

# Veome Kapil

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## EDUCATION

### Johns Hopkins University

Doctor of Philosophy (Ph.D.) in Physics  
Master of Arts (M.A.) in Physics

Baltimore, MD

Expected: July 2026  
August 2023

### Princeton University

Bachelor of Arts (B.A.) in Physics (GPA: 3.74/4.0)  
Certificate in Applications of Computing

Princeton, NJ

June 2021  
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

### Graduate Research Assistant

Johns Hopkins University

August 2021 – Present

Baltimore, MD

*“New tidal models for binary stellar simulations”*

- Contributed to the open-source COMPAS code (C++) for simulating binary star systems, translating tidal dissipation models into scalable and simulation-friendly formats.
- Developed data processing workflows to handle large-scale simulation outputs, leveraging statistical methods such as 2-sided KS tests to infer astrophysical trends.

*“Systematic bias from waveform modeling for binary black hole populations”*

- 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”*

- 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.

### OURSIP Summer Research Intern

Princeton University, Princeton, NJ

June 2020 – August 2020

*“Improving Trajectory Reconstruction of Charged Particles at the LHC”*

- 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

### Data Science Intern

Maryland New Directions

June 2024 – September 2024

Baltimore, MD

- 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.

## 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 VR experiences.
- Operated in a self-directed environment, independently managing resources and workflows in the new VR division.

## LEADERSHIP AND TEACHING

### Graduate Teaching Assistant

August 2021 – Present

Johns Hopkins University

Baltimore, MD

- 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*

### 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.

## 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.