

# Arka Banerjee

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## CONTACT INFORMATION

Fermilab Cosmic Physics Center MS127  
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## RESEARCH POSITIONS

**Fermilab**, Batavia, Illinois USA  
**Schramm Fellow in Theoretical Astrophysics**, Dec 2020 - .

**Kavli Institute for Particle Astrophysics and Cosmology**, Stanford University, Stanford, California USA  
**KIPAC Postdoctoral Fellow**, Sep 2017 - Dec 2020.

## EDUCATION

**University of Illinois, Urbana-Champaign**, Urbana, Illinois USA  
Ph.D., August 2017

- Dissertation Topic: “Cosmological Signatures of Fundamental Physics”
- Advisor: Neal Dalal

**Tata Institute of Fundamental Research**, Mumbai, India  
M.Sc., Physics, 2011

- Dissertation Topic: “Onset of nonlinear neutrino oscillations in core collapse supernovae”
- Advisor: Amol Dighe

**St. Stephen’s College**, Delhi, India  
B.Sc., Physics, 2008

## HONORS AND AWARDS

UIUC University Fellowship, Fall 2016.  
UIUC University Fellowship, Spring 2013.  
Outstanding Teaching Award, UIUC

- Spring 2016
- Fall 2012
- Spring 2012

Kamla Bajaj Award for Best Student in Physics Honours, St. Stephen’s College, 2008.

## MENTORING EXPERIENCE

Graduate student supervision for research projects:

- **Adrian Bayer**, UC Berkeley. *A fast particle-mesh simulation of non-linear cosmological structure formation with massive neutrinos*, [JCAP 01 \(2021\) 016](#).
- **Ethan Nadler**, Stanford University. *Signatures of Velocity-Dependent Dark Matter Self-Interactions in Milky Way-mass Halos*, [Astrophys.J. 896 \(2020\) 112](#).
- **Andrew Eberhardt**, Stanford University. *Investigating the use of field solvers for simulating classical systems*, [Phys.Rev.D 101 \(2020\) 4, 043011](#).
- **Yunchong Wang**, Stanford University, *Detecting clustering with kNN summary statistics: an application to the Planck SZ catalog*, in prep.

- **Sean McLaughlin**, Stanford University, *Measuring Galaxy Assembly Bias with k-nearest neighbor distributions*, in prep.

Summer supervision for undergraduate students:

- **Jacob Stanton**, Brown University.

## TEACHING EXPERIENCE

### Senior Teaching Assistant

Quantum Mechanics and Statistical Physics, UIUC

- Fall 2016

### Teaching Assistant

Quantum Mechanics and Statistical Physics, UIUC

- Spring 2016
- Spring 2012
- Fall 2011

Special Relativity and Math Applications, UIUC

- Fall 2012

Graduate course in Electromagnetism, TIFR

- Fall 2010

## PROFESSIONAL SERVICE

Referee for JCAP, PRD, ApJ, MNRAS.

## CONFERENCES AND MEETINGS ORGANIZED

*Workshop on applications of nearest neighbor distributions in cosmology and astrophysics*, Stanford University, Jan 2021.

KIPAC Postdoctoral Lunch Talks, 2018-2020.

KIPAC Hack Day, May 2019.

Local Group Meeting (Stanford, UC Berkeley, UC Davis) on Local Group Science, November 2019.

## COMPUTING SKILLS AND EXPERIENCE

Programming Languages: C, C++, Python, Mathematica, LaTeX.

Extensive experience in cluster computing and parallel computing.

## PUBLICATIONS

**24** publications, **9** as first author, **7** as second author:

**Banerjee**, Kokron, and Abel, *Modeling Nearest Neighbor distributions of biased tracers using Hybrid Effective Field Theory*, [arXiv:2107.10287](#).

Aviles, **Banerjee**, Niz, and Slepian, *Clustering in Massive Neutrino Cosmologies via Eulerian Perturbation Theory*, [arXiv:2106.13771](#).

Bhattacharya, Adhikari, **Banerjee et al.**, *The Signatures of Self-Interacting Dark Matter and Subhalo Disruption on Cluster Substructure*, [arXiv:2106.08292](#).

**Banerjee**, and Abel, *Cosmological cross-correlations and nearest neighbor distributions*, *MNRAS*, Volume 504, Issue 2, June 2021.

Bayer, **Banerjee**, and Feng, *A fast particle-mesh simulation of non-linear cosmological structure formation with massive neutrinos*, *JCAP* 01 (2021) 016.

- Banerjee**, and Abel, *Nearest Neighbor distributions: new statistical measures for cosmological clustering*,  
MNRAS, Volume 500, Issue 4, Feb. 2021.
- Aviles, **Banerjee**, *A Lagrangian Perturbation Theory in the presence of massive neutrinos*,  
JCAP 10 (2020) 034.
- Fang, **Banerjee**, Charles, Omori, *A Cross-Correlation Study of High-energy Neutrinos and Tracers of Large-Scale Structure*,  
Astrophys.J. 894 (2020) 02.
- Nadler, **Banerjee**, Adhikari, Mao, Wechsler, *Signatures of Velocity-Dependent Dark Matter Self-Interactions in Milky Way-mass Halos*,  
Astrophys.J. 896 (2020) 112.
- Eberhardt, **Banerjee**, Kopp, Abel, *Investigating the use of field solvers for simulating classical systems*,  
Phys.Rev.D 101 (2020) 4, 043011.
- Uhlemann, Friedrich, Villaescusa-Navarro, **Banerjee**, Codis, *Fisher for complements: Extracting cosmology and neutrino mass from the counts-in-cells PDF*,  
MNRAS, Volume 495, Issue 4, July 2020.
- Villaescusa-Navarro, Hahn, Massara, **Banerjee et al.**, *The Quijote simulations*,  
Astrophys.J.Suppl. 250 (2020) 1, 2.
- McClintock, Rozo, **Banerjee et al.**, *The Aemulus Project IV: Emulating Halo Bias*,  
arXiv:1907.13167.
- Banerjee et al.**, *Weighing neutrinos with the halo environment*, JCAP 06 (2020) 032.
- Banerjee et al.**, *Signatures of Self-Interacting dark matter on cluster density profile and subhalo distributions*, JCAP 02 (2020) 024.
- Chuang et al., *UNIT project: Universe N-body simulations for the Investigation of Theoretical models from galaxy surveys*, MNRAS, Volume 487, Issue 1, July 2019.
- Banerjee**, Powell, Abel, and Villaescusa-Navarro, *Reducing Noise in Cosmological N-body Simulations with Neutrinos*, JCAP 1809, no. 09, 028 (2018).
- Secco, Farah, Jain, Adhikari, **Banerjee**, and Dalal, *Probing Self-interacting Dark Matter with Disk Galaxies in Cluster Environments*, Astrophys.J. 860 (2018) no.1, 32.
- Villaescusa-Navarro, **Banerjee**, Dalal, Castorina, Scoccimaro, Angulo, and Spergel, *The imprint of neutrinos on clustering in redshift-space*, Astrophys.J. 861 (2018) no.1, 53.
- Banerjee**, Jain, Dalal, and Shelton, *Tests of Neutrino and Dark Radiation Models from Galaxy and CMB surveys*, JCAP 1801 (2018) 01, 022.
- Banerjee**, and Dalal, *Simulating nonlinear cosmological structure formation with massive neutrinos*, JCAP (2016) 11 015.
- Banerjee**, Dighe, and Raffelt, *Linearized flavor-stability analysis of dense neutrino streams*, Phys.Rev. D84 (2011) 053013.

Home, Pan, and **Banerjee**, *Larmor precession reexamined: Testable correction and its ramifications*, *Eur. Phys. J. D*, **67**, 72(2013).

Home, Pan, and **Banerjee**, *Quantitative probing of quantum-classical transition for the arrival time distribution*, *J. Phys. A: Math. Theor.* **42**, 165302 (2009).

OTHER  
CONTRIBUTIONS

Drlica-Wagner *et al.*, *Probing the Fundamental Nature of Dark Matter with the Large Synoptic Survey Telescope*, [arXiv:1902.01055](#).

Bechtol *et al.*, *Dark Matter Science in the Era of LSST*, [arXiv:1903.04425](#).

Rhodes *et al.*, *The End of Galaxy Surveys*,  
[HTTP://ADSABS.HARVARD.EDU/ABS/2019BAAS...51C.114R](http://ADSABS.HARVARD.EDU/ABS/2019BAAS...51C.114R)

TALKS AND  
PRESENTATIONS

*k*-Nearest Neighbor distributions: new statistical measures for cosmological clustering, Survey Science Meeting, UChicago, January 2021.

*Modeling structure formation in the era of precision cosmology*, IIMSc Chennai, November 2020.

*Modeling structure formation in the era of precision cosmology*, IISER Pune, October 2020.

*k*-Nearest Neighbor distributions: new statistical measures for cosmological clustering, KIPAC tea talk, Stanford University, August 2021.

*Weighing neutrinos with the Large Scale Structure of the Universe*, ICTS, Bangalore, March 2020.

*Weighing neutrinos with the Large Scale Structure of the Universe*, IISc, Bangalore, March 2020.

*Signatures of Dark Matter Self-Interactions in the Milky Way*, Local Group Meeting, Stanford, November, 2019.

*Signatures of Self-Interacting dark matter on cluster density profile and subhalo distributions*, Cosmic Controversies Conference, Chicago, October 2019.

*Signatures of Self-Interacting dark matter on cluster density profile and subhalo distributions*, LSST Dark Matter Workshop, U. Chicago, August 2019.

*Signatures of Self-Interacting dark matter on cluster density profile and subhalo distributions*, New York University, June 2019.

*Massive neutrinos and environmental scale dependence*, Cosmology Seminar, ICTS Bangalore, January 2019.

*Imprints of massive neutrinos on Large Scale Structure*, IMSC Chennai, January 2019.

*Cosmology with massive neutrinos*, INPA Seminar, Lawrence Berkeley Laboratory, October 2018.

*Massive Neutrinos and the Environmental Scale Dependence of Halo Bias*, Nonlinear Universe Conference, Smartno, July 2018.

*Reducing Noise in Cosmological N-body simulations with neutrinos*, KIPAC Tea, SLAC, January 2018.

*Reducing Noise in Cosmological N-body simulations with neutrinos*, Cosmology Lunch, Princeton University, December 2017.

*Imprints of massive neutrinos on Large Scale Structure*, Cosmology Seminar, UC Davis, October 2017.

*Cosmological effects of massive neutrinos*, IIT Bombay, August 2017.

*Void biasing in the presence of massive neutrinos*, LBL, April 2017.

*Simulating nonlinear structure formation with massive neutrinos*,

KIPAC, Stanford University, March 2017.

*Cosmological structure formation with massive neutrinos*, IPMU, Tokyo, February 2017.

*Simulating nonlinear structure formation with massive neutrinos*, CCAPP, Ohio State University, January 2017.

*Large scale biasing of voids in the presence of massive neutrinos*, University of Pennsylvania, August 2016.

*Simulating cosmologies with “fast” particles*, Santa Fe Cosmology Workshop, July 2014.

## REFERENCES

### **Prof. Tom Abel**

Department of Physics  
Stanford University  
Stanford, CA-94305  
USA

### **Prof. Risa Wechsler**

Department of Physics  
Stanford University  
Stanford, CA-94305  
USA

### **Prof. Neal Dalal**

Perimeter Institute  
Waterloo, Ontario N2L 2Y5  
Canada

### **Prof. Andrey Kravtsov**

Department of Astronomy and Astrophysics  
The University of Chicago  
Chicago, IL 60637  
USA