

EMPLOYMENT

Pennsylvania State University Assistant Research Professor	University Park, PA 2022–present
Pennsylvania State University Postdoctoral Scholar	University Park, PA 2021–2022

EDUCATION

The University of Tokyo Ph.D. in Physics, Advisor: Prof.Kipp Cannon – Thesis title : Modeling and Searching for Stochastic Gravitational-waves Backgrounds from Ultralight Boson Particles	Tokyo, Japan 2018–2021
The University of Tokyo M.S. in Physics, Advisor: Prof.Kipp Cannon – Thesis title : Towards a Search for Stochastic Gravitational-Wave Backgrounds from Ultra-light Bosons	Tokyo, Japan 2016–2018
The University of Tokyo B.S. in Applied Physics, Advisor: Prof.Norikatsu Mio – Thesis title : Performance evaluation of the frequency reference cavity for KAGRA gravitational-wave detector	Tokyo, Japan 2011–2016

RESEARCH EXPERIENCE

Pennsylvania State University – Development of a low-latency gravitational wave (GW) search pipeline, GstLAL – Bayesian parameter estimation for targeted anisotropic GW background	University Park, PA 2021–present
Research Center for the Early Universe, The University of Tokyo <i>M.S./Ph.D. Research, supervised by Prof.Kipp Cannon</i> – Fast evaluation of trigger consistency between multiple detectors using GstLAL – Searches for ultra-light bosons using stochastic GW background	Tokyo, Japan 2016–2021
LIGO Lab, California Institute of Technology <i>LIGO visitor program, hosted by Prof.Alan Weinstein</i> – Development and event follow-up for online analysis of a GW detection pipeline, GstLAL – Joint study on GW search for the ultra-light boson particle through superradiant instability	Pasadena, CA Summer 2019
Laboratoire d'Annecyde Physiquesdes Particules <i>Visiting research, supervised by Dr.Tania Regimbau</i> – Mock data study for the detection of stochastic GW background from anisotropically distributed compact binary coalescence.	Annecy, France Fall 2018
University of Minnesota <i>Visiting research, supervised by Prof.Vuk Mandic</i> – Development of a search pipeline for GW background from ultra-light scalar fields.	Minneapolis, MN Spring 2018

The University of Tokyo

B.S. Research, supervised by Prof. Norikatsu Mio

Tokyo, Japan

2015–2016

- Evaluating optical properties and frequency stability of the reference cavity KAGRA.

LIGO Livingston Observatory, California Institute of Technology

LIGO SURF program, supervised by Dr. Valery Frolov

Livingston, LA

Summer 2014

- Constructing the theoretical model of the optical loss inside the arm cavities of the Advanced LIGO.

SCHOLARSHIPS AND AWARDS

• Best Poster Award , Gravitational Wave Orchestra	2022
• Best Presentation Award , The 7th KAGRA International Workshop	2020
• Japan Society for the Promotion of Science DC1 fellowship	2018–2021
• LIGO Visitor Program , California Institute of Technology	2019
• Overseas Challenge Program for Young Researchers , JSPS	2019
• GRASP Scholarship , The University of Tokyo	2018
• SURF Program , California Institute of Technology	2014
• Best Project Award , Cosmic/Particle Spring school	2014

RESEARCH TALKS

INVITED TALKS, SEMINARS, PANEL, SYMPOSIUM

<i>The improvement of GstLAL's ranking statistics toward the fourth observing run</i>	2023
Utrecht & UMass Dartmouth joint seminar	USA (online)
<i>Overview and future prospect of LIGO-Virgo-KAGRA's fourth observing run</i>	2023
Astronomy Society of Japan Autumn meeting	Nagoya, Japan
<i>Toward unified Bayesian parameter inference of stochastic gravitational wave backgrounds</i>	2023
C-lab seminar, Nagoya University	Nagoya, Japan
<i>Panel for gravitational waves and multi-messenger astronomy</i>	2023
New Evolution of Multi-Messenger Astrophysics, Penn State	State College, USA
<i>Observation of neutron stars during LIGO-Virgo-KAGRA's observing runs</i>	2022
APS April meeting	New York, USA
<i>Modeling and searching for a stochastic GW background from ultralight bosons</i>	2021
GW Physics and Astronomy: Genesis, The Fourth Annual Area Symposium	Japan (online)
<i>Low-latency detection of the GWs from compact binary coalescences</i>	2022
ISAS seminar, ISM astronomy seminar, JGW seminar	Japan
<i>Gravitational waves from neutron star-black hole coalescences</i>	2021
LIGO-Virgo-KAGRA Collaboration webinar	
<i>First observations of black hole and neutron star mergers</i>	2021
Fundamental Theory Seminar, Penn State	Pennsylvania, USA
<i>First search for stochastic GW backgrounds from ultra-light bosons</i>	2018
The CGCA seminar, University of Wisconsin Milwaukee	Wisconsin, USA
<i>Application of a low-latency whitening filter to CBC GW searches</i>	2016
RESCEU joint seminar, The University of Tokyo	Tokyo, Japan

SELECTED CONTRIBUTED TALKS

<i>The improvement of GstLAL's ranking statistics toward the fourth observing run</i>	2023
APS April meeting	Minnesota, USA
<i>First observations of black hole and neutron star mergers</i>	2021
The 8th KAGRA International Workshop	Korea (online)
<i>Modeling and searching for a stochastic GW background from ultralight bosons</i>	2021
Amaldi 14	Australia (online)
<i>Stochastic GW backgrounds from ultra-light vectors</i>	2019
The 29th Workshop on General Relativity and Gravitation in Japan	Kobe, Japan
<i>Anisotropic GW background Mock data study</i>	2019
Gravitational Wave Physics and Astronomy Workshop	Tokyo, Japan
<i>A first search for stochastic GW backgrounds from ultra-light scalars</i>	2018
Gravitational Wave Physics and Astronomy Workshop	Maryland, USA
<i>Application of a low-latency whitening filter to CBC GW searches</i>	2017
The Third KAGRA International Workshop	Taipei, Taiwan

TEACHING EXPERIENCE

- **Substitute Lecturer** at Pennsylvania State University Fall 2022
Electromagnetism
- **Teaching Assistant** at The University of Tokyo Fall 2016
Analytical mechanics

MENTORING EXPERIENCE

- **Soichiro Kuwahara** Ph.D student at The University of Tokyo
GPU-accelerated parameter estimation for anisotropic gravitational-wave backgrounds
- **Santiago Jaraba** Ph.D student at Universidad Aut'onoma de Madrid
Parameter estimation for anisotropic gravitational-wave backgrounds [9]
- **Deepali Agarwal** Ph.D student at Inter-University Centre for Astronomy and Astrophysics (IUCAA)
Parameter estimation for anisotropic gravitational-wave backgrounds [9]
- **Erik Floden** Ph.D student at University of Minnesota
Parameter estimation and spherical-harmonics searches of anisotropic gravitational-wave backgrounds [9], [13], [26]
- **Anarya Ray** Ph.D student at University of Wisconsin-Milwaukee
Improving background sampling procedure for GstLAL
- **Richard George** Ph.D student at The University of Texas at Austin
Improving SNR – ξ^2 signal model of GstLAL [3]
- **Andre Guimaraes** Ph.D student at Louisiana State University
Improving SNR – ξ^2 signal model of GstLAL [3]
- **Shio Sakon** Ph.D student at Pennsylvania State University
Optimization of GstLAL's template bank [11]
- **Shomik Adhicary** Ph.D student at Pennsylvania State University
Improving ranking statistics for gravitational-wave detection pipeline, GstLAL [3]
- **Prathamesh Joshi** Ph.D student at Pennsylvania State University
Implementation of contamination removal and bank- ξ^2 statistics in GstLAL [1], [3]
- **Takuya Tsutsui** Ph.D student at The University of Tokyo
Rapid localization of gravitational wave sources [17]

PROFESSIONAL SERVICE

- **Thesis committee**, Pennsylvania State University 2023–2023
- **Co-leader of anisotropic stochastic-background working group**, LVK Collaboration 2022–present
- **Referee**, Physical Review D 2022–present
- **Advanced LIGO science summaries**, Writer and japanese translator 2021–present
- **Vice director**, Cosmic/Astrophysics Student Summer School in Japan 2019
- **Workshop Assistant**, Gravitational Wave Physics and Astronomy Workshop 2019

OUTREACH

- **KAGRA outreach group** 2020–2021
- **SCJSF&JABA forum talk** 2020
- **Japanese translation of GW190425’s science summary** 2019
- **GW education at a public school in Pasadena** 2019
- **RESCEU Open Lab** 2017, 2018
- **International Space Education Board Student Program** 2015, 2016

SHORT AUTHOR LIST PUBLICATIONS AND PREPRINTS

- [1] P. Joshi, **L. Tsukada**, and C. Hanna, “Method for removing signal contamination during significance estimation of a gstlal analysis”, *Phys. Rev. D*, vol. 108, p. 084032, 8 Oct. 2023.
- [2] **L. Tsukada**, *Extension of the bayesian searches for anisotropic stochastic gravitational-wave background with non-tensorial polarizations*, Aug. 2023. arXiv: 2308.09020 [astro-ph.IM].
- [3] **L. Tsukada**, P. Joshi, *et al.*, “Improved ranking statistics of the gstlal inspiral search for compact binary coalescences”, *Physical Review D*, vol. 108, no. 4, Aug. 2023.
- [4] Arianna Renzini, *et al.* including **L. Tsukada**, “Pygwb: A python-based library for gravitational-wave background searches”, *The Astrophysical Journal*, vol. 952, no. 1, p. 25, Jul. 2023.
- [5] S. Morisaki, R. Smith, **L. Tsukada**, S. Sachdev, S. Stevenson, C. Talbot, and A. Zimmerman, *Rapid localization and inference on compact binary coalescences with the advanced ligo-virgo-kagra gravitational-wave detector network*, Jul. 2023. arXiv: 2307.13380.
- [6] Anarya Ray, *et al.* including **L. Tsukada**, *When to point your telescopes: Gravitational wave trigger classification for real-time multi-messenger followup observations*, Jun. 2023. arXiv: 2306.07190 [gr-qc].
- [7] B. Ewing, R. Huxford, D. Singh, **L. Tsukada**, *et al.*, *Performance of the low-latency gstlal inspiral search towards ligo, virgo, and kagra’s fourth observing run*, May 2023. arXiv: 2305.05625 [gr-qc].
- [8] S. Banagiri, C. P. L. Berry, G. S. C. Davies, **L. Tsukada**, and Z. Doctor, *A unified p_{astro} for gravitational waves: Consistently combining information from multiple search pipelines*, Apr. 2023. arXiv: 2305.00071 [astro-ph.IM].
- [9] **L. Tsukada**, S. Jaraba, D. Agarwal, and E. Floden, “Bayesian parameter estimation for targeted anisotropic gravitational-wave background”, *Physical Review D*, vol. 107, no. 2, Jan. 2023.
- [10] Chad Hanna, *et al.* including **L. Tsukada**, “Binary tree approach to template placement for searches for gravitational waves from compact binary mergers”, *Physical Review D*, vol. 108, no. 4, 2023.
- [11] S. Sakon, **L. Tsukada**, *et al.*, *Template bank for compact binary mergers in the fourth observing run of advanced ligo, advanced virgo, and kagra*, Nov. 2022. arXiv: 2211.16674 [gr-qc].
- [12] Chad Hanna, *et al.* including **L. Tsukada**, “Metric assisted stochastic sampling search for gravitational waves from binary black hole mergers”, *Physical Review D*, vol. 106, no. 8, Oct. 2022.
- [13] E. Floden, V. Mandic, A. Matas, and **L. Tsukada**, “Angular resolution of the search for anisotropic stochastic gravitational-wave background with terrestrial gravitational-wave detectors”, *Physical Review D*, vol. 106, no. 2, Jul. 2022.
- [14] Kipp Cannon, *et al.* including **L. Tsukada**, “Gstlal: A software framework for gravitational wave discovery”, *SoftwareX*, vol. 14, p. 100680, Jun. 2021, ISSN: 2352-7110.
- [15] Debnandini Mukherjee, *et al.* including **L. Tsukada**, “Template bank for spinning compact binary mergers in the second observation run of advanced ligo and the first observation run of advanced virgo”, *Physical Review D*, vol. 103, no. 8, Apr. 2021.
- [16] **L. Tsukada**, R. Brito, W. E. East, and N. Siemonsen, “Modeling and searching for a stochastic gravitational-wave background from ultralight vector bosons”, *Phys. Rev. D*, vol. 103, p. 083005, 8 Apr. 2021.
- [17] T. Tsutsui, K. Cannon, and **L. Tsukada**, “High speed source localization in searches for gravitational waves from compact object collisions”, *Phys. Rev. D*, vol. 103, p. 043011, 4 Feb. 2021.
- [18] Surabhi Sachdev, *et al.* including **L. Tsukada**, “An early-warning system for electromagnetic follow-up of gravitational-wave events”, *The Astrophysical Journal*, vol. 905, no. 2, p. L25, Dec. 2020.
- [19] Cody Messick, *et al.* including **L. Tsukada**, *Automating the inclusion of subthreshold signal-to-noise ratios for rapid gravitational-wave localization*, Nov. 2020. arXiv: 2011.02457 [astro-ph.IM].

- [20] Patrick Godwin, *et al.* including **L. Tsukada**, *Incorporation of statistical data quality information into the gstlal search analysis*, Oct. 2020. arXiv: 2010.15282 [gr-qc].
- [21] Chiwai Chan, *et al.* including **L. Tsukada**, “Improving the background estimation technique in the gstlal inspiral pipeline with the time-reversed template bank”, Sep. 2020. eprint: 2009.03025.
- [22] C. Hanna, S. Caudill, C. Messick, A. Reza, S. Sachdev, **L. Tsukada**, *et al.*, “Fast evaluation of multidetector consistency for real-time gravitational wave searches”, *Physical Review D*, vol. 101, no. 2, Jan. 2020.
- [23] **L. Tsukada**, T. Callister, A. Matas, and P. Meyers, “First search for a stochastic gravitational-wave background from ultralight bosons”, *Physical Review D*, vol. 99, no. 10, May 2019.
- [24] Surabhi Sachdev, *et al.* including **L. Tsukada**, *The gstlal search analysis methods for compact binary mergers in advanced ligo’s second and advanced virgo’s first observing runs*, Jan. 2019. arXiv: 1901.08580 [gr-qc].
- [25] **L. Tsukada**, K. Cannon, C. Hanna, D. Keppel, D. Meacher, and C. Messick, “Application of a zero-latency whitening filter to compact binary coalescence gravitational-wave searches”, *Physical Review D*, vol. 97, no. 10, May 2018.

COLLABORATION PUBLICATIONS (MAJOR CONTRIBUTION)

- [26] B. P. Abbott *et al.*, “Search for anisotropic gravitational-wave backgrounds using data from advanced ligo and advanced virgo’s first three observing runs”, *Phys. Rev. D*, vol. 104, p. 022005, 2 Jul. 2021.
- [27] B. P. Abbott *et al.*, “Gwtc-2: Compact binary coalescences observed by ligo and virgo during the first half of the third observing run”, *Physical Review X*, vol. 11, no. 2, Jun. 2021.
- [28] B. P. Abbott *et al.*, “Observation of gravitational waves from two neutron star–black hole coalescences”, *The Astrophysical Journal Letters*, vol. 915, no. 1, p. L5, Jun. 2021.