Matt Ketkaroonkul

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Education

University of Washington Expected Jun 2024

B.S. Comprehensive Physics and Astronomy (Double Major.) *Seattle, WA*

- Minor in Aeronautical & Astronautical Engineering
- **3.9 GPA**. Quarterly Dean's List since Autumn Quarter 2020

Research Projects

Galaxy Spectra Data Analysis with Random Forest Algorithms Jan 2024 - Present

UW Astronomy *University of Washington-Seattle*

- PI/Supervisor: Professor José Sánchez-Gallego
- 10 hrs/week
- Applied Random Forest (RF) algorithms to Mapping of Nearby GAlaxies (MaNGA) datasets of spatially-varying spectra
- Explored the performance of RF algorithms to flag unusual spectra features in MaNGA datasets for potential discoveries

Magnetohydrodynamics Simulations with Trixi.jl Jun 2023 - Present

Plasma Fusion Undergraduate Research Opportunities *University of Wisconsin-Madison*

- PI/Supervisor: Dr. Benjamin Faber, Dr. Adelle Wright
- 40 hrs/week (Jun - Aug), 10 hrs/week (Aug - Oct)
- Modeled transport barrier behavior of ideal current sheets and plasma response to resonant magnetic perturbations (RMPs)
- Developed plasma fluid simulations with numerical framework Trixi.jl
- Studied magnetic reconnection and transport barrier properties of current sheet structures
- Presented poster at the 65th APS Division of Plasma Physics
- Research report submitted to Princeton Plasma Physics Laboratory

Magnetohydrodynamics Theory Research Jun 2022 - Oct 2022

Princeton Plasma Physics Laboratory *Virtual*

- PI/Supervisor: Dr. Adelle Wright
- 40 hrs/week
- Tested the robustness of current sheet structures in fusion plasmas posited by Multi-Region Relaxed MHD (MRxMHD)
- Analyzed linear and non-linear effects of a boundary-perturbed plasma using various analytical methods
- Applied Fourier Analysis, Perturbation methods to general solutions of magnetic field within plasma
- Applications of analytical model in tokamak and stellarator reactors
- Presented research project at the 64th APS Division of Plasma Physics
- Submission of report to US Dept. of Energy

Porting MATLAB magnetic probe signal processing into Python Oct 2021 - Oct 2022

HIT-SI Lab *University of Washington-Seattle*

- PI/Supervisor: Dr. Chris Hansen
- 2-6 hrs/week
- Updated codebase of data processing scripts from MATLAB to Python
- Signal filtering of the magnetic probes on the HIT-SIU experiment
- Research in the lab focuses on the spheromak concept for magnetic confinement fusion, especially the dynamics of sustaining the steady-state plasmas

CAD Design of HIT-SIU Experimental Reactor Parts Jun 2021 - Sep 2021

HIT-SI Lab *University of Washington-Seattle*

- PI/Supervisor: Dr. Chris Hansen
- 20 hrs/week
- Designed CAD models in SolidWorks for CNC machining of experiment components
- Developed a workflow to reliably produce accurate CAD models
- Gained machine shop experience in manufacturing components used in reactor coil power supplies

Publications

Nonlinear properties of the plasma response to resonant magnetic perturbations in locally force-free fields. Adelle Wright, **Matt Ketkaroonkul**. 2024. [In-progress]

Trixi.jl Numerical Simulations of Forced Reconnection in Toroidal Plasmas. **Matt Ketkaroonkul**, Benjamin Faber, Adelle Wright. 2024. [In-progress]

Presentations

Efficient and customizable simulations of the nonlinear response to the magnetic field. **Matt Ketkaroonkul**, Benjamin Faber, Adelle Wright. APS Division of Plasma Physics Conference. October 30, 2023. Denver, Colorado.

Exploring the Formation and Robustness of Relaxed MHD States. **Matt Ketkaroonkul**, Adelle Wright. APS Division of Plasma Physics Conference. October 18, 2022. Spokane, Washington.

Demonstration of low-density, high-performance operation of sustained spheromaks and favorable scalability toward compact, low-cost fusion power plants. Chris Hansen, et al. Advanced Research Projects Agency-Energy (ARPA-E) Fusion Programs Annual Meeting 2023. Boston, Massachusetts.

Community Engagement

President (2022-2023), Vice-President (2023-), Software Team Lead Nov 2020 - Present
Astronomy Undergraduate Engineering Group, Student Organization *Seattle, WA*

- Organized trips to student observatory for maintenance work
- Contributed to building a community centered around astronomy instrumentation projects (see "Telescope Camera Control Software")
- Recruited 20+ interested students to organization at student fair

Leadership Member, Teaching Assistant Oct 2023 - Present
Computational Research Access NEtwork (CRANE) *Virtual*

- Assisted instruction of computational methods in the science for queer and BIPOC students
- Tutored topics in astronomical data analysis, MHD simulations, etc.

Leadership Committee Member Nov 2020 - Present
Physics Undergraduate Peer Mentoring Program *Seattle, WA*

- Organized peer mentoring program community activities within the physics department
- Guided peer mentees in navigating their interests and experiences in physics
- Maintained communication of events and opportunities in physics with students through social media

Additional Projects

Telescope Camera Control Software Jun 2021 - Jun 2023
Astronomy Undergraduate Engineering Group *Seattle, WA*

- 2 hrs/week
- Successfully deployed an application to take telescope camera data at the Manastash Ridge Observatory for an astronomy observation capstone course (ASTR 481)
- Facilitated new student project members in learning software design within astronomy
- Developed Python wrapper for C++ library used to control Andor CCD camera
- Developed a React.js + Python Flask web application to take images

Eclipsing Binary Observation Project Apr 2023 - Jun 2023
ASTR 480: Astronomical Data Analysis Course *Seattle, WA*

- 4 hrs/week
- Analyzed light curve data from known eclipsing binaries to compare with existing data
- Utilized telescopes at Apache Point Observatory to capture light curve data

- Employed a variety of data analysis methods to reduce and contextualize light curve data

Safety Officer, Science Subteam Member Sep 2020 - Dec 2020

NASA L'Space Mission Concept Academy *Virtual*

- 10 hrs/week
- Undergraduate team of 10 researching a mission proposal for space probe
- Analyzed Mars InSight seismic data in MATLAB (e.g. kinematic measurements) to present concept of seismic experiment in mission to Enceladus
- Mobilized team effort to document engineering safety procedures during mission phases, received professional-level ratings

Additional Professional Experience

Course Grader May 2022 – Jun 2023

University of Washington *Seattle, WA*

- Graded ASTR 324, an Astronomy course in data science in Python
- Graded ASTR 101, a popular introductory astronomy course

Coding Tutor May 2020 – Aug 2021

Code Ninjas *Newcastle, WA*

- Hosted virtual calls for coding lessons in JavaScript, Roblox
- Wrote and taught 2 coding courses in Roblox, a popular game design platform
- Offered tours and coding demonstrations for prospective students, successfully enrolled over 5 students

Additional Skills

- Computer-Related
  - Proficient in GNU/Linux OS
  - Programming Languages: Julia, Python, MATLAB, C++, JavaScript
  - Other Applications: LaTeX
- Other Languages Spoken
  - Thai
  - Chinese