DRAFT DRAFT

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Education

Stony Brook University **Fall 2023 – Present**
Master of Arts in Physics *Stony Brook, NY*

Stony Brook University **Spring 2020 – Spring 2023**
Bachelor of Science in Physics, minor in Astronomy and Mathematics *Stony Brook, NY*

Rochester Institute of Technology **Fall 2019**
Rochester, NY

Research

Kinematic Weak Lensing on Galaxy Clusters **Jan. 2023 - Present**

- **Summary** — Traditional weak lensing methods are a statistical measurement and cannot be used on a single galaxy. *Kinematic Weak Lensing* is a powerful technique that can distinguish between the intrinsic shape of a galaxy and the lensing effect from cosmic shear. With velocity field information obtained from spectroscopic measurements, we can decompose the observed galaxy shape from photometric measurements, and recover the intrinsic shape of the galaxy.
- **Key Skills** — Experience with data reduction for Keck DEIMOS using the `PypeIt` data reduction pipeline. Galaxy Redshift determination using the `SpecPro` spectra analysis program.

DEIMOS Spectra Analysis: Writing an Automated Redshift Determination Program **Masters Thesis**

- **Summary** —`SpecPro` was written to work with DEIMOS spectra. However, it is written in the proprietary language `IDL` and in our experience, its "Auto-z solution" usually failed to give accurate redshifts for galaxies of interest for kinematic weak lensing. To solve this, I have written a program in `Python` that has two modes. It can perform line detection to detect the 3726-3729 Å [OII] doublet and fit a redshift. It can also use template cross-correlation fitting using `SDSS` templates, interpolated using a flux conserving algorithm, to automatically fit a redshift. The initial results are successful, properly fitting redshifts better than `SpecPro`.
- **Key Skills** — `PypeIt` & `SpecPro`. Taking advantage of powerful programming frameworks for astronomy in `Python`, like `pandas`, `Astropy`, `SciPy`, `SpecUtils`. Solving complex problems that arise when designing your own pipeline.

Projects

Intelligently Rendering the Entire Gaia Source Catalog on a Personal Laptop **Fall 2023**

- **Summary** — The *Gaia* source catalog contains 1.8 billion sources and takes up over 700 GB. It is hopeless to use traditional plotting methods (e.g. `mathplotlib`) to represent the Gaia catalog, and would seem to require substantial cloud computing resources to analyze. However, using the `Python` parallel computing library `Dask`, I can work on larger-than-memory datasets, and also parallelize the workload across multiple task streams. By using an intelligent rendering package, I am able to make beautiful maps of the celestial sphere, colored according to number density, flux, radial velocity, and more, without using expensive computing resources.
- **Key Skills** — Parallel computing using `Dask` and big data rendering using `Datashader`. Implementing interactive `Jupyter` notebooks. Exporting high resolution (8K) renders of our greatest star catalog to date, high enough quality to demonstrate structure of Milky Way.

Period Determination and Analysis of Variable Star DY Pegasi **Undergrad. Writing Req.**

- **Summary** — I carried out a telescope proposal I designed to determine various physical parameters of DY Pegasi, a variable star. I took optical observations using the university telescope and CCD Camera. After data reduction, I concatenated a light curve and determined period, absolute magnitude, distance from earth, luminosity, color index, spectral type, temperature, and estimated its mass. My obtained period agreed with the literature within 1 second.
- **Key Skills** — In addition to previously mentioned `Python` tools, gained experience with `DS9` and telescope guidance tools like Cartes du Ciel, CCDSoft, and SiTech. Refined journal writing skills in AASTeX format.

Assorted Experimental Design

- **Cloud chamber cooled via Peltier devices** — I built a cloud chamber from off-the-shelf components that can reach −40°C temperatures using thermoelectric (Peltier) coolers. No dry ice required, only electricity. A great way to demonstrate the existence of particles, including cosmic rays!
- **Pick and Place (PNP) Machine** — In undergrad I continued development of a PNP machine that will build PCBs from an input schematic. Designed, built, and integrated end-stop sensors into the PNP. Created and edited macro files that will communicate with PNP using G-Code.

Graduate Coursework

- General Relativity
- Cosmology
- Dark Matter/Energy
- Galaxies
- Gravitational Lensing
- Obs. Astronomy Lab
- Stars
- Interstellar Medium
- Computational Methods
- Research Instruments
- Graduate Seminars

Technical Skills

Spectroscopic Data Reduction: `SpecPro`, `PypeIt`, `SpecUtils`
Photometric Data Reduction: `DS9`, `Astropy`, `SciPy`, `Source Extractor`
Scientific Python/Data Analysis: `NumPy`, `SciPy`, `SymPy`, `Astropy`, `matplotlib`, `pandas`, `Dask`, `HoloViews`, `Bokeh`
Languages: Python, C++, Fortran, Java, C, C#, MATLab, G-Code
Familiar with: Generative AI (begrugingly), SIMBAD, VizieR, Git, Slack, Microsoft Office

Work Experiences

Science Fiction Forum **2021 – 2022**

Treasurer *Stony Brook University*

- **Summary** — The Science Fiction Forum is the largest free-lending library on the eastern seaboard and are among the oldest continuously running organizations at SBU. We host many outreach events for the student general body.
- **Responsibilities**— I managed a $12,000 budget and handled budget applications, which requires in-person presentation in front of a budget committee. I planned events, improved the library, and maintained alumni relations. I presided over the COVID-19 pandemic and ensured continuity for the Forum's future.

Teaching Assistant **2018 – 2019**

MEGA Academy *Flushing, NY*

- **Summary** — Worked at an afterschool tutoring center for students grades 3-12.
- **Responsibilities**— I graded ELA and math homework. I tutored students who were struggling and helped them understand key concepts.