GEORGE **HALAL**

Personal Site: https://georgehalal.github.io | GitHub: https://github.com/georgehalal | georgech@stanford.edu | 650.422.9033

EDUCATION

Stanford University | Ph.D. Physics | GPA: 4.0/4.0 | 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/C++ • HTML

Tools | Git • High Performance Computing (Slurm) • Vim • VS Code • Bash/Zsh

Python Packages | scikit-learn • pandas • SciPy • statsmodels • NumPy • PyTorch (incl. Geometric, Lightning) • TensorFlow/Keras • seaborn • xgboost • shap • Hugging Face transformers

Deep Learning | Computer Vision • Generative Modeling • Natural Language Processing • Reinforcement Learning

RELEVANT INDUSTRY EXPERIENCE

Data Science Intern | Alife Health, Inc., San Francisco, CA | 2023

- Used causal inference and machine learning techniques for studying 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

- Leveraged high-resolution spatial data from HI and PAH and low-resolution polarization images from dust to predict high-resolution polarization images for dust 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

- 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.

Dust Polarization Characterization | Stanford University | 2020–2022

- 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 through correlations of different datasets.

Bayesian Inference on Vansyngel Model | Stanford University | GitHub Link | 2020

- Implemented the model in **Python** and performed Markov Chain Monte Carlo methods to fit its parameters.

Deep Learning for Stochastic Generation of Observed Galaxy Properties | Stanford University | GitHub Link | 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. Processed data in **Python**.

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

- 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. Processed data in **Python**.

Deep Learning for Heavy-Flavor Jet Classification at RHIC | Yale University & Lehigh University | 2018–2019

- 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. Processed data in **C++**.

Deep Learning for Collision Geometry Determination | The Ohio State University & Lehigh University | 2017–2018

- 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

- BICEP/*Keck* Collaboration, et al. BICEP/*Keck* XVI: Characterizing Dust Polarization Through Correlations with Neutral Hydrogen. *The Astrophysical Journal*, 2023. https://arxiv.org/abs/2210.05684
- G. Halal, S. E. Clark, et al. Filamentary Dust Polarization and the Morphology of Neutral Hydrogen Structures. *The Astrophysical Journal*, submitted. https://arxiv.org/abs/2306.10107
- 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