Veome Kapil

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EDUCATION

Johns Hopkins University — **Baltimore, MD**
Doctor of Philosophy (Ph.D.) in Physics — *Expected: July 2026*
Master of Arts (M.A.) in Physics — *August 2023*

Princeton University — **Princeton, NJ**
Bachelor of Arts (B.A.) in Physics (GPA: 3.74/4.0) — *June 2021*
Certificate in Applications of Computing — *June 2021*

TECHNICAL SKILLS

Programming Languages: Python, SQL, C++, Excel, Java, Unity, Mathematica
Data Science Tools: TensorFlow, Scikit-learn, PyTorch, Pandas, NumPy, SciPy, Matplotlib, Geopandas, Shapely
Statistics: Bayesian Inference, Model Selection, A/B Testing, Bootstrapping, Mathematics
Machine Learning: Convolutional Neural Networks (CNNs), Regression Models, Time-domain signal processing, Feature Engineering, Deep Learning

RESEARCH EXPERIENCE

New tidal models for binary stellar simulation — **Baltimore, MD**
Lead Researcher — *January 2024 – Present*

- Contributed to the open-source COMPAS code (C++) for simulating binary star systems, working within the core development team to translate complex physical models into scalable and simulation-friendly code.
- Developed data processing workflows to handle large-scale simulation outputs, leveraging statistical methods to infer astrophysical trends.

Systematic Bias from Waveform Modeling for Binary Black Hole Populations in Next-Generation Gravitational Wave Detectors — **Baltimore, MD**
October 2022 - April 2024
Lead Researcher

- Conducted a statistical study of current gravitational wave model accuracy for future detector applications, using time-domain signal processing and Fisher information matrices to unveil a predicted failure rate of **up to 20%.**
- Used Bayesian model inference and spline regression to determine a requisite improvement in model accuracy by **a factor of 10**, outlining specific improvements in a paper published in the peer-reviewed Physical Review D journal.

Calibration of neutron star natal kick velocities to isolated pulsar observations — **Baltimore, MD**
Lead Researcher — *January 2022 - September 2022*

- Determined optimal parameters for a new supernova model using Bayesian inference, performing model selection via KS tests to propose the model most compatible with astronomical observations.
- Statistically compared the new model to older supernova models, estimating **40% fewer** predicted observable binary neutron stars. Published findings in the prestigious Monthly Notices of the Royal Astronomical Society journal.

Improving Trajectory Reconstruction of Charged Particles at the LHC — **Princeton, NJ**
OURSIP Summer Research Intern — *June 2020 – August 2020*

- Applied a Convolutional Neural Network (CNN) to distinguish between single and overlapping particle images from the Compact Muon Solenoid (CMS) detector at the LHC.
- Created 3D and 2D visualizations of overlapping particle trajectories that informed improvements in trajectory reconstruction at the CMS collaboration.

WORK EXPERIENCE

Maryland New Directions — **Baltimore, MD**
Data Science Intern — *June 2024 – September 2024*

- Used ML regression models to predict client reach for non-profit aimed at proving employment opportunities to impoverished Baltimore communities, recommending target areas to achieve a **45% increase** in the client base.
- Integrated US Census data with company databases, deploying automated A/B testing and visualization scripts to continuously monitor socio-economic and demographic trends among clients.

- Presented actionable insights to a team of non-technical stakeholders, resulting in a new program to improve training effectiveness and retention for the most vulnerable clients.

NeuroEquilibrium Diagnostic Systems, Ltd **Jaipur, IND**
Virtual Reality Research Intern *June 2016 – August 2016*

- Developed Virtual Reality (VR) applications for rehabilitation of patients with neurological disorders.
- Communicated with a diverse team of neurologists, medical practitioners, and company executives to translate company requirements into practical and effective VR experiences.
- Operated in a self-directed environment, independently managing resources and workflows in the new VR division.

LEADERSHIP AND TEACHING

Johns Hopkins University, Department of Physics and Astronomy **Baltimore, MD**
Graduate Teaching Assistant *August 2021 – January 2023*

- Singlehandedly developed new active learning modules for the undergraduate physics lab course, leading a pilot program which saw **increased student engagement and retention rates**.
- Led weekly training sessions for **25 teaching assistants**, collaboratively improving teaching methodologies and adapting to teaching challenges.

Classes Taught:

- Fall 2023-2024: AS.173.111/112 General Physics Laboratory I & II, *Head Teaching Assistant*
- Spring 2022-2023: AS.173.111/112 General Physics Laboratory I & II, *Head Teaching Assistant*
- Spring 2021-2022: AS.173.112 General Physics Laboratory II, *Teaching Assistant*
- Spring 2021-2022: AS.171.104 General Physics II for Biology Majors, *Teaching Assistant*
- Fall 2021-2022: AS.173.111 General Physics Laboratory I, *Teaching Assistant*
- Fall 2021-2022: AS.171.101/107 General Physics I for Physical Science Majors, *Teaching Assistant*

Erdos, Ltd. **New York, NY**
Chief Technology Officer, Co-Founder *September 2018 – September 2020*

- Spearheaded the development of a marketplace app connecting students with entrepreneurial projects, expanding operations to **four major US universities**.
- Led strategic partnerships and UI/UX design efforts to enhance user experience and adoption.

PUBLICATIONS AND TALKS

Papers published in peer-reviewed journals:

- Kapil, Veome, et al. "Calibration of neutron star natal kick velocities to isolated pulsar observations." *Monthly Notices of the Royal Astronomical Society* 519.4 (2023): 5893-5901.
- Kapil, Veome, et al. "Systematic bias from waveform modeling for binary black hole populations in next-generation gravitational wave detectors." *Physical Review D* 109.10 (2024): 104043.

Selected talks and presentations:

- *August 2024* – Poster Presentation at *XXXII General Assembly 2024*, **International Astronomical Union Institute**.
  "Calibration of Neutron Star Natal Kick Velocities to Isolated Pulsar Observations"
- *May 2024* – Talk at *LIGO Lab Group Meeting*, **Massachusetts Institute of Technology**.
  "Tidal Interactions in Binaries"
- *March 2024* – Talk at *COMPAS Group Meeting*, **Monash University**.
  "Systematic Bias from Waveform Modeling in next-generation GW detectors"
- *July 2023* – Panelist at *Gravitational-Wave Populations: What's Next Conference*, **University of Milano-Bicocca**.
  "Mind the Systematics. Is Waveform Calibration impacting the population?"
- *July 2020* – Talk at **Princeton University**.
  "Shared Hits in the Compact Muon Solenoid Silicon Pixel Detector"

AWARDS AND CERTIFICATIONS

2020-2021 – Allen G. Shenstone Prize in Physics **Princeton University**.
Awarded for academic excellence.

July 2023 – Certification from *The JHU Teaching Institute 2023*, **Johns Hopkins University**.
A three-day workshop on teaching best practices for JHU Graduate Students and Post-doctoral Fellows.