essinger-Hileman, ... **S. Raghunathan** et al., "Results from the Atacama B-mode Search (ABS) Experiment", JCAP, **09** 005 **(2018)**, arXiv: 1801.01218. (PhD thesis project.)
20. E. Baxter, **S. Raghunathan**, T. Crawford et al., "A Measurement of CMB Cluster Lensing with SPT and DES Year 1 Data", MNRAS, **476**, 2674 **(2018)**, arXiv: 1708.01360.
21. **S. Raghunathan**, S. Patil, E. Baxter et al., "Measuring galaxy cluster masses with CMB lensing using a Maximum Likelihood estimator: Statistical and systematic error budgets for future experiments", JCAP, **08**, 030 **(2017)**, arXiv: 1705.00411.
22. **S. Raghunathan**, R. Clowes, L. Campusano et al., "Intervening Mg II absorption systems from the SDSS DR12 quasar spectra", MNRAS, **463**, 2640 **(2016)**, arXiv: 1608.05112.
23. R. Clowes, L. Haberzettl, **S. Raghunathan** et al., "Ultraviolet Fe II Emission in Fainter Quasars: Luminosity Dependences, and the Influence of Environments", MNRAS, **460**, 1428 **(2016)**, arXiv: 1604.08411.
24. S.Simon, **S. Raghunathan**, J. Appel, et al., "Characterization of the Atacama B-mode Search", SPIE, **9153**, 15 **(2014)**.
25. R. Clowes, **S. Raghunathan**, I. Soechting et al., "Environments of strong / ultrastrong, ultraviolet Fe II emitting quasars", MNRAS, 433, 2467 **(2013)**, arXiv: 1304.7396.
26. R. Clowes, K. Harris, **S. Raghunathan** et al., "A structure in the early Universe at z ∼1.3 that exceeds the homogeneity scale of the R-W concordance cosmology", MNRAS, 429, 2910 **(2013)**, arXiv: 1211.6256.

As contributing author:

1. L. Di Mascolo, Y. Perrott, ... **S. Raghunathan** et al., "Atacama Large Aperture Submillimeter Telescope (AtLAST) Science: Resolving the Hot and Ionized Universe through the Sunyaev-Zeldovich effect", submitted to Open Research Europe, **2024**, arXiv: 2403.00909.
2. E. Hughes, F. Ge, ... **S. Raghunathan** et al., "A cool dark sector, concordance, and a low σ_8", submitted to PRD, **6**, **2023**, arXiv: 2311.05678.
3. J. Hernandez, L. Bleem, ... **S. Raghunathan** et al."Dissecting the Thermal SZ Power Spectrum by Halo Mass and Redshift in SPT-SZ Data and Simulations", OjA, **2023**, arXiv: 2309.12475.

4. Z. Pan, F. Bianchini, ... **S. Raghunathan** et al."A Measurement of Gravitational Lensing of the Cosmic Microwave Background Using SPT-3G 2018 Data", PRD, Accepted **2023**, arXiv: 2308.11608.

5. A. Gardener, E. Baxter, **S. Raghunathan** et al."Prospects for studying the mass and gas in proto-clusters with future CMB observations", submitted to OjA **2023**, arXiv: 2307.15309.

6. J. Sanchez, Y. Omori, ... **S. Raghunathan** et al., "Mapping gas around massive galaxies: cross-correlation of DES Y3 galaxies and Compton-y-maps from SPT and *Planck*", MNRAS, **2**, 3163 **(2022)**, arXiv: 2210.08633.

7. A. Anderson, P. Barry, ... **S. Raghunathan** et al., "SPT-3G+: Mapping the High-Frequency Cosmic Microwave Background Using Kinetic Inductance Detectors", SPIE, **12190**, 1219003, **(2022)**, arXiv: 2208.08559.

8. K. Dibert, A. Anderson, ... **S. Raghunathan** et al., "Forecasting ground-based sensitivity to the Rayleigh scattering of the CMB in the presence of astrophysical foregrounds", accepted in Phys. Rev. D, **106**, 6 **(2022)**, arXiv: 2205.04494.

9. The CMB-S4 Collaboration, "Snowmass 2021 CMB-S4 White Paper", arXiv: 2203.08024.

10. The CMB-HD Collaboration, "Snowmass2021 CMB-HD White Paper", arXiv: 2203.05728.

11. L. Bleem, T. Crawford, ... **S. Raghunathan** et al., "CMB/kSZ and Compton-y Maps from 2500 square degrees of SPT-SZ and Planck Survey Data", ApJ, **258**, 2 **(2022)**, arXiv: 2102.05033.

12. D. Dutcher, L. Balkenhol, ... **S. Raghunathan** et al., "Measurements of the E-Mode Polarization and Temperature-E-Mode Correlation of the CMB from SPT-3G 2018 Data", Phys. Rev. D **104**, 2 **(2021)**, arXiv: 2101.01684.

13. CMB-S4 collaboration, "CMB-S4 Science Case, Reference Design, and Project Plan", **(2019)**, arXiv: 1907.04473.

14. J. Avva, P. Ade, ... **S. Raghunathan** et al., "Particle Physics with the Cosmic Microwave Background with SPT-3G', **(2019)**, arXiv: 1911.08047.

15. K. Basu, M. Remazeilles, ... **S. Raghunathan** et al., "A Space Mission to Map the Entire Observable Universe using the CMB as a Backlight", **(2019)**, arXiv: 1909.01592.

16. J. Delabrouille, M. Abitbol, ... **S. Raghunathan** et al., "Microwave Spectro-Polarimetry of Matter and Radiation across Space and Time", **(2019)**, arXiv: 1909.01591.

17. A. Bender, P. A. R. Ade, ... **S. Raghunathan** et al., "Year two instrument status of the SPT-3G cosmic microwave background receiver", SPIE, **10708**, 1070803 **(2018)**, arXiv: 1809.00036.

18. T. Essinger-Hileman, A. Kusaka, ... **S. Raghunathan** et al., "Systematic effects from an ambient-temperature, continuously-rotating half-wave plate", Review of Scientific Instruments, **87 (2016)**, arXiv: 1601.05901.

19. S. Simon, J. Appel, ... **S. Raghunathan** et al., "Characterization of the Atacama B-mode Search Detectors with a Half-Wave Plate", Journal of Low Temperature Physics, **184**, 534 **(2016)**, arXiv: 1511.04760.

20. A. Kusaka, T. Essinger-Hileman, ... **S. Raghunathan** et al., "Modulation of CMB polarization with a warm rapidly rotating half-wave plate on the ABS instrument", Review of Scientific Instruments, **85 (2014)**, arXiv: 1310.3711.

21. S. Simon, J. Appel, ... **S. Raghunathan** et al., "In Situ Time Constant and Optical Efficiency Measurements of TRUCE Pixels in the Atacama B-Mode Search", Journal of Low Temperature Physics, **176**, 712 **(2014)**.

Conference/meeting talks: ✯- Invited/Review; Black - Conference; Red - Colloquium / Seminar.

- ✯ "South Pole Telescope x Euclid", Euclid CMBXC WG Meeting, Kavli Institute for Cosmology, University of Cambridge, Nov 2024.
- "Cosmology and Astrophysics with the Secondary Anisotropies of the Cosmic Microwave Background from South Pole Telescope and Future Surveys.", University of New Mexico, New Mexico State University, Texas A&M University, USA, Oct 2024.
- ✯ "Review talk on the kinematic Sunyaev–Zeldovich Effect", New Physics from Old Light: Illuminating the Universe with CMB Secondaries, University of Cambridge, September 2024..
- ✯ "South Pole Telescope", CMB-S4 meeting, University of Illinois Urbana Champaign, July 2024.
- ✯ "Constraining the Epoch of Reionisation using CMB as the backlight", IoA50: New Frontiers of Astronomy, University of Cambridge, July 2024.
- ✯ "Constraints on the Epoch of Reionisation using the kSZ 4-pt measurement from the South Pole Telescope", PASCOS 2024 - Rencontres du Vietnam, July 2024.
- ✯ "Cosmology with the South Pole Telescope (SPT): Latest and Upcoming results from SPT", Cosmology from home, June 2024.
- "Sunyaev-Zeldovich from CMB Surveys", University of Southern California / University of California Santa Cruz, USA, March 2024.
- "Sunyaev-Zeldovich from CMB Surveys", University of Cincinnati / Case Western Reverse University, USA, Nov 2023.
- "Constraining the Epoch of Reionisation Using the kinematic Sunyaev-Zeldovich Signal.", University of Illinois Urbana Champaign / University of Minnesota, USA, Sep/Oct 2023.
- "Prospects for Kinematic Sunyaev-Zeldovich Measurements from Current and Future CMB Experiments", Observing the Universe at millimetre wavelengths, Grenoble, France, June 2023.
- "Towards a robust detection of the kinematic Sunyaev-Zeldovich power spectrum using South Pole Telescope and Herschel-SPIRE data.", California Institute of Technology, University of California Davis, and University of Wisconsin Milwaukee, USA, April/May 2023.
- ✯ "Observing and interpreting the most ancient light in the universe", Mini School on Gravitation and Cosmology, Indian Institute of Technology IIT-Madras, India, Nov 2022. (Invited Review Talk)
- "Demystifying the dark side of the universe Using kinematic and thermal Sunyaev-Zeldovich effects.", Tata Institute of Fundamental Research, Nov 2022.
- ✯ "Kinematic Sunyaev–Zeldovich effect and reionisation science from small-scale CMB experiments", CMB+EoR Summer workshop, Montreal, Canada, July 2022. (Invited Review Talk)
- "First detection of polarized CMB-Cluster lensing using SPTpol and DES", Cluster Mass ESA meeting, Virtual, Sep 2021.
- "Demystifying the dark side of the universe using secondary cosmic microwave background anisotropies.", USC, USA, Jan 2021 and NCSA, USA, May 2021.
- "CMB-Cluster lensing", Stanford / UCLA, USA, Jan 2018; and Harvard / Cornell / Princeton, USA, Sep 2017.

- "CMB-Cluster lensing forecasts for the CMB-S4 experiment", Clusters 2017, Spain, Jul 2017.
- "CMB-Cluster lensing with SPTpol and SPT-3G: Forecasts and systematic error budgets", Swinburne University and University of Queensland, Australia, Jun 2017.
- "Primordial gravitational waves and CMB polarization", University of Melbourne, School of Physics colloquium, Australia, Aug 2016.
- "Towards the first detection of CMBPol cluster lensing using SPTpol data", Australian Astronomical Society Annual meeting, University of Sydney, Australia, Jul 2016.
- "Status of the Atacama B-mode Search experiment", Cosmology on the Beach, Mexico, Jan 2016.
- "Search for primordial gravitational waves using Atacama B-mode Search experiment", SOCHIAS (Chilean Astronomical Society) annual meeting, Chile, Mar 2015.
- "Search for primordial B-modes from CMB polarization and characterizing ABS telescope", Alpine cosmology workshop, Austria, Jul 2014.
- "Pointing and beam characterization of the Atacama B-mode Search (ABS) experiment", Workshop on New Light in Cosmology from the CMB, ICTP, Italy, Jul 2013.
- "CMB Polarization and the search for tensor modes", CosmoSur II, Chile, May 2013.

References:

- Prof. John Carlstrom (Director of the South Pole Telescope): Chair of the Department of Astronomy and Astrophysics; Subramanyan Chandrasekhar Distinguished Service Professor, University of Chicago; **Email:** jc@kicp.uchicago.edu.
- Prof. Gilbert Holder: Brand & Monica Fortner Endowed Chair in Physics, Department of Physics, University of Illinois Urbana-Champaign; **Email:** gholder@illinois.edu
- Prof. Lloyd Knox: Vaida Endowed Chair in Physics, Department of Physics and Astronomy, University of California Davis; **Email:** lknox@ucdavis.edu.
- A/Prof. Bradford Benson (Director of operations of the South Pole Telescope): Associate Professor, Department of Astronomy and Astrophysics / Scientist, University of Chicago / Fermi National Lab; **Email:** bbenson@astro.uchicago.edu
- A/Prof. Christian Reichardt: Associate Professor, School of Physics, The University of Melbourne; **Email:** christian.reichardt@unimelb.edu.au

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