

GEORGE HALAL

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EDUCATION

Stanford University	Ph.D. Physics	GPA: 4.00/4.00	2019–2024
Lehigh University	B.S. Physics & Minor in Applied Mathematics	GPA: 3.97/4.00	2015–2019
Thesis: "Machine Learning Applications for Relativistic Heavy-Ion Collisions"			

SKILLS

Proficient	Python • SQL • MATLAB • LaTeX	Familiar	C++ • HTML • Tableau
Python Packages	scikit-learn • pandas • SciPy • statsmodels • NumPy • PyTorch & PyTorch Lightning TensorFlow/Keras • seaborn • xgboost • shap • Hugging Face transformers • matplotlib • pytest		
Tools	Git • High Performance Computing (Slurm) • Vim • VS Code		
Machine Learning Topics	Computer Vision • Generative Modeling • Natural Language Processing		
Other Topics	Causal Inference • Bayesian Inference • Hypothesis Testing • Time Series/Signal Processing		

RELEVANT INDUSTRY EXPERIENCE

Data Science Intern	Alife Health, Inc., San Francisco, CA	2023
<ul style="list-style-type: none">Used causal inference and machine learning techniques to study dose adjustment patterns and their effects on IVF outcomes.Developed statistical tests to alert clinics when one of their doctors performs better or worse than average on different metrics.		

RELEVANT RESEARCH PROJECTS

Deep Learning-Based Super-Resolution for Dust Polarization Images	Stanford University	2023–2024
<ul style="list-style-type: none">Leveraged high-resolution spatial data from HI and PAH and low-resolution polarization images from dust to predict high-resolution polarization images for dust using PyTorch in sky regions where only low-resolution data is available.		
Causal Inference for Quantifying the Effects of the Local Bubble and Dust on Magnetic Field Tracers	Stanford University	2023
Spherical Harmonic Convolutional Hough Transform	Stanford University GitHub Link	2021–2023
<ul style="list-style-type: none">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.		
Quantification of Foreground Signal Obscuring Residual Radiation from Early Universe	Stanford University	2020–2022
<ul style="list-style-type: none">Developed statistical tests in Python and MATLAB for quantifying the dust contribution of different components and measuring the dust's properties through correlations of different datasets.		
Bayesian Inference on Vansyngel Dust Model	Stanford University GitHub Link	2020
<ul style="list-style-type: none">Implemented the model in Python and performed Markov Chain Monte Carlo methods to fit its parameters to data.		
Deep Learning for Stochastic Generation of Observed Galaxy Properties	Stanford University GitHub Link	2020
<ul style="list-style-type: none">Developed a conditional Wasserstein generative adversarial neural network with gradient penalty (cWGAN- GP) in PyTorch to generate observed galaxy properties in wide-field surveys.		
Deep Learning for Modeling the Transfer Function of Galaxy Detection	Stanford University GitHub Link	2020
Deep Learning for Searching for 2- ν Double- β Decay of ^{136}Xe	Stanford University	2019
<ul style="list-style-type: none">Developed a Long Short-Term Memory-based network in TensorFlow/Keras to search for this decay to the excited state of ^{136}Ba in EXO-200 data. Achieved an AUC of 0.98.		
Deep Learning for Heavy-Flavor Jet Classification at RHIC	Yale University & Lehigh University	2018–2019
<ul style="list-style-type: none">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. Processed data in C++.		
Deep Learning for Collision Geometry Determination	The Ohio State University & Lehigh University	2017–2018
<ul style="list-style-type: none">Developed a model in TensorFlow/Keras to identify the collision geometry of nuclei, based on which of the STAR EPD detector tiles are hit during a given collision. Processed data in C++.		

PUBLICATIONS

First/Corresponding-Author Publications

- G. Halal, S. E. Clark, et al. Filamentary Dust Polarization and the Morphology of Neutral Hydrogen Structures. *The Astrophysical Journal*, 2024. <https://doi.org/10.3847/1538-4357/ad06aa>
- BICEP/Keck Collaboration, et al. BICEP/Keck XVI: Characterizing Dust Polarization Through Correlations with Neutral Hydrogen. *The Astrophysical Journal*, 2023. <https://doi.org/10.3847/1538-4357/acb64c>
- G. Halal, S. E. Clark, M. Tahani. Imprints of the Local Bubble and Dust Complexity on Magnetic Field Tracers. In prep.

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