KWANGMIN OH

Curriculum Vitae

Michigan State University
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Appointments

2023–present **Postdoctoral Research Associate**, *Michigan State University*, USA.
X-ray observation, Globular cluster, X-ray binaries, Compact objects, Black hole

Education

2019–2023 : **PhD, Astronomy & Astrophysics**, *Chungnam National University*, Korea.
X-ray observation, Globular cluster, Compact objects, Black hole, Gravitational wave, Clustering, Machine Learning

2017–2019 : **MS, Astronomy & Space Science**, *Chungnam National University*, Korea.

2008–2017 : **BS, Astronomy & Space Science**, *Chungnam National University*, Korea.

Current Research

2023 – ***Ultra-luminous X-ray sources Analysis***.
Exploring ultra-luminous X-ray sources in globular clusters using long-term X-ray and optical data to understand their nature including evolution and dynamics.

2021 – ***Globular Cluster Dynamics***.
Using Monte-Carlo simulations to study the impact of dense globular cluster environments on the formation and evolution of compact objects, comparing these insights with observational data.

2020 – ***Machine Learning for Compact Object Classification***.
Creating an automated system to classify compact objects in globular clusters, training the model with data from the well-studied 47 Tuc cluster and applying it to 12 other clusters.

Research Experiences

Michigan State University

2024 – present ***Undergraduate Student Mentorship***.
Supervised an undergraduate research project focused on classifying X-ray sources in unstudied GCs, guiding data analysis and machine learning applications for astrophysical classification.

2023 – present ***Studying Ultra-luminous X-ray Sources in Extragalactic Globular Clusters***.
Led a conducted a detailed analysis of 15-20 years of X-ray and optical data to investigate the dynamics and evolutionary processes of ultra-luminous X-ray (ULX) sources in extragalactic globular clusters.
Advisor: Dr. Stephen E. Zepf, *Professor, Department of Physics & Astronomy*, Michigan State University

2023 – present ***Globular Cluster Dynamics***.
By comparing Monte Carlo simulation results to observational data, this research examines the formation and interaction of compact objects in dense GCs

Chungnam National University

2019 – 2023 ***Machine Learning Techniques for Classifying Compact Objects in Globular Clusters***.
Developed advanced machine learning algorithms for the automatic classification of compact objects within globular clusters, leveraging well-documented clusters as training datasets.
Advisor: Dr. David Hui, *Professor, Department of Astronomy & Space Science*, Chungnam National University

2017 – 2020 ***Studying Compact Objects in Globular Clusters***.
Identified a variety of compact objects, including cataclysmic variables, millisecond pulsars, low-mass X-ray binaries, and black holes, within globular clusters.
Advisor: Dr. David Hui, *Professor, Department of Astronomy & Space Science*, Chungnam National University

Gravitational Wave Data Research as LIGO-Virgo-KAGRA (LVK) Collaboration Member

June 2019 – present ***KAGRA Collaboration Member***.
Contributed to gravitational wave data research as part of the LIGO-Virgo-KAGRA (LVK) collaboration, with a focus on developing noise reduction techniques to enhance gravitational wave signal detection.
Advisor: Dr. David Hui, *Professor, Department of Astronomy & Space Science*, Chungnam National University

Fellowships

2022 – 2023 ***Research Subsidies for Ph.D. Fellowship*** of National Research Foundation of Korea, Government of Korea, as a PhD research scholar, (40K USD)

2019 – 2022 ***Global Ph.D. Fellowship*** of National Research Foundation of Korea, Government of Korea, as a PhD research scholar, (100K USD)

Awards & Achievements

Feb, 2022 ***Research Fair*** of Chungnam National University, Korea

August, 2021 ***Excellence Research Award*** of Chugnam National University, Korea

Spring, 2019 ***Academic excellence scholarship*** in Chugnam National University, Korea

2017 ***Academic excellence scholarship*** in Chugnam National University, Korea

Research Skills and Expertise

Languages Python, R, IDL, IRAF, CIAO, HEASoft, extensive experience in Linux-based scripting for scientific computing and data analysis.

Machine Learning Skilled in auto-regressive modeling and machine learning algorithms (scikit-learn, Keras) for data classification and prediction.

Data Analysis X-ray spectroscopy, imaging, and timing analysis **(Chandra, XMM-Newton)**; Optical and Ultraviolet spectroscopy **(SOAR, GEMINI, MAGELLAN)**, Gamma-ray binned likelihood analysis **(Fermi/LAT)**.

Simulation Modeling Proficient in Monte-Carlo N-body cluster simulation using **MOCCA** for studying dynamical processes and cluster evolution. Experienced in **CLOUDY** model simulations for analyzing the physical conditions and spectra of ionized gases surrounding stars.

Teaching Experience

2018 ***Astronomical Instruments***, *Teaching Assistant at Astronomy & Space Science dept*, Chungnam National University.

2017 ***Astronomical Observation & Practice***, *Teaching Assistant at Astronomy & Space Science dept*, Chungnam National University.

2017 ***Research Assistant***, *at Statistics dept*, Chungnam National University.

Conferences & Presentations

2024 Seminar talk, *Dynamical Effects in Globular Clusters and the Formation of X-ray Sources*, Research Seminar, October, 9th, 2024, Michigan State University, East Lansing, MI, USA

2024 Oral presentation, *Probing Intracluster Dynamics and Evolution of Globular Clusters through Cataclysmic Variable Populations*, MODEST24, August, 18th-23rd, 2024, Nicolaus Copernicus Astronomical Center, Warsaw, Poland

2024 Oral presentation, *Probing Intracluster Dynamics and Evolution of Globular Clusters through Cataclysmic Variable Populations*, COSPAR 2024, July 13th-21st, 2024, Korea

2024 Oral presentation, *Intracluster dynamics and evolution via CV populations*, University of Toronto, Globular Clusters and Their Tidal Tails, May 28th-31st, 2024, Toronto, Canada

2024 Poster, *Influences of dynamical disruptions on the evolution of pulsars in globular clusters*, AAS 243, 243rd meeting of American Astronomical Society, 7–11 Jan 2024, New Orleans, Louisiana, USA

2023 Seminar talk, *Unveiling Interaction in Globular Clusters and their Impact on Compact Binary Evolution*, Research Seminar, 27, July, The University of Hong Kong, Hong Kong

2022 Invited talk, *Unveiling Impacts of Dynamical Effects on the Compact Binaries in Globular Clusters*, 67th Workshop on Gravitational waves and Numerical Relativity, 26-27, Oct, APCTP Headquarter, Korea

2021 Oral presentation, *Classifying X-ray sources in globular clusters by ensemble learning*, 5th Center for High-Energy Astrophysics Workshop, 29-30 Oct, 2021, Korea

2020 Oral presentation, *Adopting Machine Learning Techniques X-ray Source Classification in Globular Cluster*, 2020 7th SGPF conference, 14 Nov, 2020, National Research Foundation of Korea, Korea

2020 Oral presentation, *Adopting machine learning for identifying X-ray sources in globular cluster*, 4th Center for High-Energy Astrophysics Workshop, 15-16 Jan, 2020, Korea

2019 Poster, *Searching for gravitational waves from core-collapse supernovae using weighted wavelet z-transform and Hilbert-Huang transform*, KAGRA, the 22nd Face to Face meeting, 4-5 Dec, 2019, RESCEU (Research Center for the Early Universe), Tokyo, Japan

2019 Poster, *Multi-Epoch X-ray observations of globular cluster M62* , X-ray Astronomy 2019: Current Challenges and New Frontier in the Next Decade, 8-13 Sep, 2019, CNR/INAF Research Area, Bologna, Italy

2019 Poster, *Searching continuous gravitational waves with an autoregressive approach*, KAGRA, the 23rd Face to Face meeting, Univ of Toyama, 22-24 Aug, 2019, Univ. of Toyama, Japan

2019 Poster, *Searching continuous gravitational waves with an autoregressive approach*, KAGRA, the 22nd Face to Face meeting, 19-21 April, 2019, ICRR, Kashiwa

2019 Oral presentation, *X-ray observation of Globular clusters*, 3rd Center for High-Energy Astrophysics Workshop, 16-17 Jan, 2019, Korea

2018 Poster, *Multi-epoch X-ray observations of globular cluster M62*, MODEST-18 Dense stellar systems in the er of GAIA, LIGO & LISA, 25-29 June, 2018, FIRÁ, Santorini, Greece

2018 Oral presentation, *An X-ray emission from Globular cluster*, CHEA Workshop on High Energy Astrophysics of Compact Objects, 12-13 April, 2018, UNIST, Korea

2018 Oral presentation, *High energy observation of Globular Cluster*, 2nd Center for High-Energy Astrophysics Workshop, 17-18 Jan, 2018, Korea

2017 Oral presentation, *High energy observation of Globular Cluster*, The 7th Fermi Asian Network Workshop, 7-11 Dec 2017, Lijiang, China

2017 Poster, *Re-examining the gamma-Ray Properties of Globular Clusters*, 7th International Fermi Symposium, 15-20 Oct 2017, Congress Center Garmisch-Partenkirchen

Publications

2025 B. Leal, **Kwangmin, Oh**, J Strader, S Zepf, K Dage, Sangin Kim, C. Y. Hui. The X-ray Source Population of the Metal-Rich Globular Cluster NGC 6528 (in prep)

2025 **Kwangmin, Oh**, Kristen C. Dage, Alexey Bobrick, Elias Aydi, Arash Bahramian, Adelle J. Goodwin, Daryl Haggard, Jimmy Irwin, Arunav Kundu, Jay Strader, Thomas J. Maccarone, and Stephen E. Zepf. Spectral insights and evolutionary pathways of globular cluster ULX in NGC 1399: a two-decade X-ray and optical study. , volume 537, pages 3884–3894, March 2025.

2025 Kristen C. Dage, Evangelia Tremou, Bolivia Cuevas Otahola, Eric W. Koch, **Kwangmin, Oh**, Richard M. Plotkin, Vivian L. Tang, Muhammad Ridha Aldhalemi, Zainab Bustani, Mariam Ismail Fawaz, Hans J. Harff, Amna Khalyleh, Timothy McBride, Jesse Mason, Anthony Preston, Cortney Rinehart, Ethan Vinson, Gemma Anderson, Edward M. Cackett, Shih Ching Fu, Sebastian Kamann, Teresa Panurach, Renuka Pechetti, Payaswini Saikia, Susmita Sett, Ryan Urquhart, and Christopher Usher. Detecting the Black Hole Candidate Population in M51's Young Massive Star Clusters: Constraints on Accreting Intermediate-mass Black Holes. , volume 979, page 82, January 2025.

2024 **Kwangmin, Oh**, Jongsuk Hong, C. Y. Hui, Sangin Kim, and Mirek Giersz. Probing intracluster dynamics and evolution of globular clusters through cataclysmic variable populations. , volume 532, pages 259–269, July 2024.

2024 Sangin Kim, C. Y. Hui, Jianqi Yan, Alex P. Leung, **Kwangmin, Oh**, A. K. H. Kong, L. C.-C. Lin, and Kwan-Lok Li. Autoregressive search of gravitational waves: Denoising. *Phys. Rev. D*, volume 109, page 102003. American Physical Society, May 2024.

2023 **Kwangmin, Oh**, C Y Hui, Jongsuk Hong, J Takata, A K H Kong, Pak-Hin Thomas Tam, Kwan-Lok Li, and K S Cheng. Influences of dynamical disruptions on the evolution of pulsars in globular clusters. *Monthly Notices of the Royal Astronomical Society*, volume 525, pages 4167–4175, 08 2023.

2020 **Kwangmin, Oh**, C Y Hui, K L Li, and A K H Kong. Multi-epoch X-ray imaging of globular cluster M62 with Chandra. *Monthly Notices of the Royal Astronomical Society*, volume 498, pages 292–303, 08 2020.

2020 Sangin Kim, C. Y. Hui, Jongsu Lee, **Kwangmin, Oh**, L. C. C. Lin, and J. Takata. A deep X-ray spectral imaging of the bow-shock pulsar wind nebula associated with PSR B1929+10. *Astron. Astrophys.*, volume 637, page L7, 2020.

2020 C Y Hui, Jongsu Lee, K L Li, Sangin Kim, **Kwangmin, Oh**, Shengda Luo, Alex P Leung, A K H Kong, J Takata, and K S Cheng. Searches for pulsar-like candidates from unidentified objects in the Third Catalog of Hard Fermi-LAT Sources with machine learning techniques. *Monthly Notices of the Royal Astronomical Society*, volume 495, pages 1093–1109, 04 2020.

2017 **Kwangmin, Oh** and C Y Hui. Re-examining the gamma-ray properties of globular clusters. 2017.

Collaboration publications

2025 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Swift-BAT GUANO Follow-up of Gravitational-wave Triggers in the Third LIGO–Virgo–KAGRA Observing Run. , volume 980, page 207, February 2025.

2024 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Ultralight vector dark matter search using data from the KAGRA O3GK run. , volume 110, page 042001, August 2024.

2024 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Swift-BAT GUANO follow-up of gravitational-wave triggers in the third LIGO-Virgo-KAGRA observing run. *arXiv e-prints*, page arXiv:2407.12867, July 2024.

2024 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Search for gravitational waves emitted from SN 2023ixf. *arXiv e-prints*, page arXiv:2410.16565, October 2024.

2024 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Observation of Gravitational Waves from the Coalescence of a 2.5–4.5 M $_\odot$ Compact Object and a Neutron Star. , volume 970, page L34, August 2024.

2024 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. A search using GEO600 for gravitational waves coincident with fast radio bursts from SGR 1935+2154. *arXiv e-prints*, page arXiv:2410.09151, October 2024.

2023 The LVK Collaboration. Search for subsolar-mass black hole binaries in the second part of Advanced LIGO's and Advanced Virgo's third observing run. *Monthly Notices of the Royal Astronomical Society*, volume 524, pages 5984–5992, 02 2023.

2023 The LVK Collaboration. Search for gravitational-lensing signatures in the full third observing run of the LIGO-Virgo network. *arXiv e-prints*, page arXiv:2304.08393, April 2023.

2023 The LVK Collaboration. Population of Merging Compact Binaries Inferred Using Gravitational Waves through GWTC-3. *Physical Review X*, volume 13, page 011048, January 2023.

2023 The LVK Collaboration. Open Data from the Third Observing Run of LIGO, Virgo, KAGRA, and GEO. , volume 267, page 29, August 2023.

2023 The LVK Collaboration. Constraints on the Cosmic Expansion History from GWTC-3. , volume 949, page 76, June 2023.

2023 The LVK Collaboration. A Joint Fermi-GBM and Swift-BAT Analysis of Gravitational-Wave Candidates from the Third Gravitational-wave Observing Run. *arXiv e-prints*, page arXiv:2308.13666, August 2023.

2023 The LVK Collaboration. *arXiv e-prints*, page arXiv:2308.03822, August 2023.

2023 KAGRA collaboration. Overview of KAGRA : Data transfer and management. *Progress of Theoretical and Experimental Physics*, volume 2023, page 10A102, 09 2023.

2023 KAGRA collaboration. Correction to: Input optics systems of the KAGRA detector during O3GK. *Progress of Theoretical and Experimental Physics*, volume 2023, page 059301, May 2023.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Searches for gravitational waves from known pulsars at two harmonics in the second and third ligo-virgo observing runs. *The Astrophysical Journal*, volume 935, page 1. The American Astronomical Society, may 2022.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Search for subsolar-mass binaries in the first half of advanced ligo's and advanced virgo's third observing run. *Phys. Rev. Lett.*, volume 129, page 061104. American Physical Society, Aug 2022.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Search for intermediate-mass black hole binaries in the third observing run of Advanced LIGO and Advanced Virgo. , volume 659, page A84, March 2022.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Search for gravitational waves from Scorpius X-1 with a hidden Markov model in O3 LIGO data. *arXiv e-prints*, page arXiv:2201.10104, January 2022.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Search for gravitational-wave transients associated with magnetar bursts in Advanced LIGO and Advanced Virgo data from the third observing run. *arXiv e-prints*, page arXiv:2210.10931, October 2022.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Search for continuous gravitational waves from 20 accreting millisecond x-ray pulsars in o3 ligo data. *Phys. Rev. D*, volume 105, page 022002. American Physical Society, Jan 2022.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Search for continuous gravitational wave emission from the Milky Way center in O3 LIGO-Virgo data. , volume 106, page 042003, August 2022.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Performance of the KAGRA detector during the first joint observation with GEO 600 (O3GK). *arXiv e-prints*, page arXiv:2203.07011, March 2022.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Narrowband Searches for Continuous and Long-duration Transient Gravitational Waves from Known Pulsars in the LIGO-Virgo Third Observing Run. , volume 932, page 133, June 2022.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Model-based cross-correlation search for gravitational waves from the low-mass X-ray binary Scorpius X-1 in LIGO O3 data. *arXiv e-prints*, page arXiv:2209.02863, September 2022.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. First joint observation by the underground gravitational-wave detector KAGRA with GEO 600. *Progress of Theoretical and Experimental Physics*, volume 2022, 04 2022. 063F01.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. All-sky search for gravitational wave emission from scalar boson clouds around spinning black holes in ligo o3 data. *Phys. Rev. D*, volume 105, page 102001. American Physical Society, May 2022.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. All-sky search for continuous gravitational waves from isolated neutron stars using Advanced LIGO and Advanced Virgo O3 data. *arXiv e-prints*, page arXiv:2201.00697, January 2022.

2022 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. All-sky, all-frequency directional search for persistent gravitational waves from advanced ligo's and advanced virgo's first three observing runs. *Phys. Rev. D*, volume 105, page 122001. American Physical Society, Jun 2022.

2022 KAGRA Collaboration LIGO Scientific Collaboration, Virgo Collaboration and CHIME/FRB Collaboration. Search for Gravitational Waves Associated with Fast Radio Bursts Detected by CHIME/FRB During the LIGO–Virgo Observing Run O3a. *arXiv e-prints*, page arXiv:2203.12038, March 2022.

2022 KAGRA collaboration. Performance of the KAGRA detector during the first joint observation with GEO600 (O3GK). *Progress of Theoretical and Experimental Physics*, volume 2023, page 10A101, 06 2022.

2022 KAGRA collaboration. Noise subtraction from KAGRA O3GK data using Independent Component Analysis. *arXiv e-prints*, page arXiv:2206.05785, June 2022.

2022 KAGRA collaboration. Input optics systems of the KAGRA detector during O3GK. *arXiv e-prints*, page arXiv:2210.05934, October 2022.

2022 KAGRA collaboration. The current status and future prospects of kagra, the large-scale cryogenic gravitational wave telescope built in the kamioka underground. *Galaxies*, volume 10, 2022.

2021 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Tests of General Relativity with GWTC-3. *arXiv e-prints*, page arXiv:2112.06861, December 2021.

2021 Virgo Collaboration LIGO Scientific Collaboration and KAGRA Collaboration. Constraints from ligo o3 data on gravitational-wave emission due to r-modes in the glitching pulsar psr j0537–6910. *The Astrophysical Journal*, volume 922, page 71. The American Astronomical Society, nov 2021.

2021 KAGRA collaboration. Vibration isolation systems for the beam splitter and signal recycling mirrors of the kagra gravitational wave detector. *Classical and Quantum Gravity*, volume 38, page 065011. IOP Publishing, mar 2021.