

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 • Data Wrangling, Analysis, and AB Testing with SQL

SKILLS

Proficient:

Python • MATLAB • PyTorch • \LaTeX

Familiar:

C/C++ • SQL • Keras • scikit-learn • pandas • HTML

Tools:

Git • Cloud Computing • Vim • Bash/Zsh

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 $2-\nu$ 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 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 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**, D. Beck, A. Cukierman, S. E. Clark, and C. L. Kuo. Dust Filament Morphologies with the Spherical Rolling Hough Transform. *The Astrophysical Journal*, in prep.

Full Publication List:

<https://ui.adsabs.harvard.edu/search/q=%20author%3A%22Halal%2C%20G>