

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>