

# 杉山 素直

履歴書, 最終更新日: October 13, 2025

## 連絡先

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## 研究分野

### 理論および観測的宇宙論:

宇宙の大規模構造、重力レンズ（弱レンズ、マイクロレンズ）、原始ブラックホール

## 共同研究

すばる望遠鏡 HSC 弱重力レンズグループ、メンバー (2021 年～現在, 2024 年 12 月より共同議長)  
ダークエネルギーサーベイ (DES)、メンバー (2024 年～現在)

## 職歴

現在	<b>ポスドク研究員,</b> アメリカ合衆国, ペンシルベニア大学, フィラデルフィア 受入教員: Bhuvnesh Jain	2023 年 9 月 – 現在
過去	<b>JSPS 海外特別研究員,</b> アメリカ合衆国, ペンシルベニア大学, フィラデルフィア <b>ポスドク研究員,</b> 日本, カブリ数物連携宇宙研究機構, 千葉 指導教員: 高田昌広	2023 年 9 月 – 現在 2023 年 4 月 – 2023 年 8 月
	<b>プロジェクト研究員,</b> 日本, Beyond AI, 東京	2023 年 4 月 – 2023 年 8 月
	<b>日本学術振興会特別研究員 (DC2) ,</b> 日本, カブリ数物連携宇宙研究機構, 千葉	2021 年 4 月 – 2023 年 3 月
学歴	<b>東京大学, 東京, 日本,</b> 物理学専攻, 博士課程 論文題目: “ <i>Joint cosmology analyses using gravitational weak lensing data from Subaru Hyper Suprime-Cam</i> ” 指導教員: 高田昌広	2020 年 4 月 – 2023 年 3 月
	<b>東京大学, 東京, 日本,</b> 物理学専攻, 修士 論文: “ <i>Validation of cosmological analysis based on perturbation theory for wide-field galaxy survey</i> ” 指導教員: 高田昌広	2018 年 4 月 – 2020 年 3 月
	<b>東京大学, 東京, 日本,</b> 物理学専攻, 学士	2014 年 4 月 – 2018 年 3 月

## 獲得研究資金 および 受賞

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

理学系研究科奨励賞(博士課程), 東京大学, 理学系, 2023年3月

WINGS IGPEES, コース修了, Sep. 2018 – Mar. 2023

## 教育

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

Coadvised students: Rafael C. H. Gomes (a PhD student at UPenn since 2023), Noriaki Nakasawa (a master student at the University of Nagoya, 2022)

## 活動

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### 学会

日本天文学会 (ASJ), 2018年 – 現在

日本物理学会 (JPS), 2022年 – 現在

IPMU ランチセミナー (共同オーガナイザー), 2019年 – 2021年

HSC 弱重力レンズミニワークショップ主催, 2022年8月

Sesto 2025 - Tracing Cosmic Evolution with Galaxy Clusters V (SOC), 2025

International Journal of Modern Physics D

The Astrophysical Journal

American Astronomical Society Journals

Journal of Cosmology and Astroparticle Physics

開発コード: `fft-extended-source`, `fastnc`, `dark emulator` (Dark Quest Project の一部)

C、C++、Python、HSC パイプライン (画像解析用) を使用できます

Definitive search for PBH dark matter in the multiverse cosmology with HSC の PI

Survey of M31 eclipsing binaries: Toward a 1% distance measurement の co-PI

### 採択された観測

## アウトリーチ, メディア協力

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NHK コズミック フロント 「原始ブラックホール 宇宙創成のマスターキー」 出演, 2021年

Quanta Magazine on *Clashing Cosmic Numbers Challenge Our Best Theory of the Universe*, インタビュー, 2024年

朝日新聞, 宇宙の標準理論にはころび? 暗黒物質の精密な「地図」で解析, インタビュー, 2024年

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最新の論文リストは [ADS](#) を参照ください。

\* = 著者リストアルファベット順

**筆頭著者または主要な貢献をした査読付論文**

1. **Sugiyama, Sunao** and M. Park. Data Compression with Noise Suppression for Inference under Noisy Covariance. *arXiv e-prints*, arXiv:2508.14021, [August 2025:arXiv:2508.14021](#)
2. **Sugiyama, Sunao**, R. C. H. Gomes, and B. Jain. Cosmology from a joint analysis of second and third order shear statistics with Subaru Hyper Suprime-Cam Year 3 data. *arXiv e-prints*, arXiv:2508.14019, [August 2025:arXiv:2508.14019](#)
3. R. C. H. Gomes, **Sugiyama, S.**, B. Jain, et al. Dark Energy Survey Year 3 Results: Cosmological constraints from second and third-order shear statistics. *arXiv e-prints*, arXiv:2508.14018, [August 2025:arXiv:2508.14018](#)
4. R. C. H. Gomes, **Sugiyama, S.**, B. Jain, et al. Cosmology with second and third-order shear statistics for the Dark Energy Survey: Methods and simulated analysis. *arXiv e-prints*, arXiv:2503.03964, [March 2025:arXiv:2503.03964](#)
5. **Sugiyama, Sunao**, R. C. H. Gomes, and M. Jarvis. Fast modeling of the shear three-point correlation function. *arXiv e-prints*, arXiv:2407.01798, [July 2024:arXiv:2407.01798](#)
6. 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](#)
7. 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](#)
8. 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](#)
9. 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](#)
10. **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](#)
11. **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](#)
12. 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](#)
13. 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](#)
14. **Sugiyama, Sunao**. Fast Fourier Transformation Based Evaluation of Microlensing Magnification with Extended Source. *ApJ*, 937(2):63, [October 2022:63](#)

15. **Sugiyama, Sunao**, M. Takada, H. Miyatake, et al. HSC Year 1 cosmology results with the minimal bias method: HSC  $\times$ BOSS galaxy-galaxy weak lensing and BOSS galaxy clustering. *Phys. Rev. D*, 105(12):123537, **June 2022:123537**
16. **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**
17. \*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**
18. **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**
19. **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**
20. 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**

### その他の共著論文

21. T. Zhang, X. Li, **Sugiyama, Sunao**, et al. Cosmology and Source Redshift Constraints from Galaxy Clustering and Tomographic Weak Lensing with HSC Y3 and SDSS using the Point-Mass Correction Model. *arXiv e-prints*, arXiv:2507.01386, **July 2025:arXiv:2507.01386**
22. T. Zhang, **Sugiyama, Sunao**, S. More, et al. Modelling Galaxy Clustering and Tomographic Galaxy-Galaxy Lensing with HSC Y3 and SDSS using the Point-Mass Correction Model and Redshift Self-Calibration. *arXiv e-prints*, arXiv:2507.01377, **July 2025:arXiv:2507.01377**
23. R. Terasawa, M. Takada, T. Kurita, and **Sugiyama, Sunao**. Late-time suppression of structure growth as a solution for the  $S_8$  tension. *arXiv e-prints*, arXiv:2505.09176, **May 2025:arXiv:2505.09176**
24. 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. *Phys. Rev. D*, 111(6):063509, **March 2025:063509**
25. R. Terasawa, M. Takada, **Sugiyama, Sunao**, and T. Kurita. Testing small-scale modifications in the primordial power spectrum with Subaru HSC cosmic shear, primary CMB and CMB lensing. *arXiv e-prints*, arXiv:2503.20396, **March 2025:arXiv:2503.20396**
26. K.-F. Chen, I. N. Chiu, M. Oguri, et al. Weak-Lensing Shear-Selected Galaxy Clusters from the Hyper Suprime-Cam Subaru Strategic Program: I. Cluster Catalog, Selection Function and Mass–Observable Relation. *The Open Journal of Astrophysics*, 8:2, **January 2025:2**
27. T. Sunayama, H. Miyatake, **Sugiyama, Sunao**, et al. Optical cluster cosmology with SDSS redMaPPer clusters and HSC-Y3 lensing measurements. *Phys. Rev. D*, 110(8):083511, **October 2024:083511**
28. I. N. Chiu, K.-F. Chen, M. Oguri, et al. Weak-Lensing Shear-Selected Galaxy Clusters from the Hyper Suprime-Cam Subaru Strategic Program: II. Cosmological Constraints from the Cluster Abundance. *The Open Journal of Astrophysics*, 7:90, **October 2024:90**
29. 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**
30. 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**

31. 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

## 他の記事

1. S. Sugiyama, M. Takada, and H. Miyatake. Weak lensing cosmology with subaru hsc data. *ASJ EUREKA*, 117(1):304–314, May 2024:304–314

## 講演

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全44件のうち21件のトークを選出しました。全リストは[こちらをご覧ください](#)。

1. **Cosmology from a joint analysis of second and third order shear statistics**, KICP seminar, 2025, Oct., *Oral*
2. **Cosmology with third-order shear statistics Applications to HSC and DES**, Beyond-two-point Statistics Meet Survey Systematics, 2025, Sep., *Oral (Invited Talk)*
3. **Exploring Primordial Black Hole with Microlensing Data: Updates on Analysis Pipeline**, UPenn CfPC workshop, 2024, Nov., *Oral*
4. **Exploring Primordial Black Hole with Microlensing Data: Updates on Analysis Pipeline**, Focus week on primordial black holes 2024, 2024, Nov., *Oral (Invited Talk)*
5. **Cosmology with third-order shear statistics**, Roman F2F meeting, 2024, Oct., *Oral*
6. **Exploring Primordial Black Hole with Microlensing Data**, Pacific conference, 2024, Aug., *Oral (Invited Talk)*
7. **Cosmology from Subaru HSC weak lensing Year 3 data**, MIIfA colloquium, 2024, May., *Oral (Invited Talk)*
8. **Cosmology from weak lensing three-point correlation function**, astro/cosmo seminar at CMU, 2024, Feb., *Oral*
9. **Cosmology from Subaru HSC weak lensing Year 3 data**, Subaru Users Meeting FY2023, 2024, Jan., *Oral*
10. **HSC Y3 weak lensing cosmology results**, CosmoPalooza, 2023, Oct., *Oral*
11. **HSC Year 3 Weak Lensing Cosmology Results**, HSC webinar, 2023, Apr., *Oral*
12. **HSC Y3 cosmology results**, CMB x LSS, 2023, Apr., *Oral (Invited Talk)*
13. **Collaborative coding: git and github**, CD3 Opening Symposium, 2023, Apr., *Oral*
14. **Revealing the nature of dark matter with gravitational lensing: weak and microlensing**, Colloquium at Osaka theoretical astrophysics group, 2022, Jul., *Oral (Invited Talk)*
15. **Exploring Primordial black hole with microlensing observation of Andromeda galaxy**, Subaru Users Meeting 2021, 2022, Jan., *Oral*
16. **すばるHSCとSDSSデータの銀河弱重力レンズとクラスタリングの大スケール信号を用いた宇宙論統合解析**, 天文学会 2021年秋季年会, 2021, Sep., *Oral*
17. **Exploring Dark Matter Candidates with Microlensing**, KEK theory seminar, 2021, Apr., *Oral*
18. **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)*
19. **HSCマイクロレンズによるPBHシナリオの観測的制限**, 第9回観測的宇宙論ワークショップ, 2020, Nov., *Oral*

20. 広天域銀河サーベイデータの宇宙論解析における摂動論的手法の有効性の検証, Seminar at astro group of Hirosaki University, 2020, Feb., *Oral*
21. Wave effect on PBH micro-lensing and constraintWave effect on PBH micro-lensing and constraint, 第7回観測的宇宙論ワークショップ, 2018, Dec., *Oral*

## プレスリリース

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原始ブラックホールと多元宇宙が予言するダークマターの探索, IPMU, 2020 Dec

ダークマターを見る！ - HSC国際チームが宇宙の標準理論を検証, IPMU, 2024 Apr