

## Biographical Sketch of Bhuvnesh Jain

Department of Physics and Astronomy  
University of Pennsylvania  
Philadelphia, Pennsylvania 19014  
<http://www.physics.upenn.edu/people/b.jain.html>

Tel: (215) 573-5330  
Fax: (215) 898-2010  
Email: [bjain@physics.upenn.edu](mailto:bjain@physics.upenn.edu)

### Education:

1989 A.B. (High Honors) Physics Princeton University  
1994 Ph.D. Physics M.I.T.  
Thesis title: The Evolution of Cosmological Density Fluctuations  
Co-supervisors: E. Bertschinger, A. Guth

### Professional Appointments:

2021- Co-Director, Data Driven Discovery Initiative, University of Pennsylvania  
2016- Walter H. and Leonore C. Annenberg Professor in the Natural Sciences  
2011-2015 Edmund J. and Louise W. Kahn Term Professor in the Natural Sciences  
2009- Co-Director, Center for Particle-Cosmology, University of Pennsylvania  
2001- Professor of Physics & Astronomy (Assistant, Associate and Full), University of Pennsylvania  
1999-2000 Associate Research Scientist, Johns Hopkins University  
1997-1999 Postdoctoral Fellow, Johns Hopkins University  
1994-1997 Postdoctoral Fellow, Max-Planck-Institute for Astrophysics

### Positions and Honors:

2020- Co-chair, Advisory Board of the Dark Energy Survey  
2017-2020 Scientific Editor, Galaxies and Cosmology, The Astrophysical Journal  
2017-2018 Chair, Fundamental Physics with the Hubble Space Telescope Working Group  
2017-2019 Cosmic Visions Dark Energy Group, Department of Energy  
2015- Fellow, American Physical Society  
2015-2017 Science Policy Committee, SLAC Board of Overseers, Stanford University  
2012-2015 Spokesperson, Large Synoptic Survey Telescope (LSST) Dark Energy Science Collaboration  
2007-2016 Co-coordinator, Dark Energy Survey (DES) Weak Lensing Working Group  
2014-2016 Science Advisory Council, LSST  
2006-2012 Co-chair, Large Synoptic Survey Telescope (LSST) Weak Lensing Science Collaboration  
2004-2009 Cottrell Scholars Award  
2007 Editor, Focus Issue on Gravitational Lensing, New Journal of Physics  
1989-91 Karl Taylor Compton Fellow, MIT

### University and Department Service:

2014- Affiliate Faculty, Warren Center for Network and Data Sciences  
2020- Committee on committees, Penn SAS  
2020- Data Driven Discovery, Penn SAS strategic planning group

2006-2020 Penn representative on the Management Committee of the DES project  
2001- Served on several faculty search, promotion and mentorship committees (seven as chair)  
2007-2009 Faculty Senate  
2006-2009 Penn representative on the Board of the LSST project

### Publications in Refereed Journals:

1. "Density Fluctuations in Extended Inflation," A. H. Guth and B. Jain, 1992, Phys. Rev. **D 45**, 426-432.
2. "Gravitational Instability of Cold Matter," E. Bertschinger and B. Jain, 1994, ApJ, **431**, 486-494.
3. "Second Order Power Spectrum and Nonlinear Evolution at High Redshift," B. Jain and E. Bertschinger, 1994, ApJ, **431**, 495-505.
4. "Nonlinear Evolution of Correlation Functions and Power Spectra," B. Jain, H. J. Mo and S. D. M. White, 1995, MNRAS, **276**, L25-L29.
5. "Self-Similar Evolution of Gravitational Clustering: Is  $n = -1$  Special?," B. Jain and E. Bertschinger, 1996, ApJ, **456**, 43-54.
6. "The Nonlinear Correlation Function and Density Profiles of Virialized Halos," R. Sheth and B. Jain, 1997, MNRAS, **285**, 231-238.
7. "Does Gravitational Clustering Stabilize on Small Scales?," B. Jain, 1997, MNRAS, **287**, 687-698.
8. "Cosmological Model Predictions for Weak Lensing: Linear and Nonlinear Regimes," B. Jain and U. Seljak, 1997, ApJ, **484**, 560-573.
9. "Detection of Shear due to Weak Lensing by Large-Scale Structure," P. Schneider, L. van Waerbeke, Y. Mellier, B. Jain, S. Seitz, B. Fort, 1998, A & A, **333**, 767-778.
10. "The Effect of Weak Lensing on the Angular Correlation Function of Faint Galaxies," R. Moessner, B. Jain and J. V. Villumsen, 1998, MNRAS, **294**, 291-298.
11. "A New Measure for Cosmic Shear," P. Schneider, L. van Waerbeke, B. Jain, G. Kruse, 1998, MNRAS, **296**, 873-892.
12. "Angular Cross-Correlation of Galaxies: A Probe of Gravitational Lensing by Large-Scale Structure," R. Moessner and B. Jain, 1998, MNRAS, **294**, L18-24.
13. "Self-Similar Evolution of Gravitational Clustering II: N-Body Simulations of the  $n = -2$  Spectrum," B. Jain and E. Bertschinger, 1998, ApJ, **509**, 517-530.
14. "The Formation and Evolution of Clusters of Galaxies in Different Cosmogonies," A. Huss, B. Jain and M. Steinmetz, 1999, MNRAS, **308**, 1011-1031.
15. "How universal are the density profiles of dark halos?," A. Huss, B. Jain and M. Steinmetz, 1999, ApJ, **517**, 64-69.
16. "Cosmic Shear and Halo Abundances: Analytical Versus Numerical Results," K. Reblinsky, G. Kruse, B. Jain and P. Schneider, 1999, A & A, **351**, 815-826.
17. "Ray Tracing Simulations of Weak Lensing by Large-Scale Structure," B. Jain, U. Seljak and S. White, 2000, ApJ, **530**, 547-577.
18. "The Statistics of Weak Lensing at Small Angular Scales: Probability Distribution Function," D. Munshi and B. Jain, 2000, MNRAS, **318**, 109-123.
19. "Weak Lensing with SDSS Commissioning Data: The Galaxy-Mass Correlation Function To  $1/h$  Mpc," P. Fischer et al (SDSS Collaboration), 2000, AJ, **120**, 1198-1208.
20. "Detection of Correlated Galaxy Ellipticities from CFHT Data: First Evidence for

Gravitational Lensing by Large-Scale Structures,” L. van Waerbeke et al, 2000, *A & A*, **358**, 30-44.

21. “Statistics of Dark Matter Halos from Gravitational Lensing,” B. Jain and L. van Waerbeke, 2000, *ApJL*, **530**, L1-L4.

22. “Statistics of Weak Lensing at Small Angular Scales: Analytical Predictions for Lower Order Moments,” D. Munshi and B. Jain, 2001, *MNRAS*, **322**, 107-120.

23. “How Many Galaxies Fit in a Halo? Constraints on Galaxy Formation Efficiency from Spatial Clustering,” R. Scoccimarro, R. Sheth, L. Hui and B. Jain, 2001, *ApJ*, **546**, 20-34.

24. “The Topology of Weak Lensing Fields,” T. Matsubara and B. Jain, 2001, *ApJL*, **552**, L89-L92.

25. “Cosmic Shear Analysis in 50 Uncorrelated VLT Fields. Implications for  $\Omega_0$ ,  $\sigma_8$ ,” R. Maoli et al, 2001, *A & A*, **368**, 766-775.

26. “Cosmic Shear Statistics and Cosmology,” L. van Waerbeke et al, 2001, *A & A*, **374**, 757-769.

27. “Cosmic Shear from STIS Pure Parallels. I. Data,” N. Pirzkal et al, 2001, *A & A*, **375**, 351-358.

28. “Cosmic Shear from STIS Pure Parallels. II. Analysis,” H. Hammerle et al, 2002, *A & A*, **385**, 743-760.

29. “The Kurtosis of the Cosmic Shear Field,” M. Takada and B. Jain, 2002, *MNRAS*, **337**, 875-894.

30. “Magnification Effects as Measures of Large-Scale Structure,” B. Jain, 2002, *ApJ*, **580**, L3-L6.

31. “The Angular Correlation Function of Galaxies from Early Sloan Digital Sky Survey Data,” A. Connolly, SDSS Collaboration, 2002, *ApJ*, **579**, 42-47.

32. “Analysis of Systematic Effects and Statistical Uncertainties in Angular Clustering of Galaxies from Early Sloan Digital Sky Survey Data,” R. Scranton, SDSS Collaboration, 2002, *ApJ*, **579**, 48-75.

33. “The Three-dimensional Power Spectrum from Angular Clustering of Galaxies in Early Sloan Digital Sky Survey Data,” S. Dodelson, SDSS Collaboration, 2002, *ApJ*, **572**, 140-156.

34. “The Angular Power Spectrum of Galaxies from Early Sloan Digital Sky Survey Data,” M. Tegmark, SDSS Collaboration, 2002, *ApJ*, **571**, 191-205.

35. “Likelihood Analysis of Cosmic Shear on Simulated and VIRMOS-DESCART Data,” L. van Waerbeke et al, 2002, *A & A*, **393**, 369-379.

36. “A Conspicuous Tangential Alignment of Galaxies in a STIS Parallel Shear Survey Field: A New Dark-lens Candidate?,” J. -M. Miralles et al, 2002, *A & A*, **388**, 68-73.

37. “The Three-Point Correlation Function in Cosmology,” M. Takada and B. Jain, 2003, *MNRAS*, **340**, 580-608.

38. “The Three-Point Correlation Function for Spin-2 Fields,” M. Takada and B. Jain, 2003, *ApJL*, **583**, L49-L52.

39. “Karhunen-Loève Estimation of the Power Spectrum Parameters from the Angular Distribution of Galaxies in Early Sloan Digital Sky Survey Data,” A. Szalay, B. Jain, T. Matsubara, R. Scranton, M. Vogeley, SDSS collaboration, 2003, *ApJ*, **591**, 1-11.

40. “Weak-Lensing Results from the 75 Square Degree Cerro Tololo Inter-American Observatory Survey,” M. Jarvis et al, 2003, *AJ*, **125**, 1014-1032.

41. "Three-Point Correlations in Weak Lensing Surveys: Model Predictions and Applications," M. Takada and B. Jain, 2003, MNRAS, **344**, 857-886.
42. "Quasar-Galaxy and Galaxy-Galaxy Cross-Correlations: Model Predictions with Realistic Galaxies," B. Jain, R. Scranton and R. Sheth, 2003, MNRAS, **345**, 62-70.
43. "Cross-correlation Tomography: Measuring Dark Energy Evolution with Weak Lensing," B. Jain and A. Taylor, 2003, Phys. Rev. Lett. **91**, 141302, (4pp).
44. "Last Stand Before WMAP: Cosmological Parameters from Lensing, CMB, and Galaxy Clustering," X. Wang, M. Tegmark, B. Jain, M. Zaldarriaga, 2003, Phys. Rev. D, **681**, 3001 (12pp).
45. "Dark Energy Constraints from Weak Lensing Cross-Correlation Cosmography," G. Bernstein and B. Jain, 2004, ApJ, **600**, 12-25.
46. "Substructure and the Halo Model of Large-Scale Structure," R. Sheth and B. Jain, 2003, MNRAS, **345**, 529-538.
47. "Cosmological Parameters from Lensing Power Spectrum and Bispectrum Tomography," M. Takada and B. Jain, 2004, MNRAS, **348**, 897-915.
48. "Effects of Halo Substructure on the Power Spectrum and Bispectrum," D. Dolney, B. Jain and M. Takada, 2004, MNRAS, 352, 1019
49. "Joint Galaxy-Lensing Observables and the Dark Energy," W. Hu and B. Jain, 2004, Phys. Rev. D, 70, 43009 (16pp).
50. "The Three-Dimensional Power Spectrum of Galaxies from the Sloan Digital Sky Survey," M. Tegmark et al, 2004, ApJ, 606, 702-740
51. "Cosmological parameters from SDSS and WMAP," M. Tegmark et al, 2004, Phys. Rev. D, **69**, 103501 (26pp).
52. "Detection of Cosmic Magnification with the Sloan Digital Sky Survey," R. Scranton et al., 2005, ApJ, 633, 589-602
53. "Constraints on dark energy models from galaxy clusters with multiple arcs," 2005, M. Meneghetti, B. Jain, M. Bartelmann, K. Dolag, MNRAS, 362, 1301-1310
54. "PSF anisotropy and systematic errors in weak lensing surveys," B. Jain, M. Jarvis and G. Bernstein, 2006, JCAP, 02, 001 (18pp).
55. "Systematic errors in future weak-lensing surveys: requirements and prospects for self-calibration," D. Huterer, M. Takada, G. Bernstein and B. Jain, 2006, MNRAS, 366, 101-114
56. "Baryon oscillations and dark-energy constraints from imaging surveys," 2006, D. Dolney, B. Jain, M. Takada, MNRAS, 366, 884-898
57. "Dark Energy Constraints from the CTIO Lensing Survey," 2006, M. Jarvis, B. Jain, G. Bernstein and D. Dolney, ApJ, 644, 71-79
58. "Short GRB and binary black hole standard sirens as a probe of dark energy," N. Dalal, D. Holz, S. Hughes and B. Jain, 2006, Phys. Rev. D, 2006, 74, 3006 (9pp).
59. "Cosmological constraints from the SDSS luminous red galaxies," M. Tegmark et al., 2006, Phys. Rev. D, 74, 123507 (34pp).
60. "N-Body Simulations of Alternate Gravity Models," H. Stabenau and B. Jain, 2006, Phys. Rev.

D, 74, 084007 (13pp).

61. "Color Tomography," B. Jain, A. Connolly and M. Takada, 2007, JCAP, 03, 13 (23pp).
62. "On combining lensing shear information from multiple filters," M. Jarvis and B. Jain, 2008, JCAP, 01, 003 (8pp).
63. "Photometric Redshifts with Surface Brightness Priors," H. Stabenau, A. Connolly, B. Jain, 2007, MNRAS, 387, 1215-1226
64. "Observational Tests of Modified Gravity," B. Jain and P. Zhang, 2007, Phys. Rev. D, 78, 063503, arXiv:0709.2375
65. "Weak Gravitational Lensing and its Cosmological Applications," H. Hoekstra and B. Jain, 2008, Ann. Rev. of Nuc. and Part. Science, 58, 99
66. "Galaxy-CMB and galaxy-galaxy lensing on large scales: Sensitivity to primordial non-Gaussianity," 2009, Jeong, D., Komatsu, E., **Jain, B.**, PRD, 80, 123527
67. "Tests of gravity from imaging and spectroscopic surveys," 2009, Guzik, J., **Jain, B.**, Takada, M., PRD, 81, 023503
68. "Topological defects in gravitational lensing shear fields," 2009, Vitelli, V., **Jain, B.**, Kamien, R., 2009, JCAP, 09, 034
69. "Three-point correlations in f(R) models of gravity," 2009, A. Borisov, B. Jain, PRD, 79, 3506
70. "MgII absorption systems and their neighbouring galaxies from a background-subtraction technique," 2010, M. Caler, R. Sheth and B. Jain, MNRAS, 406, 1269
71. "Lensing magnification: implications for counts of submillimetre galaxies and SZ clusters," 2010, M. Lima, B. Jain, M. Devlin, MNRAS, 406, 2352
72. "Submillimeter Galaxy Number Counts and Magnification by Galaxy Clusters," 2010, M. Lima, B. Jain, Devlin, M., Aguirre, J., ApJ, 717, L31
73. "Cosmological Tests of Gravity," 2010, B. Jain, J. Khoury, Annals of Physics, 325, 1479
74. "Re-capturing Cosmic Information," 2011, H-J. Seo, M. Sato, S. Dodelson, B. Jain, M. Takada, ApJ, 729, L11
75. "Magnification effects on source counts and fluxes," 2011, B. Jain and M. Lima, MNRAS, 411, 2113
76. "Three-dimensional Reconstruction of the Density Field: An SVD Approach to Weak-lensing Tomography," 2011, J. VanderPlas, A. Connolly, B. Jain, M. Jarvis, ApJ, 727, 118
77. "Tests of modified gravity with dwarf galaxies," 2011, B. Jain, J. VanderPlas, JCAP, 10, 032
78. "Microlensing of Kepler Stars as a Method of Detecting Primordial Black Hole Dark Matter," 2011, K. Griest, M. Lehner, A. Cieplak, B. Jain, PRL, 107, 1101
79. "Interpolating Masked Weak Lensing Signal with Karhunen-Loeve Analysis," 2012, J. VanderPlas, A. Connolly, B. Jain, & M. Jarvis, ApJ, 744, 180
80. "Spherical Collapse in f(R) Gravity," 2012, A. Borisov, B. Jain, P. Zhang, PRD, 85, 3581
81. "Halo Scale Predictions of Symmetron Modified Gravity," J. Clampitt, B. Jain, J. Khoury, 2012, JCAP, 01, 030

82. "Astrophysical tests of gravity: a screening map of the nearby universe," 2012, Cabre, A., Vikram, V., Zhao, G., B. Jain, Koyama, K., JCAP, 07, 034
83. "Astrophysical Tests of Modified Gravity: Constraints from Distance Indicators in the Nearby Universe," 2012, B. Jain, V. Vikram, J. Sakstein, ApJ, 779, 39, arXiv:1204.6044
84. "The impact of camera optical alignments on weak lensing measures for the Dark Energy Survey," 2012, M. Antonik, et al, MNRAS, 431, 3291, arXiv:1206.5320
85. "Astrophysical Tests of Modified Gravity: the Morphology and Kinematics of Dwarf Galaxies," 2012, V. Vikram, A. Cabre, B. Jain, J. VanderPlas, JCAP, 08, 020, arXiv:1303.0295
86. "Information content of weak lensing power spectrum and bispectrum: including the non-Gaussian error covariance matrix," 2013, Kayo, I., Takada, M., B. Jain, MNRAS, 429, 344
87. "The effective number density of galaxies for weak lensing measurements in the LSST project," 2013, C. Chang, M. Jarvis, B. Jain, et al, MNRAS, 434, 2121
88. "Detecting modified gravity in the stars," 2014, J. Sakstein, B. Jain, V. Vikram, IJMPD, 23, 12
89. "Delensing galaxy surveys," 2014, C. Chang, B. Jain, MNRAS, 443, 102, arXiv:1405.1432
90. "Growth of cosmic structure: Probing dark energy beyond expansion," 2015, D. Huterer et al, Astroparticle Physics, 63, 23
91. "Beyond the Cosmological Standard Model," A. Joyce, B. Jain, J. Khoury, M. Trodden, 2015, Physics Reports, 568, 1, arXiv:1407.0059
92. "Cosmic discordance: are Planck CMB and CFHTLenS weak lensing measurements out of tune?," N. MacCrann, J. Zuntz, S. Bridle, B. Jain, M. Becker, 2015, MNRAS, 451, 2877
93. "Wide-Field Lensing Mass Maps from Dark Energy Survey Science Verification Data," C. Chang, V. Vikram, B. Jain, et al., Phys. Rev. Letters, 2015, 115, 051301
94. "Wide-field lensing mass maps from Dark Energy Survey science verification data: Methodology and detailed analysis," V. Vikram, C. Chang, B. Jain, et al, PRD, 2015, 92, 022006
95. "Lensing Measurements of the Mass Distribution in SDSS Voids," J. Clampitt, B. Jain, 2015, MNRAS, 454, 3357, arXiv:1404.1834
96. "Weak lensing by galaxy troughs in DES Science Verification data," 2016, D. Gruen et al., MNRAS, 455, 3367,
97. "CMB lensing tomography with the DES Science Verification galaxies," 2016, T. Giannantonio et al., MNRAS, 456, 3213
98. "Clustering and Bias Measurements of SDSS Voids," J. Clampitt, B. Jain, C. Sanchez, 2016, MNRAS, 456, 4425, arXiv:1507.08031
99. "Detection of Stacked Filament Lensing Between SDSS Luminous Red Galaxies," J. Clampitt, H. Miyatake, B. Jain, M. Takada, 2016, MNRAS, 457, 2391, arXiv:1402.3302
100. "Lensing Measurements of the Ellipticity of Luminous Red Galaxies Dark Matter Halos," J. Clampitt, B. Jain, 2016, MNRAS, 457, 4135, arXiv:1506.03536
101. "The DES Science Verification Weak Lensing Shear Catalogs," M. Jarvis et al, 2016, MNRAS, 460, 2245, arXiv:1507.05603
102. "Cosmology from Cosmic Shear with DES Science Verification Data," The Dark Energy

- Survey Collaboration, 2016, *PRD* 94, 022001, arXiv:1507.05552
103. “Joint measurement of lensing-galaxy correlations using SPT and DES SV data,” E. Baxter, J. Clampitt, T. Giannantonio, S. Dodelson, B. Jain, et al, 2016, *MNRAS*, 461, 4099, arXiv:1602.07384
  104. “Constraining the Mass-Richness Relationship of redMaPPer Clusters with Angular Clustering,” E. Baxter, E. Rozo, B. Jain, E. Rykoff, R. Wechsler, 2016, *MNRAS*, 463, 205, arXiv:1604.00048
  105. “Tidal stripping as a test of satellite quenching in redMaPPer clusters,” Y. Fang, J. Clampitt, N. Dalal, B. Jain et al, 2016, *MNRAS*, 463, 1907, arXiv:1604.08611
  106. “Cosmic shear measurements with Dark Energy Survey Science Verification data,” M. Becker et al, 2016, *PRD*, 94, 022002
  107. “The Dark Energy Survey: more than dark energy - an overview,” The Dark Energy Survey Collaboration, 2016, *MNRAS*, 460, 1270
  108. “Detection of the kinematic Sunyaev-Zel’dovich effect with DES Year 1 and SPT,” B. Soergel et al, 2016, *MNRAS*, 461, 3172
  109. “Joint analysis of galaxy-galaxy lensing and galaxy clustering: Methodology and forecasts for Dark Energy Survey,” Y. Park, E. Krause, S. Dodelson, B. Jain et al, 2016, *PRD*, 94, 3533
  110. “Cosmic voids and void lensing in the Dark Energy Survey Science Verification data,” C. Sanchez, J. Clampitt, A. Kovacs, B. Jain et al, 2017, *MNRAS*, 465, 746
  111. “Galaxy-galaxy lensing in the Dark Energy Survey Science Verification data,” J. Clampitt et al, 2017, *MNRAS*, 465, 4204
  112. “Imprint of DES superstructures on the cosmic microwave background,” A. Kovacs et al, 2017, *MNRAS*, 465, 4166, arXiv:1610.00637
  113. “A Measurement of the Galaxy Group-Thermal Sunyaev-Zel’dovich Effect Cross-Correlation Function,” V. Vikram, A. Lidz, B. Jain, 2017, *MNRAS*, 467, 2315
  114. “The Halo Boundary of Galaxy Clusters in the SDSS,” E. Baxter, C. Chang, B. Jain et al, 2017, *ApJ*, 841, 18, arXiv:1702.01722
  115. “Tests of Gravity Theories Using Supermassive Black Holes,” J. Sakstein, B. Jain, J. S. Heyl, L. Hui, 2017, *ApJL*, 844, L14, arXiv:1704.02425
  116. “Implications of the Neutron Star Merger GW170817 for Cosmological Scalar-Tensor Theories,” J. Sakstein, B. Jain, 2017, *PRL*, 119, 1303, arXiv:1710.05893
  117. “A gravitational-wave standard siren measurement of the Hubble constant,” B. P. Abbott et al, 2017, *Nature*, 551, 85, arXiv:1710.05835
  118. “Tests of Neutrino and Dark Radiation Models from Galaxy and CMB surveys,” A. Banerjee, B. Jain, N. Dalal, J. Shelton, 2018, *JCAP*, 01, 022, arXiv:1612.07126
  119. “Dark Energy Survey Year 1 Results: Curved-Sky Weak Lensing Mass Map,” C. Chang et al., *MNRAS*, 2018, 475, 3165, arXiv:1708.01535
  120. “The ellipticity of galaxy cluster haloes from satellite galaxies and weak lensing,” T. Shin, J. Clampitt, B. Jain et al, 2018, *MNRAS*, 475, 2421, arXiv:1705.11167



121. "A measurement of CMB cluster lensing with SPT and DES year 1 data," E. Baxter et al, 2018, *MNRAS*, 476, 2674, arXiv:1708.01360
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125. "The Splashback Feature around DES Galaxy Clusters: Galaxy Density and Weak Lensing Profiles," C. Chang, E. Baxter, B. Jain et al, 2017, *ApJ*, 864, 83, arXiv:1710.06808
126. "Void Lensing as a Test of Gravity," T. Baker, J. Clampitt, B. Jain, M. Trodden, 2018, *PRD*, 98, 3511, arXiv:1803.07533
127. "Probing Self-interacting Dark Matter with Disk Galaxies in Cluster Environments," L. Secco, A. Farah, B. Jain, S. Adhikari, A. Banerjee, N. Dalal, 2017, *ApJ*, 860, 32, arXiv:1712.04841
128. "Density split statistics: joint model of counts and lensing in cells," O. Friedrich et al, 2018, *PRD*, 98, 023508, arXiv:1710.05162
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130. "Dark Energy Survey Year 1 Results: Cosmological Constraints from Cosmic Shear," M. Troxel et al, 2018, *PRD*, 98, 043528, arXiv:1708.01538
131. "Dark Energy Survey Year 1 Results: A Precise  $H_0$  Measurement from DES Y1, BAO, and D/H Data," DES Collaboration, 2018, *MNRAS*, 480, 3879; arXiv:1711.00403
132. "DES Y1 Results: Validating cosmological parameter estimation using simulated Dark Energy Surveys," N. MacCrann et al, 2018, *MNRAS*, 480, 4614; arXiv:1803.09795
133. "Splashback in galaxy clusters as a probe of cosmic expansion and gravity," S. Adhikari, J. Sakstein, B. Jain et al, 2018, *JCAP*, 11, 033; arXiv:1806.04302
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135. "Dark Energy Survey Year 1 Results: Cosmological Constraints from Galaxy Clustering and Weak Lensing," DES Collaboration, 2018, *PRD*, 98, 043526; arXiv:1708.01530
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138. "Dark Energy Survey Year 1 Results: Constraints on Extended Cosmological Models from Galaxy Clustering and Weak Lensing," DES Collaboration, 2019, *PRD*, 99, 123505; arXiv:1810.02499
139. "Cosmological Constraints from Multiple Probes in the Dark Energy Survey," DES

Collaboration, 2019, PRL, 122, 171301, arXiv:1811.02375

140. "Measurement of the Splashback Feature around SZ-selected Galaxy Clusters with DES, SPT and ACT," T. Shin, S. Adhikari, E. Baxter, C. Chang, B. Jain et al, 2019, MNRAS, 487, 2900; arXiv:1811.06081

141. "Dark Energy Survey year 1 results: the relationship between mass and light around cosmic voids," Y. Fang, N. Hamaus, B. Jain et al, 2019, MNRAS, 490, 3573

142. "The Simons Observatory: science goals and forecasts," P. Ade et al, 2019, JCAP, 02, 056

143. "Constraints on the redshift evolution of astrophysical feedback with Sunyaev-Zel'dovich effect cross-correlations," S. Pandey et al, 2019, PRD, 100, 063519

144. "Local resolution of the Hubble tension: The impact of screened fifth forces on the cosmic distance ladder," H. Desmond, B. Jain, J. Sakstein, 2019, PRD, 100, 043537

145. "Screened fifth forces mediated by dark matter-baryon interactions: Theory and astrophysical probes," J. Sakstein, H. Desmond, B. Jain, 2019, PRD, 100, 104035

146. "Controlling and leveraging small-scale information in tomographic galaxy-galaxy lensing," N. MacCrann, J. Blazek, B. Jain, E. Krause, 2020, MNRAS, 491, 5498; arXiv:1903.07101

147. "Dark Energy Survey Year 3 results: cosmology with moments of weak lensing mass maps - validation on simulations," 2020, Gatti, M., Chang, C., Friedrich, O., Jain, B. et al, MNRAS, 498, 4060-4087

148. "Model independent comparison of supernova and strong lensing cosmography: Implications for the Hubble constant tension," 2020, Pandey, S., Raveri, M., and Jain, B., Physical Review D, 102, 023505

149. "The Statistics of Extended Debris Disks Measured with Gaia and Planck," 2020, Nibauer, J., Baxter, E., and Jain, B., The Astronomical Journal, 159, 210

150. "Perturbation theory for modeling galaxy bias: Validation with simulations of the Dark Energy Survey," 2020, Pandey, S., Krause, E., Jain, B., MacCrann, N. et al, Physical Review D, 102, 123522

151. "Dark energy survey internal consistency tests of the joint cosmological probes analysis with posterior predictive distributions," 2021, Doux, C., Baxter, E., Lemos, P., Chang, C. et al, MNRAS, 503, 2688-2705

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### **Preprints and Other Publications:**

1. "Principal Component Analysis of PSF Variation in Weak Lensing Surveys," M. Jarvis, B. Jain, 2004; arXiv:astro-ph/0412234

2. "Lensing Systematics from Space: Modeling PSF effects in the SNAP survey," H. Stabenau, B. Jain, G. Bernstein, M. Lampton, 2007; arXiv:0710.3355

3. "Editorial: Focus on Gravitational Lensing," B. Jain, 2008, NJP, Vol. 9, Issue 12

4. "Telescope Optics and Weak Lensing: PSF Patterns due to Low Order Aberrations," M. Jarvis, P. Schechter, B. Jain, 2008; arXiv:0810.0027

5. "Weak Gravitational Lensing with LSST," 2009, D. Wittman, B. Jain, Chapter for LSST Science Book; arXiv:0912.0201

6. "Designing Surveys for Tests of Gravity," 2011, B. Jain, Phil. Trans. R. Soc. A, 369, 5081; arXiv:1104.0415

7. "Novel Probes of Gravity and Dark Energy, Snowmass Report," B. Jain et al, arXiv:1309.5389

8. “The Whole is Greater than the Sum of the Parts: Optimizing the Joint Science Return from LSST, Euclid and WFIRST,” B. Jain, D. Spergel et al, 2015, White Paper, arXiv:1501.07897
10. “Fundamental Physics with the Hubble Space Telescope,” N. Dalal et al, 2018, Report of the HST and Fundamental Physics Working Group, arXiv:1712.04928
11. “Cosmic Visions Dark Energy: Small Projects Portfolio,” K. Dawson et al, Report of the Cosmic Visions Dark Energy Panel for the US DOE, arXiv:1802.07216
12. “Planet X in CMB and Optical Galaxy Surveys,” E. Baxter, B. Jain et al, 2018, arXiv:1812.08701

**Selected Recent Presentations:**

- 2022 Growth of structure in the universe, Sesto, Italy, July 2022
- 2022 Key Challenges in Gravitational Lensing, Cambridge, July 2022
- 2022 Dark Energy Survey collaboration meeting, April 2022
- 2022 Cosmology with weak lensing: Beyond two-point statistics (virtual), April 2022
- 2022 Stellar Tests of Gravity Workshop, CMU, March 2022
- 2021 Cosmology seminar (virtual), Perimeter Institute, November 2021
- 2021 Astronomy colloquium, Columbia University, October 2021
- 2021 Machine Learning in Astronomical Surveys (virtual), IAP Paris, October 2021
- 2021 IUCAA colloquium (virtual), IUCAA Pune, June 2021
- 2021 The Impact of Machine Learning in Cosmology (virtual), ML Club, April 2021
- 2021 IISc colloquium (virtual), IISc Bangalore, February 2021
- 2021 Department colloquium (virtual), U Penn, February 2021
- 2021 PennIDEAS panel on Big Data, U Penn, February 2021
- 2020 Dark Energy Survey collaboration meeting, May 2020
- 2020 JPL colloquium, Pasadena, February 2020
- 2020 IUCAA cosmology seminar, Pune, January 2020
- 2020 Public lecture, IUCAA (Pune University), Pune, January 2020
- 2020 TIFR Theory seminar, Mumbai, January 2020
- 2019 CITA cosmology seminar, Toronto, November 2019
- 2019 Dark Energy Survey collaboration meeting, Session organizer, Sussex, November 2019
- 2019 Cosmic Controversies conference, Invited panelist, Chicago, October 2019
- 2019 Astrophysics colloquium, Institute d’Astrophysique, Paris, September 2019
- 2019 Astronomy on Tap, Public talk, Philadelphia, August 2019
- 2019 IGC@25: Multimessenger Universe, Invited panelist, Penn State, June 2019
- 2019 Particle Cosmology Workshop, Co-organizer, New York City, June 2019
- 2019 Dark Energy Survey collaboration meeting, Co-organizer, Philadelphia, June 2019
- 2019 Splashback in Galaxy Clusters, April 2019, Stanford University, May 2019
- 2019 Planetary science with CMB and optical surveys, Co-organizer, Philadelphia, April 2019
- 2019 Testing Gravity 2019, Invited talk, Vancouver, January 2019
- 2019 Lensing in the era of precision cosmology, Invited talk, Berkeley, January 2019
- 2018 CMB in High Definition, Invited talk, CCA, New York, December 2018
- 2018 WFIRST workshop, Co-organizer, Princeton University, December 2018
- 2018 Cosmology with Voids, Invited review talk, CCA, New York, September 2018
- 2018 LSST Dark Energy Science Collaboration, CMU, July 2018

- 2018 The Nonlinear Universe, Invited talk, Smartno, Slovenia, July 2018
- 2018 DES Collaboration meeting, College Station, Texas, May 2018
- 2018 DES Key Project Workshop, OSU, April 2018
- 2017 Cosmic Visions: Dark Energy Workshop, session chair, LBL, Berkeley, November 2017
- 2017 CITA, seminar, Toronto, September 2017
- 2017 The Low Redshift Universe, Invited talk, Nordita, Stockholm, July 2017
- 2017 The Nonlinear Universe, Invited talk, Smartno, Slovenia, July 2017
- 2017 WFIRST science team collaboration meeting, Baltimore, June 2017
- 2017 Dark Energy Survey Collaboration meeting, Chicago, June 2017
- 2017 Quantifying and Understanding the Galaxy Halo Connection, panelist, Santa Barbara, May 2017
- 2017 LSST-DESC collaboration meeting, SLAC, February 2017
- 2017 Testing Gravity 2017, Invited talk, Vancouver, January 2017

**Recent courses taught:**

- Undergraduate: Astronomy 212: Introduction to Astrophysics II: Stars, Galaxies and the Universe  
 Astronomy 006: The Solar System, Exoplanets, and Life  
 Physics 360: Statistics, Data Science and Machine Learning  
 Physics 359: Data Analysis for the Natural Sciences II: Machine Learning
- Graduate: Physics 533: Topics in Cosmology

**Recent Undergraduate Students:**

- 2022- Sam Charney, Matthew Currie, Julia Esposito, Nick Liu, Kyle Miller
- 2021-2022 Michelle (Yiwei) Chai (thesis co-supervisor), Tara Dacunha (thesis), Julia Esposito, Sarah Kane, Eli Wiston (thesis)
- 2020-2021 Matt Belyakov (thesis), Tara Dacunha, Sarah Kane, Sam Goldstein (thesis), Jacob Nibauer (thesis), Eli Wiston
- 2019-2020 Tara Dacunha, Sebastian Gonzalez, Jacob Nibauer, Sam Goldstein
- 2017-2018 Jules Almazar, Amanda Farah (thesis)

**Ph.D. Students:**

- 2025 Minsu Park
- 2022 Shivam Pandey
- 2020 Lucas Secco, Kavli postdoctoral fellow, University of Chicago
- 2020 Tae-Hyeon Shin, postdoctoral fellow, Stonybrook University
- 2018 Yuedong Fang; research scientist at Qian Lab, China Academy of Space Technology
- 2014 Joseph Clampitt; currently in finance
- 2010 Alex Borisov; faculty at Cleveland State University
- 2010 Michelle Caler (co-supervisor with R. Sheth); faculty at West Chester University
- 2008 Hans Stabenau; Cardiology Fellow, Beth Israel
- 2006 Greg Dobler (research supervisor: Charles Keeton); Assistant Professor, University of Delaware

2005 Derek Dolney; Medical Physicist, Radiation Oncology at Penn

**Postdocs:**

2020- Marco Gatti (co-supervised)  
2019- Tanvi Karwal (co-supervised)  
2019-2022 Marco Raveri (co-supervised), currently faculty at University of Genoa  
2018-2021 Cyrille Doux, currently Research Scientist at CNRS, Grenoble, France  
2014-2019 Eric Baxter, currently faculty at U Hawaii  
2017-2019 Jeremy Sakstein (co-supervised), currently faculty at U Hawaii  
2016-2018 Vivian Miranda (co-supervised), currently faculty at Stonybrook University  
2014-2016 Juliana Kwan, currently postdoc at Liverpool John Moores University  
2012-2014 Elisabeth Krause; currently faculty at U Arizona  
2012-2014 Tim Eifler; currently faculty at U Arizona  
2010-2014 Vinu Vikram; currently faculty at Central University of Kerala, India  
2009-2012 Anna Cabre; currently Marie Curie Fellow at the Institute of Marine Sciences (Barcelona)  
2008-2010 Marcos Lima; currently faculty, U. Sao Paolo, Brazil  
2006-2009 Jacek Guzik; currently faculty at Jagiellonian University, Krakow, Poland  
2002-2007 Mike Jarvis; currently research staff at U Penn  
2001-2002 Hanadi Abdelsalam; currently faculty at PMU, Saudi Arabia  
2001-2004 Masahiro Takada; currently faculty, IPMU and University of Tokyo