

EMPLOYMENT

University of Nevada, Las Vegas NCfA Fellow	Las Vegas, NV 2024–present
Pennsylvania State University Assistant Research Professor Postdoctoral Scholar	University Park, PA 2022–2024 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 detector	Tokyo, Japan 2011–2016

RESEARCH EXPERIENCE

Nevada Center of Astrophysics, University of Nevada, Las Vegas – Optimizing a GW search pipeline, GstLAL, targeted for electromagnetic counterparts.	Las Vegas, NV 2024–present
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 2021–2024
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 Physique des 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>	Minneapolis, MN Spring 2018
– Development of a search pipeline for GW background from ultra-light scalar fields.	
The University of Tokyo <i>B.S. Research, supervised by Prof. Norikatsu Mio</i>	Tokyo, Japan 2015–2016
– Evaluating optical properties and frequency stability of the reference cavity KAGRA.	
LIGO Livingston Observatory, California Institute of Technology <i>LIGO SURF program, supervised by Dr. Valery Frolov</i>	Livingston, LA Summer 2014
– Constructing the theoretical model of the optical loss inside the arm cavities of the Advanced LIGO.	

TEACHING EXPERIENCE

• Substitute Lecturer at Pennsylvania State University <i>Electromagnetism</i>	Fall 2022
• Teaching Assistant at The University of Tokyo <i>Analytical mechanics</i>	Fall 2016

FELLOWSHIP AND AWARDS

• NCfA Fellowship , University of Nevada Las Vegas	2024
• Paper Award , United Japanese researchers Around the world	2024
• LEADER Fellowship (declined), Japan Society for the Promotion of Science (JSPS)	2023
• Best Poster Award , Gravitational Wave Orchestra	2022
• Best Presentation Award , The 7th KAGRA International Workshop	2020
• DC1 Research Fellowship , JSPS	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>Going wider and deeper in the search for gravitational waves</i> CRA seminar, Georgia Institute of Technology	2024 Atlanta, USA
<i>Going wider and deeper in the search for gravitational waves</i> Astrophysics Colloquium, Texas Tech University	2024 Lubbock, USA
<i>Overview and prospect of the GW transient search in the fourth observing run</i> The extreme Universe : CTA-Japan workshop	2024 Tokyo, Japan
<i>Toward unified Bayesian parameter inference of stochastic gravitational wave backgrounds</i> LIGO seminar, California Institute of Technology	2023 Pasadena, USA
<i>The improvement of GstLAL's ranking statistics toward the fourth observing run</i> Utrecht & UMass Dartmouth joint seminar	2023 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

MENTORING EXPERIENCE

- **Soichiro Kuwahara** Ph.D student at The University of Tokyo spring 2022 - present
GPU-accelerated parameter estimation for anisotropic gravitational-wave backgrounds
- **Santiago Jaraba** Ph.D student at Universidad Aut'ónoma de Madrid spring 2022 - 2024
Parameter estimation for anisotropic gravitational-wave backgrounds [12]
- **Deepali Agarwal** Ph.D student at IUCAA spring 2022 - 2023
Parameter estimation for anisotropic gravitational-wave backgrounds [12]
- **Erik Floden** Ph.D student at University of Minnesota spring 2021 - present
Parameter estimation and spherical-harmonics searches of anisotropic gravitational-wave backgrounds [12], [15], [28]
- **Anarya Ray** Ph.D student at University of Wisconsin-Milwaukee spring 2022 - spring 2023
Improving background sampling procedure for GstLAL
- **Richard George** Ph.D student at The University of Texas at Austin spring 2022 - spring 2023
Improving SNR – ξ^2 signal model of GstLAL [9]
- **Andre Guimaraes** Ph.D student at Louisiana State University spring 2022 - spring 2023
Improving SNR – ξ^2 signal model of GstLAL [9]
- **Shio Sakon** Ph.D student at Pennsylvania State University spring 2022
Optimization of GstLAL's template bank [3]
- **Shomik Adhicary** Ph.D student at Pennsylvania State University spring 2022 - present
Improving ranking statistics for gravitational-wave detection pipeline, GstLAL [9]
- **Prathamesh Joshi** Ph.D student at Pennsylvania State University spring 2022 - present
Implementation of contamination removal and bank- ξ^2 statistics in GstLAL [8], [9]
- **Takuya Tsutsui** Ph.D student at The University of Tokyo 2019
Rapid localization of gravitational wave sources [19]

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, Physical Review Letter 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] S. S. Chaudhary, *et al.* including **L. Tsukada**, “Low-latency gravitational wave alert products and their performance at the time of the fourth ligo-virgo-kagra observing run”, *Proceedings of the National Academy of Sciences*, vol. 121, no. 18, e2316474121, Apr. 2024.
- [2] 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”, *Physical Review D*, vol. 109, no. 4, Feb. 2024.
- [3] S. Sakon, **L. Tsukada**, *et al.*, “Template bank for compact binary mergers in the fourth observing run of advanced ligo, advanced virgo, and kagra”, *Physical Review D*, vol. 109, no. 4, Feb. 2024.
- [4] S. Schmidt, S. Caudill, J. D. E. Creighton, R. Magee, **L. Tsukada**, *et al.*, *Searching for gravitational-wave signals from precessing black hole binaries with the gstlal pipeline*, 2024. arXiv: 2403.17186 [gr-qc].
- [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”, *Phys. Rev. D*, vol. 108, p. 123 040, 12 Dec. 2023.
- [6] **L. Tsukada**, “Extension of the bayesian searches for anisotropic stochastic gravitational-wave background with nontensorial polarizations”, *Physical Review D*, vol. 108, no. 12, Dec. 2023.
- [7] S. Banagiri, C. P. L. Berry, G. S. C. Davies, **L. Tsukada**, and Z. Doctor, “Unified p_{astro} for gravitational waves: Consistently combining information from multiple search pipelines”, *Phys. Rev. D*, vol. 108, p. 083 043, 8 Oct. 2023.
- [8] 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. 084 032, 8 Oct. 2023.
- [9] **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.
- [10] A. 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.
- [11] A. 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].
- [12] **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.
- [13] C. 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.
- [14] C. 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.
- [15] 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.
- [16] K. Cannon, *et al.* including **L. Tsukada**, “Gstlal: A software framework for gravitational wave discovery”, *SoftwareX*, vol. 14, p. 100 680, Jun. 2021, ISSN: 2352-7110.
- [17] D. 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.
- [18] **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. 083 005, 8 Apr. 2021.

- [19] 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.
- [20] S. 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.
- [21] C. 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].
- [22] P. Godwin, *et al.* including **L. Tsukada**, *Incorporation of statistical data quality information into the gstlal search analysis*, Oct. 2020. arXiv: 2010.15282 [gr-qc].
- [23] C. 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.
- [24] 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.
- [25] **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.
- [26] S. 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].
- [27] **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)

- [28] B. P. Abbott, *et al.* including **L. Tsukada**, “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.
- [29] B. P. Abbott, *et al.* including **L. Tsukada**, “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.
- [30] B. P. Abbott, *et al.* including **L. Tsukada**, “Observation of gravitational waves from two neutron star–black hole coalescences”, *The Astrophysical Journal Letters*, vol. 915, no. 1, p. L5, Jun. 2021.