

Hurum Maksora Tohfa

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EDUCATION

PhD in Astronomy

University of Washington (2023-)

Supervisor: Matt McQuinn

Bryn Mawr College (2018 - 2022)

Magna Cum Laude

Bachelor's (with honors) in physics with a minor Mathematics, and concentration in scientific computing

Publications

Tohfa, H.; Crump, J.; Baker, E.; Hart, L.; Grin, D.; Brosius, M.; Chluba, J. (2023). A Cosmic Microwave Background Search for Fine-Structure Constant Evolution. <https://arxiv.org/pdf/2307.06768.pdf>

Jacobson-Galan, W. V., Dessart, L., Margutti, R., Chornock, R., Foley, R. J., Kilpatrick, C. D., Jones, D. O., Taggart, K., Angus, C. R., Bhattacharjee, S., Braff, L. A., Brethauer, D., Burgasser, A. J., Cao, F., Carlile, C. M., Chambers, K. C., Coulter, D. A., Dominguez-Ruiz, E., Dickinson, C. B., de Boer, T., Gagliano, A., Gall, C., Gao, H., Gates, E. L., Gomez, S., Guolo, M., Halford, M. R. J., Hjorth, J., Huber, M. E., Johnson, M. N., Karpoor, P. R., Laskar, T., LeBaron, N., Li, Z., Lin, Y., Loch, S. D., Lynam, P. D., Magnier, E. A., Maloney, P., Matthews, D. J., McDonald, M., Miao, H.-Y., Milisavljevic, D., Pan, Y.-C., Pradyumna, S., Ransome, C. L., Rees, J. M., Rest, A., Rojas-Bravo, C., Sandford, N. R., Sandoval Ascencio, L., Sanjaripour, S., Savino, A., Sears, H., Sharei, N., Smartt, S. J., Softich, E. R., Theissen, C. A., Tinyanont, S., **Tohfa, H.**, Villar, V. A., Wang, Q., Wainscoat, R. J., Westerling, A. L., Wiston, E., Wozniak, M. A., Yadavalli, S. K., & Zenati, Y. (2023). "SN 2023ixf in Messier 101: Photo-ionization of Dense, Close-in Circumstellar Material in a Nearby Type II Supernova". <https://arxiv.org/pdf/2306.04721.pdf>

AWARDS AND RECOGNITION

Dean's Distinguished Fellowship (UC Riverside), AIP SPS Outstanding Undergraduate Research Award, MIT Summer Research Stipend, Velay Fellowship 2020, Bryn Mawr College Summer Science Research Grant, Bryn Mawr College Merit Scholarship, Philadelphia Foundation (Hussain Scholarship), National Team Member (International Olympiad of Astronomy and Astrophysics 2017), National Team Member (International Junior Science Olympiad 2015)

RESEARCH EXPERIENCES

University of Washington

Seattle, WA

Graduate Research Assistant

Present

Advisor: Professor Matthew McQuinn

- Running simulations to analyze effect of baryon streaming velocity on large scale structure formation.

UC Riverside

Riverside, CA

Advisor: Professor Simeon Bird

- Extracting features from Lyman- α forest data using wavelet scatter transform

- Constructing corresponding fisher information matrix to compare efficiency of scatter coefficients compared to power spectra for constraining cosmological parameters.

Microsoft Research

Research Intern at Project Premonition

Mentor: Dr Simon David William Frost

Redmond, WA

May 2022-August 2022

- Designed and implemented noise-filters for separating wingbeat data from other optical noise.
- Extracted best wingbeat features and wrote time-series based deep learning neural network (LSTM) for classifying mosquito species and comparing performance with existing GAN model (increased the accuracy by about 17%)
- Ran evaluation pipeline of implemented neural network and comparing classified species trend with ecological behavior of mosquitoes to validate our results.

Undergraduate Research Assistant, Department of Physics and Astronomy Haverford College

Advisor: Professor Daniel Grin

September 2019- Present

Other Collaborators: Dr Luke Hart, Dr Jens Chluba

Fellowship received: Velay Fellowship

CMB Spectral distortion due to variation in the fine structure constant (Undergraduate Thesis)

- Wrote python programs to numerically solve relevant dynamic equations of scalar field for BSBM, Runaway Dilaton model analytically solving the equations at boundaries to validate results.
- Constraining free parameters in the models with Planck 2018, QSO data using Principal Component Analysis and Monte Carlo simulation
- Forecasting uncertainties in possible detection of the fine structure constant in upcoming CMB experiment - Simons Observatory

Research Intern, Kavli Institute for Astrophysics

Advisor: Professor Michael McDonald

Goal: Analyzing X-Ray cavity detection Bias

Massachusetts Institute Technology

May 2021- September 2021

- Proving the relationship between pressure of X-Ray cavities and luminosity can be generalized as a cluster property and analytically proving that the geometry of the cavity is the main catalyst behind the scatter seen in the pressure-luminosity relationship.
- Determining the exact correlation between distance from the cavity and cavity radius where most of the detected cavities are seen.
- Making further detailed simulations for finding ways to meaningfully account for the biases in X-Ray cavities

Undergraduate Research Assistant, Department of Physics

Advisor: Professor Michael Schulz

Award received: Bryn Mawr Summer Science Research Grant

Goal: Understanding the ultralocality of Lifshitz field using AdS/CFT correspondence.

Bryn Mawr College

May 2019- August 2019

- Analytically solved the field equations for Lifshitz metric and finding the correlation function using AdS/CFT correspondence that specified ultralocality of the field

Undergraduate Research Assistant, Department of Physics

Advisor: Professor David Schaffner

Goal: Developing a python program for analyzing energy fluctuation between different frequency level in plasma.

Bryn Mawr College

December 2018-May 2019

- Wrote a program in python using bi-spectral analysis to find the bi-coherence to see at which energy modes the energy transfer takes place in plasma. The program is now being used to understand stability of transient spiral arms in galaxies.

Relevant Course Work: Electromagnetism, Quantum Mechanics, Multivariable Calculus, Number Theory, Linear Algebra, Differential Equations, Advanced Classical Mechanics, Mathematical Methods, Real Analysis, Abstract Algebra, Abstract Algebra II, Advanced Quantum Mechanic, Advanced Electronics Lab, Applied Statistics, Introduction to Computer Science, Statistical Mechanics and Thermodynamics, Advanced Electrodynamics and Magnetism, Introduction to Data Structures and Algorithms, Graph Theory, Classical Mechanics and Galactic Dynamics (Graduate Level), Computational Physics, Computational Cosmology

Graduate level - Classical Mechanics, Electromagnetism I & II, Math Methods, Fundamentals of Astrophysics, Observational Astrophysics, Statistical Mechanics and thermodynamics, Galactic Dynamics, Cosmology

Other: LICK workshop in observational astronomy 2023, Center for Matter at Atomic Pressures Summer School 2021 (selected to receive a stipend), CMB-S4 Summer School 2021

WORKING EXPERIENCE

University of California Riverside Riverside, CA

- Teaching Assistant for Introductory physics lab Fall 2022, Winter 2023, Spring 2023

Haverford College Haverford, PA

- Teaching Assistant for Phys-309(Advanced Electromagnetism) Fall 2021
- Teaching Assistant for Phys-303(Statistical Mechanics and Thermodynamics) Fall 2021
- Teaching Assistant for Phys-302(Advanced Quantum Mechanics) Spring 2021
- Teaching Assistant for Phys-308(Advanced Classical Mechanics) Fall 2020
- Teaching Assistant for Math-121(Multivariable Calculus) Spring 2020

Student Consultant

- Helping to re-evaluate Haverford College's Chemistry major compared to other peer institutions to make the major accessible and content for both the students and the faculties (Fall 2019), developing resources for Trauma-informed, Anti-racist Remote Teaching and Learning (Summer 2020), developing resources for pedagogical challenges in STEM education and providing suggestions to make learning more equitable and accessible (Summer 2020), facilitating open conversation on trauma-informed, Anti-racist, Remote Teaching and Learning (Summer and fall 2020), helping Haverford College Math department to make their curriculum more equitable for remote classes (Summer 2020), providing meaningful feedback in designing syllabus and collecting student feedback for Statistical Thermodynamics and Kinetics (Fall 2020, 2021)

Bryn Mawr College Bryn Mawr, PA

- Peer Tutor (Introductory Physics, Modern Physics) Fall 2020- Spring 2022
- Quantitative center tutor Fall 2020-Spring 2022
- Teaching Assistant for Phys-101: Introductory physics (Fall 2019) and Phys-102: Introductory physics II (Spring 2019,2020)

Publications

Tohfa. Hurum "Fine structure constant variation due to special variation", Virtual Summer Research Symposium, Haverford College, PA, 2020

Tohfa. Hurum Maksora "Fine structure constant variation", American Physical Society, NY, 2022

Tohfa. Hurum Maksora "Fine structure constant variation", American Astronomical Society, CA, 2022

Tohfa. Hurum Maksora "Understanding X-ray Cavities", MIT Summer Research Symposium, Massachusetts Institute of Technology, MA, 2021

Tohfa. Hurum, Pandey.Shiksha, Khan.Faryal, "Computing Lifshitz Field Theory Correlation Functions Using the AdS/CFT Correspondence", Summer Science Research Symposium, Bryn Mawr College, PA, 2019

Tohfa. Hurum, Pandey, Shiksha “Bispectrum Analysis on non-linear system”, Spring Research Symposium, Bryn Mawr College, PA, 2019

SKILLS AND INTERESTS

Clubs and organizations: President of Society of physics students: Bryn Mawr Chapter (Awarded as 2019-2020 Distinguished SPS Chapter), STEM Scholar (New York Academy of Sciences), Member (American Physical Society, Bryn Mawr College Math Club)

Computational skills: Bayesian Statistics, High performance computing, Programming Languages- Python, Mathematica, Java, R.

Languages: Bengali (Native), English (Fluent), Spanish (Elementary)