KAITLYN CHEN

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EDUCATION

Harvey Mudd College *Expected B.S. Physics/Computer Science*
Relevant Courses: Quantum Physics, Electromagnetic Theory & Optics, Mechanics & Wave Motion, Data Science, Probability, and Statistics (Python), Data Structures/Program Development (C++), Principles of Computer Science (Java, DrRacket), Intro to Computer Science (Python), Discrete Math, Linear Algebra, Single & Multivariable Calculus

EXPERIENCE

1. **Carnegie Astrophysics Internship** , Carnegie Observatories *June 2023-present*
   Skills: Data Science, Machine Learning, Markov Chain Monte Carlo (MCMC), spectroscopy, Scientific Writing, GitHub, Python: matplotlib, pandas, numpy, emcee, Python Scripts, Unix

   Researching with Dr. Trevor Dorn-Wallenstein using machine learning to analyze yellow supergiant spectra from the Magellan Inamori Kyocera Echelle spectrograph. Established a Bayesian framework to regress fundamental parameters on our highly-dimensional dataset by using MCMC to fit models to our data. Enhanced technical skills in Python, data visualization with matplotlib, data manipulation with pandas and numpy, and Unix commands in Terminal. Worked with different fits and hdf5 files to load and save spectral data. Tabulated the results with pandas and created visualizations of the sample in Hertzsprung-Russell (HR) and spectroscopic HR diagrams. Calculated binomial confidence intervals with astropy to determine the significance of factors that played into the stars' evolutionary status and plotted them with matplotlib.

2. **Inner Edge of Planetary Period Ratio Distribution**, Harvey Mudd *August 2023-present*
   Skills: Machine Learning, Statistics: Pearson-R, K-S p-tests, Kernel Density Estimations, Terminal, Linux, GitHub, LaTeX, Python: pandas, numpy, matplotlib

   Working with Prof. Daniel Tamayo simulating data using the machine learning model Stability of Planetary Orbital Configurations Klassifier (SPOCK) to analyze compact period ratios. Use Linux commands to work with high performance workstations. Use SPOCK to simulate planetary systems and analyze the significance of eccentricity, mass, and dispersion, of system survivability. Use scipy.stats to calculate Kolmogrov-Smirnov p-values to relate the simulated data to the NASA Exoplanet Archive, which was sorted through with pandas. Used matplotlib to graph changes in p-value for varying inputs of the parameters and used numpy to work with arrays of information stored from each simulation. Understand how changes in kernel density estimations for SPOCK's input parameters (eccentricity, mass, number of planets) affect the statistical test results.

3. **Training Machine Learning Model: SPOCK**, Harvey Mudd *December-May 2023*
   Skills: Machine Learning: scikit-learn, GitHub, Terminal, Ubuntu, SSH, conda, dask, Python: numpy, matplotlib

   Worked with Prof. Daniel Tamayo updating and training the machine learning (ML) model Stability of Planetary Orbital Configurations Klassifier (SPOCK) with scikit-learn. Pulled and pushed the repository of the ML model to make accessible to other users. Used the gradient-boosted decision tree algorithm, XGBoost. Took high-dimensional inputs and reduced it to 10 features. Debug original code to work with a newer version of python and changes in the dask library used for parallelization. Used GitHub to make the updates accessible and conda commands to have multiple python environments to work between the old and updated ML model.

4. **Identifying GD-1 Stellar Stream**, American Astronomical Society *January 2024*
   Skills: SQL: queries, joins, filtering, ADQL: polygon, Python: astroquery, pandas, gala, astropy, File Formats: hdf, fits, csv

   Learned to query astronomical databases. Use Gaia and Pan-STARRS data to identify and visualize the GD-1 stellar stream. Conduct coordinate transformations from ICRS to SkyCoord to GD-1 to work with the data.

5. **Physics of Atomic Nuclei**, Joint Institute for Nuclear Astrophysics *July 2020*
   Skills: Excel, Data Analysis, Data Measurements

   Worked with Dr. Micha Kilburn analyzing the chemical elements within a star from the Gemini North telescope by using a graph of its spectra wavelength and flux. Analyzed and calculated wavelengths of a spectrum to determine the element.

PUBLICATIONS

1. **A Spectroscopic Hunt for Post-Red Supergiants in the Large Magellenic Cloud: I. Preliminary Results** *March 2024*
   Kaitlyn M. Chen, Trevor Z. Dorn-Wallenstein

2. **Characterizing Early Compact Planetary Formation with a Correlation Between Instability and Planet Loss** *in prep*
   B. Bonifacio, Oswaldo Cardenas, **K. Chen**, N. Hall, D. Tamayo

PRESENTATIONS

AAS iPoster, Chambliss Finalist, American Astronomical Society *January 9, 2024*
Presented iPoster on Hunting for Post-Red Supergiants at AAS meeting to many astronomers.

Characterizing Compact Planetary Formation, American Astronomical Society *May 16, 2024*
Presented a poster at the 55th American Astronomical Society Division on Dynamical Astronomy meeting.

Hunting for Post-Red Supergiants, Carnegie Observatories *August 25, 2023*
Final slideshow presentation to 50+ people at Carnegie Observatories.

Conferences for Women in Physics, American Physical Society *January 20, 2024*
Poster presentation on Hunting for Post-Red Supergiants to undergraduate women in physics from the central and southern California region.

OUTREACH

Spectroscopy Demonstration, Upward Bound *July 2023*
Lead a comprehensive spectroscopy demonstration teaching 40 low-income/first generation high school students in a pre-college program about spectroscopy. Introduced them to the captivating world of spectroscopy, integrating scientific principles and data visualization techniques, offering them a unique glimpse into the realm of scientific exploration.

OPEN SOURCE

movel *June 2024*
Developed and maintain a pip installable package that can calculate the first three moments of velocity in accordance with the equations from Briquet and Aerts (2002).