GEORGE HALAL

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EDUCATION

STANFORD UNIV.
PH.D. PHYSICS
2019-24 | GPA: 4.0/4.0

LEHIGH UNIV.
B.S. PHYSICS + MINOR:
APPLIED MATHEMATICS
2015-19 | GPA: 3.97/4.00
Thesis: "Machine Learning Applications for Relativistic Heavy-Ion Collisions"

RELEVANT COURSEWORK

TAKEN
Deep Learning
Machine Learning
Statistical Methods in Astrophysics

AUDITED
Deep Learning for Computer Vision
Natural Language Processing with Deep Learning
Foundations of Reinforcement Learning
Computer Vision: Foundations & Applications
Design & Analysis of Algorithms
Signal Processing & Linear Systems
Computer Organization & Systems

COURSERA
SQL for Data Science

SKILLS

Proficient:
Python • MATLAB • PyTorch • LaTeX
Familiar:
C/C++ • SQL • Keras • scikit-learn • pandas • HTML
Tools:
Git • Cloud Computing • Vim

RESEARCH EXPERIENCE

SPHERICAL HARMONIC CONVOLUTIONAL HOUGH TRANSFORM | Stanford University | 2021-Present
- Developed algorithm in Python, which achieved 3000x runtime speedup and 5x decrease in memory consumption over previous algorithm
- GitHub: `https://github.com/georgehalal/sphericalrht`

CROSS-CORRELATING CMB & ISM DATASETS FOR DUST POLARIZATION CHARACTERIZATION | Stanford University | 2020-Present
- Developed statistical tests in Python and MATLAB for quantifying the dust contribution of different components in a certain sky area and measuring the dust's properties

BAYESIAN INFERENCE ON VANSYNGEL MODEL | Stanford University | 2020
- Implemented the Vansyngel model in Python and performed Markov Chain Monte Carlo methods to get the parameters' posteriors
- GitHub: `https://github.com/georgehalal/BayesInfer_DustModel`

MACHINE LEARNING FOR STOCHASTIC GENERATION OF OBSERVED GALAXY PROPERTIES | Stanford University | 2020
- Developed a conditional Wasserstein generative adversarial neural network with gradient penalty (cWGAN-GP) in PyTorch to generate observed galaxy properties in wide-field surveys
- GitHub: `https://github.com/georgehalal/cWGAN-GP`

MACHINE LEARNING FOR MODELING THE TRANSFER FUNCTION OF GALAXY DETECTION | Stanford University | 2020
- GitHub: `https://github.com/georgehalal/DetectNet`

MACHINE LEARNING TO SEARCH FOR 2-ν DOUBLE-β DECAY OF ^{136}XE TO THE EXCITED STATE OF ^{136}BA | Stanford University | 2019
- Developed a Long Short-Term Memory neural network in Keras in Python to search for this decay in EXO-200 data

MACHINE LEARNING FOR HEAVY-FLAVOR JET CLASSIFICATION AT RHIC | Yale University & Lehigh University | 2019
- Developed a model made of a concatenation of Long Short-Term Memory (LSTM) and fully-connected networks on a list of discriminators to classify charm, bottom, and light jets

MACHINE LEARNING FOR CENTRALITY DETERMINATION WITH THE STAR EPD | The Ohio State University & Lehigh University | 2017 - 2018
- Developed a model to identify the centrality of a collision, based on which of the detector tiles are hit during a given collision

PUBLICATIONS

In Preparation:
- **G. H.** (for the BICEP/Keck Collaboration) and S. Clark. Characterizing Dust Polarization with BICEP/$Keck$ Through Correlations with Neutral Hydrogen. *The Astrophysical Journal*, in prep.
- **G. Halal**, A. Cukierman, D. Beck, S. Clark, and C.-L. Kuo. Polarization of Dust Filaments and the Spherical Rolling Hough Transform. *The Astrophysical Journal*, in prep.
- A. Cukierman, S. Clark, and **G. Halal**. Magnetic Misalignment of Interstellar Dust Filaments. *The Astrophysical Journal*, in prep.

Full Publication List:
`https://ui.adsabs.harvard.edu/search/q=%20author%3A%22Halal%2C%20G`