GEORGE HALAL

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EDUCATION

Stanford University
PH.D. PHYSICS
2019-24 | GPA: 4.0/4.0

Lehigh University
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 • Data Wrangling, Analysis, and AB Testing with SQL

SKILLS

Proficient
Python • SQL • MATLAB • PyTorch • TensorFlow • LaTeX

Familiar
C/C++ • scikit-learn • pandas • HTML

Tools
Git • Cloud Computing • Vim • Bash/Zsh

RESEARCH EXPERIENCE

Spherical Harmonic Convolutional Hough Transform | Stanford University | 2021-Present
- Developed a computer vision algorithm in Python to model the morphology of interstellar gas
- Achieved 3000x runtime speedup and 5x decrease in memory consumption over the previous algorithm
- GitHub: `https://github.com/georgehalal/sphericalrht`

Dust Polarization Characterization Through Correlations of CMB & ISM Datasets | 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 for Searching 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 TensorFlow/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 and fully-connected layers in TensorFlow/Keras to classify charm, bottom, and light jets in heavy-ion collisions

Machine Learning for Collision Geometry Determination with the STAR EPD | The Ohio State University & Lehigh University | 2017-2018
- Developed a model to identify the collision geometry of nuclei, based on which of the detector tiles are hit during a given collision

PUBLICATIONS

First/Corresponding-Author Publications in Preparation:
- **G. Halal**, the BICEP/Keck Collaboration, et al. Characterizing Dust Polarization with BICEP/$Keck$ Through Correlations with Neutral Hydrogen. *The Astrophysical Journal*, in prep.
- **G. Halal**, S. E. Clark, D. Beck, A. Cukierman, and C. L. Kuo. Dust Filament Morphologies with the Spherical Rolling Hough Transform. *The Astrophysical Journal*, in prep.

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