GEORGE HALAL | Personal Site: https://georgehalal.github.io | Email: georgech@stanford.edu | Phone: +1 (650) 422-9033

SUMMARY

Astrophysicist specialized in developing efficient machine learning and statistical techniques for large and complex telescope datasets.

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

Familiar | C++ • HTML • Tableau

Python Packages | PyTorch • PyTorch Lightning • Scikit-learn • Pandas • Hugging Face (transformers, tokenizers, datasets, evaluate, accelerate, peft, trl) • NumPy • Statsmodels • SciPy • Seaborn • Xgboost • Shap • Matplotlib • Requests • RE • WandB

Machine Learning | Computer Vision • Generative AI/LLMs/Natural Language Processing • Sequence Modeling • MLOps

Other Topics | Causal Inference • Bayesian Inference • A/B Testing • Time Series Analysis/Signal Processing

EXPERIENCE

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

Causal Inference and Machine Learning for IVF Intracycle Dose Adjustments

- Developed techniques for analyzing the impact of dose adjustment patterns throughout IVF cycles on pregnancy outcomes.
- Employed statistical tests to alert clinics when a doctor's performance deviates from average on key performance indicators (KPIs).

Graduate Student Researcher | Stanford University, Stanford, CA | 2019–2024

Transformer-Based Super-Resolution for Dust Polarization Images

- Built a multi-image encoder, a transformer-based fusion module, and a decoder to increase the image resolutions by 4x.

Causal Inference for Modeling the Effects of the Nearby Dust Geometry on Magnetic Fields | Paper Link

Spherical Harmonic Convolutional Hough Transform | GitHub Link | Paper Link | Invited Talk Link

- Developed a computer vision algorithm to model the structure of interstellar gas.
- Achieved 3000x runtime speedup and 5x memory reduction over the previous state-of-the-art.

Modeling the Foreground Obscuring Radiation from the Early Universe | Paper Link | Award Link | Invited Talks: Harvard, Spain, S4

- Used computer vision, hypothesis testing, and Bayesian inference for quantifying this foreground signal, setting new limits.

Deep Learning for Stochastic Generation of Observed Galaxy Properties | GitHub Link

- Developed a conditional Wasserstein generative adversarial neural network with gradient penalty (cWGAN-GP) to generate observed galaxy properties in wide-field surveys.

Deep Learning for Modeling the Transfer Function of Galaxy Detection | GitHub Link

- Developed a probabilistic model for predicting the transfer function of galaxy detection in wide-field surveys, achieving an ROC-AUC score of 0.95.

Deep Learning for Searching for 2-ν Double-β Decay of ^{136}Xe | Poster Link

- Developed a Long Short-Term Memory (LSTM) based model to search for this decay to the excited state of ^{136}Ba in EXO-200 data, achieving an ROC-AUC score of 0.98.

Undergraduate Student Researcher | Yale University and Lehigh University | 2018–2019

Deep Learning for Heavy-Flavor Jet Classification at RHIC | Report Link | Talk Link

- Developed a Python-based Long Short-Term Memory (LSTM) model to classify bottom, charm, and light jets, attaining misclassification rates of 2.1%, 10.9%, and 4×10^{-3}%, respectively, leveraging C++ for efficient data preprocessing.

Undergraduate Student Researcher | The Ohio State University and Lehigh University | 2016–2018

Deep Learning for Collision Geometry Determination

- Developed a model to identify the collision geometry of nuclei based on the activation pattern of STAR-EPD detector tiles in Python, leveraging C++ for efficient data preprocessing.

PUBLICATIONS | 15+ including 3 first/corresponding-author in top astrophysics journal