Nicholas A. Gabriel

[website] [github]

Education:

The George Washington University — **Washington, DC**
Ph.D. Physics — *exp. 2025*
M.S. Physics — *2021*
Thesis: "Neural Operators for Many-Body Complex Systems"

University of Mary Washington — **Fredericksburg, VA**
B.S. Mathematics (with honors), B.S. Physics — *2017*

Research and Work Experience:

The George Washington University — **Washington, DC**
Research Assistant, Advisor: Dr. Neil Johnson — *January 2019 - present*

Neural operators for many-body complex systems: [paper] [github]

Proposed a novel operator learning framework for modeling many-body complex systems, successfully combining advanced architectures for graph neural networks and neural operators. Scalability in both system size and model size was demonstrated on benchmarks with millions of nodes. Trained the largest physics-informed neural operator to date, ROMA-H (1.4B params), using the NVIDIA GH200 Superchip.

Graph learning for foreign influence detection: [paper] [github]

Developed a framework for detecting foreign influence on social media using graph learning and feature attribution to identify models and features that can generalize across influence operation campaigns.

Data Collection/Web Scraping: [github]

Led data collection efforts for social media tracking of foreign influence and extremist communities. Wrote data collection tools for social media using Python Selenium, Beautiful Soup, and Gmail API.

Brookhaven National Laboratory — **Upton, NY**
Intern, Advisor: Dr. David Jaffe — *June 2016 - August 2016*

Developed software for simulation and statistical analysis of radioactive sources for calibration of the PROSPECT experiment antineutrino detector. Primary deliverables: Bash scripts, NumPy and SciPy code, and CERN ROOT modules.

Massachusetts General Hospital — **Boston, MA**
AAPM Undergraduate Fellow, Advisor: Dr. Alexei Trofimov — *June 2015 - August 2015*

Prototyped a Python gaze tracking interface for use in proton radiotherapy treatment of ocular melanoma using PyQT and OpenCV.

Technical Skills:

Languages/Libraries: Python, C, Bash, BLAS, TeX, CUDA C, MATLAB, Mathematica

Software:

Python: Pandas/Dask, NumPy, PyTorch, JAX, PyG, Jraph, scikit-learn, statsmodels, SpaCy, NLTK, Gensim, Selenium, Beautiful Soup

Linux/SWE/HPC: Git, SSH, Vim, Conda, Slurm, SQL, Elasticsearch, cloud computing

ML/AI: Transformers, physics-informed neural networks, neural operators, graph neural networks, message passing neural networks, graph learning, NLP, LLM, fine-tuning, LoRA/QLoRA, multimodal learning, uncertainty quantification (UQ), Explainable AI (XAI)

Math/Stats: Differential Geometry, Numerical Analysis, Functional Analysis, Partial Differential Equations, Multivariate Timeseries Analysis, Graph Theory, Experimental Design