

Hung Kwan Fok

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Education

Brandeis University

B.S. in Applied Mathematics & Physics with Highest Honors (*Summa Cum Laude*)

Waltham, MA

Aug 2019 - May 2023

- **Cummulative GPA:** 3.96/4.00
- **Major GPAs:** 3.98/4.00 (Physics), 4.00/4.00 (Applied Mathematics)
- **Advisors:** Prof. Reto Trappitsch, Prof. James Cho
- **Honor Thesis:** The Impact of Nuclear Uncertainties on the Galactic Chemical Evolution of Silicon Isotopes
- **Courses:** Origins of Elements, Particle Physics, Quantum Theory, Electromagnetism, Waves and Oscillations, Thermodynamics and Statistical Mechanics, Principles of Mathematical Modeling (Dynamical Systems), Advanced Calculus and Fourier Analysis (PDEs), Differential Equations, Numerical Methods and Big Data, Advanced Programming Techniques

Research Interest

- **Astrophysical Fluid Dynamics:** Exoplanet, Protoplanetary Discs, Stellar Convection
- **Exoplanet Climates and Atmospheric Dynamics:** General Circulation Models (GCMs)

Research Experience

Post-Baccalaureate Researcher

Waltham MA

Advisor: Prof. James Y-K. Cho

June 2023 - Present

- My research focuses on studying exoplanet atmospheric dynamics utilizing General Circulation Models (GCMs).
- Developed the pseudo-spectral solver **SWBOB** for exoplanet atmospheric dynamics studies, incorporating explicit time-stepping algorithms, forcing schemes, and adaptation to the Equivalent Barotropic Equations.
- Led the research studying the effect and validity of implicit time integration scheme in the context of hot exoplanet, offering insights into computational efficiency and solution accuracy.

Undergraduate Researcher; Galactic Forensic Lab

Waltham MA

Advisors: Prof. Reto Trappitsch, Dr. Marco Pignatari (Konkoly Observatory)

Jan 2022 - Present

- Initiated a pioneering study on the influence of nuclear uncertainties in the GCE model of isotopes.
- Developed a parallelized Monte Carlo framework for evaluating the effects of nuclear reaction rate uncertainties on both stellar nucleosynthesis and GCE simulations of Si isotopes.
- Uncovered the role of convective O-C shell merger in enhancing the production of Si isotopes in massive stars.
- First to quantify the influence of nuclear uncertainties on GCE calculations of silicon isotopes.
- Research led to a potential solution to the GCE model-data discrepancy presented by presolar SiC grains, a long-standing problem in the field.
- A first-authored paper in preparation.

Research Assistant; Mathematical Neuroscience Team

Waltham MA

Advisor: Prof. Jonathan Touboul

May 2021 - Aug 2021

- Explored brain homeostasis mechanisms responding to early-stage cell death using computational models.
- Conducted in-depth analyses on brain development impacted by varied intensities and durations of induced cell death, utilizing both stochastic and deterministic modeling approaches.
- Assessed the influence of stochastic effects in brain development, contrasting findings derived from stochastic models against those from ordinary differential equation (ODE) models.
- Evaluated the consequences of distinct modeling assumptions by comparing outcomes under varied premises, including the potential death of any neurons versus exclusively newborn neurons.

Honors & Awards

Phi Beta Kappa	The most prestigious undergraduate honor society in the US	2023
Physics Faculty Prize	Awarded to a graduating senior for excellence in Physics	2023
Presidential Scholarship	Brandeis-sponsored merit scholarship (\$60,000)	2019 – 2023
Dean's List	All semesters	2019 – 2023

Presentations

Duke University (TUNL)

NuGrid Collaboration Meeting 2023 (Talk)

Durham, NC

May 2023

"The Impact of Nuclear Uncertainties on the GCE of Silicon Isotopes in Comparison with Stardust Grains"

University of Hull

NuGrid Collaboration Meeting 2022 (Talk)

Hull, UK

Sep 2022

"The Impact of Nuclear Uncertainties on the GCE of Silicon Isotopes in Comparison with Stardust Grains"

Teaching Experience

Teaching Assistant; Brandeis University

Waltham MA

Courses: Introductory Physics & Physics Laboratory

Jan 2022 - May 2023

- Proposed and developed the Python tutorial sessions on fundamental programming concepts and data analysis.
- Gave one-on-one tutoring to students on regression analysis, statistical testing, and fundamental physics concepts.
- Led weekly recitation, lab sessions, and review sessions.
- Graded exams, quizzes, and homework assignments.
- Received over 90% positive feedback from students.

Skills

Programming Languages

Python (Pandas, NumPy, SciPy, Scikit-learn. etc.), MATLAB, Java, Fortran.

Miscellaneous

Shell, Git, Github, \LaTeX , Microsoft Excel.

Languages

English, Mandarin, Cantonese.