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SUMMARY

Leveraged deep learning techniques, such as U-Net, for effective segmentation of radio interferometric images. Demonstrated extensive expertise in statistical methods, including Power Spectrum Analysis (Fourier Transform), t-test, KS-test, Principal Component Analysis (PCA), Gaussian Process Regression (GPR), and the Fisher Information Matrix. Collaborated on multidisciplinary research projects within the Hydrogen Epoch of Reionization Array (HERA), successfully working with over 100 researchers to advance the understanding of cosmic phenomena.

EDUCATION

Massachusetts Institute of Technology (MIT), Cambridge, MA, USA
Ph.D. Department of Physics (GPA: 4.6/5.0) 2024
Dissertation: "Instrumental effects in 21 cm Cosmology: One-point Statistics and Power Spectrum with the HERA Interferometer" under the supervision of Prof. Hewitt

Yonsei University, Seoul, South Korea
M.S. Astronomy Department (GPA: 4.3/4.3) *2016*

Yonsei University, Seoul, South Korea
B.S. Astronomy Department (GPA: 4.26/4.3, Summa Cum Laude in College of Science (rank 1st out of 220)) *2013*

EXPERIENCE

Department of Physics, MIT, Cambridge, MA, USA *Spring 2024 - Summer 2024*
Research Assistant
Applied U-Net (a type of convolutional neural network) using PyTorch to extract detailed structural information, such as object boundaries, from radio images (link for a demo).
Estimated model parameters with precision, quantifying uncertainties using advanced methods, including the Fisher Information Matrix, while accounting for instrument noise.
Identified data anomalies and predicted the detection of faint cosmological signals by performing in-depth statistical analysis of one-point statistics on radio images, considering instrumental effects.
Processed a large volume of radio interferometric data (several TB), reducing it to manageable image data cubes (< 100 GB) while preserving any cosmological information.

Department of Physics, MIT, Cambridge, MA, USA *Fall 2023*
Teaching Assistant: Organized and guided weekly lab experiments, mentored students on their lab projects, and assessed reports, term papers, and presentations.

Department of Physics, MIT, Cambridge, MA, USA *Spring 2019 - Spring 2023*
Research Assistant
Developed a Python-based rapid simulator for radio interferometric measurements (github), streamlining and parallelizing intensive tasks, achieving a 10x improvement in computation speed over existing simulators.
Forecasted the impact of potential perturbations in the antenna system using power spectrum analysis, and developed mitigation strategies for systematics in radio observations by applying Fourier filtering, PCA, and GPR.
Tracked daily observations by visualizing and summarizing data in Jupyter Notebook.

Department of Physics, MIT, Cambridge, MA, USA *Fall 2018*
Teaching Assistant: Led weekly recitations, provided academic guidance on course materials, and evaluated homework and exams.

Department of Astronomy, Yonsei University, Seoul, South Korea *Fall 2013 - Fall 2015*
Research Assistant
Supervised two undergrads and published a paper on the statistical properties of galaxies based on their diverse shapes.
Analyzed a dataset of 1 million galaxies, downsampling it to 20k candidates for studying active supermassive black holes.

SKILLS

Programming: Python, SQL, Data Manipulation: Pandas, NumPy, Machine Learning: Scikit-learn, Pytorch, TensorFlow

HONORS AND ACHIEVEMENTS

Fellowship of Physics Department, MIT (2017), The Highest Honors at Graduation, Yonsei University (2012), The Highest Honors, Yonsei University (2009, 2010, 2011), The National Scholarship for Science and Engineering (South Korea, 2009-2010)