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++, Java, Mathematica
Data Science Tools: Pandas, TensorFlow, Scikit-learn, PyTorch, Numpy, SciPy, Matplotlib, Geopandas
Statistics: Bayesian Inference, Model Selection, A/B Testing, Bootstrapping
Machine Learning: Convolutional Neural Networks (CNNs), Regression Models, Time-domain signal processing, Deep Learning

RESEARCH EXPERIENCE

Graduate Research Assistant	**August 2021 – Present**
Johns Hopkins University	Baltimore, MD

Tidal models for binary stellar simulations
- Contributed to the open-source COMPAS code for simulating binary star systems, turning complex physical models into scalable and simulation-friendly code.
- Developed data processing workflows to handle large-scale simulation outputs.
- Leveraged statistical methods to infer astrophysical trends, finding **15% fewer** black hole mergers with new models.

Study of systematic bias from gravitational waveform modeling
- Conducted a statistical study of current gravitational wave model accuracy for future applications, unveiling a predicted error rate of **up to 20%.**
- Used statistical methods to quantify a **10x** model improvement requirement, outlining specific recommendations in a paper published in Physical Review D.

Calibration of neutron star natal kick velocities
- Optimized parameters for a new supernova model using Bayesian inference with simulated neutron stars.
- Proposed the model most compatible with astronomical observations using model selection.
- Contextualized the new work within the larger scientific landscape, predicting **40% fewer** observable binary neutron star mergers.

OURSIP Summer Research Intern	**June 2020 – August 2020**
Princeton University, Princeton, NJ	

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

WORK EXPERIENCE

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

- Used ML regression models recommend target areas for a non-profit aimed at providing employment opportunities to impoverished Baltimore communities, achieving a **45% increase** in the client base.
- Integrated US Census data with company databases 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.

Graduate Teaching Assistant   **August 2021 – Present**
Johns Hopkins University   Baltimore, MD
- Led development of new active learning modules for the undergraduate physics lab course
- Managed weekly training sessions for 25 teaching assistants, collaboratively improving teaching methodologies.

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*

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

Virtual Reality Research Intern   **June 2016 – August 2016**
NeuroEquilibrium Diagnostic Systems, Ltd   Jaipur, IND
- 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 virtual experiences.
- Independently managed resources and workflows in the new VR division.

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

The JHU Teaching Institute 2023 Certification, Johns Hopkins University   **July 2023**
A three-day workshop for JHU Graduate Students and Post-doctoral Fellows on evidence-based inclusive teaching practices and instructional approaches that engage students, support improved learning outcomes, and foster equitable classrooms.

Allen G. Shenstone Prize in Physics, Princeton University   **2020-2021**
Awarded to physics students who have shown excellence in their course work and promise in independent research.