XIAORUI LU

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EDUCATION

Brown University *September 2022 - May 2024*
Master of Science: Physics
Thesis: **[Optimizing RFI Detection in MWA: Adapting the HERA XRFI Module]**

University of California Santa Cruz *2018-2022*
Bachelor of Science: Astrophysics

EXPERIENCE

RFI Detection in MWA Data for 21 cm EoR Analysis
RFI Detection and Machine Learning Applications in Radio Astronomy *2022 - 2024*
Supervised by Prof. Jonathan Pober, Department of Physics, Brown University

- Played a pivotal role in adapting the XRFI module from the HERA project for MWA data, concentrating on improving RFI detection capabilities in radio astronomy.
- Utilized advanced statistical methods in xrfi to identify outliers, effectively pinpointing RFI in complex astronomical datasets.
- Implemented a watershed algorithm combined with median filtering, significantly improving the comprehensiveness of RFI flagging.
- Contributed to ensuring the integrity and quality of 21 cm Epoch of Reionization (EoR) experimental data by meticulous RFI elimination.
- Pioneered the application of the xrfi algorithm to MWA data, potentially revolutionizing RFI detection techniques in the field.
- The project highlighted interdisciplinary collaboration, incorporating both traditional statistical methods and cutting-edge machine learning tools.
- **[Project Presentation Slides]**

Pulsar Observation and Data Analysis *Summer 2021*
Supervised by Prof. Zhen Yan, SHAO, Chinese Academy of Sciences

- Collaborated with a team of scientists to observe and analyze pulsar sources using the Shanghai Tianma 65m Radio Telescope.
- Developed a Python program, **AstroScheduller**, in collaboration with colleagues, automating the generation of observation outlines for astronomical radio sources. This significantly increased efficiency and ensured accuracy.
- Implemented a user-friendly visualization interface to streamline the observation process, transitioning from manual to fully automated outline generation.
- Processed pulsar observation data into usable formats, facilitating further analysis and interpretation.

TECHNICAL STRENGTHS

Programming Languages	Python, MATLAB, SQL, Microsoft Office Suite
Python Packages	Astropy, Matplotlib, Numpy, Scipy, pyuvdata, hera_qm, Scikit-learn, TensorFlow
Machine Learning	Supervised Learning, Model Validation, Feature Engineering, Data Preprocessing
Software & Tools	Linux, HTML, LaTeX, Excel, Mathematica, Azure
Language	Mandarin, English, Cantonese

PREVIOUS PROJECTS

General Relativity *Spring 2023*

· Focused on gravitational lensing, exploring the fundamental concepts and applications in astrophysical contexts.

Quantum Mechanics I *Fall 2022*

· Studied the Chandrasekhar limit, which describes the maximum mass of a stable white dwarf star, deepening understanding of stellar physics.

Astrophysics Advanced Laboratory *Spring 2022*

· Analyzed the characteristics of five stars using aperture photometry, emphasizing precision and data interpretation skills. **[Photometry Project]**
· Examined the solar spectrum in the visible band, applying spectroscopic techniques to understand solar characteristics. **[Spectroscopy Project]**
· Observed the galactic hydrogen 21 cm line, contributing to the understanding of galactic structures and processes. **[Radio Project]**

Scientific Communication for Physicists *Winter 2022*

· Investigated deuteration fractionation in massive star formation regions, focusing on understanding the chemical processes and implications for astrophysical research.

OTHER EXPERIENCE

Astronomical Society *2016-2018*
Manager of Technology Department

· Led weekly seminar discussions on how to handle telescopes from safety protocols to various functions.
· Helped enhance students' knowledge of Astronomy by presenting and facilitating discussions about topics such as Cosmic Time and Distance, Galaxy Formation, and Exoplanets.

Chinese and British Space Science Education Week *Summer 2017*
Beijing

· Ranked first in the school's association selection for three consecutive years.
· Led weekly seminar discussions on how to handle telescopes from safety protocols to various functions.
· Helped enhance students' knowledge of Astronomy by presenting and facilitating discussions about topics such as Cosmic Time and Distance, Galaxy Formation, and Exoplanets.

REFERENCES

- **Jonathan Pober** Brown University
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  profumo@ucsc.edu
- **Tesla Jeltema** University of California Santa Cruz
  tesla@ucsc.edu