SUNAO SUGIYAMA

Compiled on May 30, 2024

CONTACT INFORMATION

Address	Center for Particle Cosmology, Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA 19104, USA
Room	4N21
Email	ssunao@sas.upenn.edu
Website	https://git-sunao.github.io
Github	https://github.com/git-sunao

RESEARCH INTERESTS

Theoretical and Observational cosmology: *large-scale structure of the Universe, gravitational weak/micro lensing, primordial black hole*

COLLABORATIONS

Subaru HSC weak lensing working group, member (2021-present)
Dark Enrgy Survey (DES), member (2024-present)

POSITIONS

Current positions

Postdoctoral researcher Sep. 2023 – Present
University of Pennsylvania, Philadelphia, the United States
Mentor: Prof. Bhuvnesh Jain

JSPS Overseas Research Fellow Sep. 2023 – Present
University of Pennsylvania, Philadelphia, the United States

Past positions

Postdoctoral researcher Apr. 2023 – Aug. 2023
Kavli IPMU, Chiba, Japan
Mentor: Prof. Masahiro Takada

Project Researcher Apr. 2023 – Aug. 2023
Beyond AI, Tokyo, Japan

JSPS Research Fellowships for Young Scientists (DC2) Apr. 2021 – Mar. 2023
Kavli IPMU, Chiba, Japan

Educations

University of Tokyo, Tokyo, Japan Apr. 2020 – Mar. 2023
Ph.D. course in Physics
Dissertation: *"Joint cosmology analyses using gravitational weak lensing data from Subaru Hyper Suprime-Cam"*
Supervisor: Prof. Masahiro Takada

University of Tokyo, Tokyo, Japan Apr. 2018 – Mar. 2020
M.S. in Physics
Dissertation: *"Validation of cosmological analysis based on perturbation theory for wide-field galaxy survey"*
Supervisor: Prof. Masahiro Takada

University of Tokyo, Tokyo, Japan Apr. 2014 – Mar. 2018
B.A. in Physics

GRANT & AWARDS

Grant-in-Aid for JSPS Research Fellows (DC2), Japan Society for the Promotion of Science, Apr. 2021 – Mar. 2023

The School of Science Encouragement Award (Doctoral program), University of Tokyo, the School of Science, Mar. 2023

WINGS IGPEES, course completion, Sep. 2018 – Mar. 2023

TEACHING

Collaborative coding: git and github, CD3 symposium 2023, Kavli IPMU

Coadvised Noriaki Nakasawa, a master student at the University of Nagoya, 2022

PROFESSIONAL ACTIVITIES

Society	The Astronomical Society of Japan (ASJ), 2018 – present
	The Physical Society of Japan (JPS), 2022 – present
Seminar/Workshop	IPMU weekly lunch seminar (co-organizer), 2019 – 2021
	HSC weaklensing mini workshop, Aug. 2022
Referee	International Journal of Modern Physics D
Computing	`fft-extended-source`
	`dark emulator` as a part of Dark Quest Project
	I can work with C, C++, Python, HSC pipeline (for image analysis)
Accepted Observation	**PI** of Definitive search for PBH dark matter in the multiverse cosmology with HSC

PUBLIC ENGAGEMENT AND OUTREACH

Apperence on *Cosmic Front, Primordial Black Hole: the master key of the Universe (title in Japanese)* produced by NHK, 2021

Interviewed by Quanta Magazine on *Clashing Cosmic Numbers Challenge Our Best Theory of the Universe*, 2024

Interviewed by Asahi Shimbun on *Breakdown in the standard model of the Universe? An analysis using precise dark matter "map" (title in Japanese)*, 2024

PUBLICATIONS

The up-to-date list of publication availabele at ADS.

* = Author list alphabetized
Major author

1. **Sugiyama, Sunao**, H. Miyatake, S. More, et al. Hyper Suprime-Cam Year 3 results: Cosmology from galaxy clustering and weak lensing with HSC and SDSS using the minimal bias model. Phys. Rev. D, 108(12):123521, December 2023:123521. doi: 10.1103/PhysRevD.108.123521
2. S. More, **Sugiyama, Sunao**, H. Miyatake, et al. Hyper Suprime-Cam Year 3 results: Measurements of clustering of SDSS-BOSS galaxies, galaxy-galaxy lensing, and cosmic shear. Phys. Rev. D, 108(12):123520, December 2023:123520. doi: 10.1103/PhysRevD.108.123520
3. R. Dalal, X. Li, A. Nicola, et al. Hyper Suprime-Cam Year 3 results: Cosmology from cosmic shear power spectra. Phys. Rev. D, 108(12):123519, December 2023:123519. doi: 10.1103/PhysRevD.108.123519
4. X. Li, T. Zhang, **Sugiyama, Sunao**, et al. Hyper Suprime-Cam Year 3 results: Cosmology from cosmic shear two-point correlation functions. Phys. Rev. D, 108(12):123518, December 2023:123518. doi: 10.1103/PhysRevD.108.123518
5. H. Miyatake, **Sugiyama, Sunao**, M. Takada, et al. Hyper Suprime-Cam Year 3 results: Cosmology from galaxy clustering and weak lensing with HSC and SDSS using the emulator based halo model. Phys. Rev. D, 108(12):123517, December 2023:123517. doi: 10.1103/PhysRevD.108.123517
6. **Sugiyama, Sunao**, M. Takada, and A. Kusenko. Possible evidence of axion stars in HSC and OGLE microlensing events. *Physics Letters B*, 840:137891, May 2023:137891. doi: 10.1016/j.physletb.2023.137891
7. H. Miyatake, **Sugiyama, Sunao**, M. Takada, et al. Cosmological inference from an emulator based halo model. II. Joint analysis of galaxy-galaxy weak lensing and galaxy clustering from HSC-Y1 and SDSS. Phys. Rev. D, 106(8):083520, October 2022:083520. doi: 10.1103/PhysRevD.106.083520
8. H. Miyatake, Y. Kobayashi, M. Takada, et al. Cosmological inference from an emulator based halo model. I. Validation tests with HSC and SDSS mock catalogs. Phys. Rev. D, 106(8):083519, October 2022:083519. doi: 10.1103/PhysRevD.106.083519
9. **Sugiyama, Sunao**. Fast Fourier Transformation Based Evaluation of Microlensing Magnification with Extended Source. ApJ, 937(2):63, October 2022:63. doi: 10.3847/1538-4357/ac8df1
10. **Sugiyama, Sunao**, M. Takada, H. Miyatake, et al. HSC Year 1 cosmology results with the minimal bias method: HSC ×BOSS galaxy-galaxy weak lensing and BOSS galaxy clustering. Phys. Rev. D, 105(12):123537, June 2022:123537. doi: 10.1103/PhysRevD.105.123537
11. **Sugiyama, Sunao**, V. Takhistov, E. Vitagliano, et al. Testing stochastic gravitational wave signals from primordial black holes with optical telescopes. *Physics Letters B*, 814:136097, March 2021:136097. doi: 10.1016/j.physletb.2021.136097
12. *A. Kusenko, M. Sasaki, **Sugiyama, Sunao**, et al. Exploring Primordial Black Holes from the Multiverse with Optical Telescopes. Phys. Rev. Lett., 125(18):181304, October 2020:181304. doi: 10.1103/PhysRevLett.125.181304
13. **Sugiyama, Sunao**, M. Takada, Y. Kobayashi, et al. Validating a minimal galaxy bias method for cosmological parameter inference using HSC-SDSS mock catalogs. Phys. Rev. D, 102(8):083520, October 2020:083520. doi: 10.1103/PhysRevD.102.083520

14. **Sugiyama, Sunao**, T. Kurita, and M. Takada. On the wave optics effect on primordial black hole constraints from optical microlensing search. MNRAS, 493(3):3632–3641, April 2020:3632–3641. doi: 10.1093/mnras/staa407

15. H. Niikura, M. Takada, N. Yasuda, et al. Microlensing constraints on primordial black holes with Subaru/HSC Andromeda observations. *Nature Astronomy*, 3:524–534, April 2019:524–534. doi: 10.1038/s41550-019-0723-1

Contributing author

16. R. Terasawa, X. Li, M. Takada, et al. Exploring the baryonic effect signature in the Hyper Suprime-Cam Year 3 cosmic shear two-point correlations on small scales: the S_8 tension remains present. *arXiv e-prints*, arXiv:2403.20323, March 2024:arXiv:2403.20323. doi: 10.48550/arXiv.2403.20323

17. J. Shi, T. Sunayama, T. Kurita, et al. The intrinsic alignment of galaxy clusters and impact of projection effects. MNRAS, 528(2):1487–1499, February 2024:1487–1499. doi: 10.1093/mnras/stae064

18. T. Zhang, X. Li, R. Dalal, et al. A general framework for removing point-spread function additive systematics in cosmological weak lensing analysis. MNRAS, 525(2):2441–2471, October 2023:2441–2471. doi: 10.1093/mnras/stad1801

19. T. Sunayama, H. Miyatake, **Sugiyama, Sunao**, et al. Optical Cluster Cosmology with SDSS redMaPPer clusters and HSC-Y3 lensing measurements. *arXiv e-prints*, arXiv:2309.13025, September 2023:arXiv:2309.13025. doi: 10.48550/arXiv.2309.13025

20. Y. Park, T. Sunayama, M. Takada, et al. Cluster cosmology with anisotropic boosts: validation of a novel forward modelling analysis and application on SDSS redMaPPer clusters. MNRAS, 518(4):5171–5189, February 2023:5171–5189. doi: 10.1093/mnras/stac3410

SELECTED TALKS

Listing 13 selected talks out of 33 talks. See here for the full list of talks.

1. **Cosmology from Subaru HSC weak lensing Year 3 data**, MIfA colloquium, 2024, May., *Oral* (**Invited Talk**)
2. **HSC Y3 weak lensing cosmology results**, CosmoPalooza, 2023, Oct., *Oral*
3. **HSC Year 3 Weak Lensing Cosmology Results**, HSC webinar, 2023, Apr., *Oral*
4. **HSC Y3 cosmology results**, CMB x LSS, 2023, Apr., *Oral* (**Invited Talk**)
5. **Collaborative coding: git and github**, CD3 Opening Symposium, 2023, Apr., *Oral*
6. **Revealing the nature of dark matter with gravitational lensing: weak and microlensing**, Colloqium at Osaka theoretical astrophysics group, 2022, Jul., *Oral* (**Invited Talk**)
7. **Exploring Primordial black hole with microlensing observation of Andromeda galaxy**, Subaru Users Meeting 2021, 2022, Jan., *Oral*
8. **Joint analysis of galaxy-galaxy lensing and clustering at large scales from Subaru HSC and SDSS data**, 2021 Autumn Annual Meeting of ASJ, 2021, Sep., *Oral*
9. **Exploring Dark Matter Candidates with Microlensing**, KEK theory seminar, 2021, Apr., *Oral*
10. **Testing stochastic gravitational wave signals by PBH microlensing**, 4th KEK-PH + KEK-Cosmo Joint Lectures and Workshop on "Gravitational Wave", 2020, Nov., *Oral* (**Invited Talk**)
11. **Observational constraint on PBH scenarios with HSC microlensing**, 9th workshop on observational cosmology, 2020, Nov., *Oral*

12. **Validation of PT-based method for cosmology analysis with wide field galaxy survey data**, Seminar at astro group of Hirosaki University, 2020, Feb., *Oral*

13. **Wave effect on PBH micro-lensing and constraintWave effect on PBH micro-lensing and constraint**, 7th workshop on observational cosmology, 2018, Dec., *Oral*

PRESS RELEASES

Primordial black holes and the search for dark matter from the multiverse

How to see the invisible: Using dark matter distribution to test our cosmological model