ANVITA BHAGAVATHULA

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EDUCATION

Cornell University (Cornell Tech) New York, NY   **May 2024**
M.Eng. in Electrical and Computer Engineering
Awards: Merit-based scholarship
Relevant Coursework: Algorithms and Data Structures for Applications, Modern Computer Systems and Architecture, Machine Learning Engineering

Brown University, Providence, RI   **May 2023**
Sc.B. Physics with Honors, A.B. Applied Math | GPA: 3.95
Relevant Coursework: Deep Learning, Solid State Physics (graduate-level), Data Structures and Program Organization, Computational Probability and Statistics, Intro to Computational Chemistry, Quantum Mechanics I and II, Thermodynamics and Statistical Mechanics, Partial Differential Equations, Complex Analysis, Honors Statistics, Linear Algebra

TECHNICAL SKILLS

Coding Languages:	Python, MATLAB, C
Packages:	PyTorch, TensorFlow, JAX, Pandas, Scikit-learn, RDKit, Numba (CUDA), PyMC
Other Tools:	Git, Bash scripting, Quantum Espresso, AWS, LaTeX
Languages:	English, Telugu, Spanish, Hindi

RESEARCH EXPERIENCE

Cornell University S4AI Lab, *Research Assistant,* New York City, NY   **Sep 2023 - Present**
Dr. Udit Gupta
- Leading project on quantifying uncertainty of operational and embodied carbon emissions of AI inference hardware using probabilistic modeling. Analyzed time-series electricity generation and carbon intensity data of various locations to produce initial uncertainty distributions.

Brown University Li Lab and Rubenstein Lab, *Research Assistant,* Providence, RI   **June 2021 - May 2023**
Dr. Jia Li and Dr. Brenda Rubenstein
- Honors senior thesis: developed a combined computational and experimental approach to understand the origin of the superconducting phase in 2D graphene systems using Density Functional Theory and transport measurements.
- Created an intuitive user-friendly program to generate twisted trilayer graphene unit cells and performed band structure and fermi surface calculations on these structures. Proposed a cluster-based approach to model large unit cells that correspond to small twist angles.
- Built a nano-electronic device made from twisted tri-layer graphene to measure its transport properties at cryogenic temperatures. Gained experience with unique fabrication techniques, circuit design, and electron beam lithography.
- Thesis laid groundwork for a collaborative effort by PIs to further study these systems in this manner which is now being supported by a DEPSCoR grant.

Brown University Crunch Group, *Research Assistant,* Providence, RI   **Sep 2022 - Feb 2023**
Dr. Somdatta Goswami
- Researched physics-informed neural networks (PINNs) that leverage underlying physical laws or governing equations to extract patterns from data and solve high-dimensional differential equations.
- Designed a PINN to solve the one-dimensional heat equation using a unique regularization technique to make effective parameter updates by adaptively weighting the boundary conditions and residual errors during training. Improved L2 error by 6 orders of magnitude at boundary conditions compared to a conventional PINN.
- Started implementing a separable self-adaptive PINN in collaboration with two other students to solve the two-dimensional time-dependent heat equation using low-rank decomposition and forward-mode auto-differentiation on a per-axis basis.

Microsoft Research, *Research Intern, S*eattle, WA   **June 2022 – Aug 2022**
Dr. Ranveer Chandra and Dr. Sara Malvar
- Designed an interpretable multimodal ML-based approach to predict protein digestibility coefficients and accelerate the production of sustainable alternative proteins. Filed a provisional patent for this methodology.
- Created two ground-truth protein property datasets by leveraging nutritional composition information, latent protein structure information using embeddings extracted from a pretrained transformer model, and Shapley value analysis.
- Co-first author on paper presenting this novel methodology that has been submitted to *Nature Partner Journals: Science of Food.*

WORK EXPERIENCE

Aqemia, *Deep Learning Intern,* Paris, FR   **June 2023 – Aug 2023**
- Created a graph neural network model to predict reaction synthesis feasibility of drug candidates.
- Implemented a unique attention-based architecture using reactant and product graphs with encoded reaction sites generated using substructure matching that addressed the distribution shift between the training and testing data.
- The model performed with a false positive rate < 0.1 on in-house testing data and accelerated the rate at which promising molecules are filtered, optimized, and synthesized within a drug-discovery startup. Supervised by Dr. Jacques Boitreaud and Dr. Antoine Brochard.

Transcelestial Technologies, *Software Engineer Intern,* Singapore   **Jan 2021 – Apr 2021**
- Created Streamlit based client facing web-tool that halved time taken to qualify equipment installations for a laser communications startup.
- Designed and implemented a processing algorithm using Fourier analysis, Euler angle integration, and signal processing to analyze time-series vibration data and evaluate installation structures.
- This web-tool led to faster deployment of devices that facilitated internet connectivity in Southeast Asia during the COVID-19 pandemic. Supervised by Dr. Jan Smisek.

LEADERSHIP AND TEACHING EXPERIENCE

Break Through Tech AI, *Teaching Assistant,* **New York, NY**   **Aug 2023 – Present**
- Supporting 20 students who belong to underrepresented gender identities in STEM in their endeavor to develop machine learning solutions to industry-issued challenges. Responsibilities include holding meetings for students, providing debugging support, and evaluating coursework.

Brown University Women in Physics, *Lead Coordinator,* **Providence, RI**   **Jan 2021 – May 2023**
- Organized several community-building initiatives such as group study sessions, lunches, and peer mentoring.

Physics Department Diversity Action Plan Committee, *Member,* **Providence, RI**   **Jan 2020 – May 2023**
- Addressed diversity issues within the Physics department in a committee of undergraduates, doctoral students, and faculty.
- Designed climate survey to collect data on the state of diversity in the department which received over 100 responses.

ACADEMIC PROJECTS

- **Minitorch:** Implemented selected back end Pytorch functionality from scratch as part of a Machine Learning Engineering class (Python).
- **CNN Kernel:** Implemented CNN kernel and optimized the matrix multiplication operation via tiling, sparsity, and multithreading (C).
- **2D Ising:** Modeled behavior of a magnetic dipole lattice at different temperatures using Markov Chain Monte Carlo algorithm (MATLAB).
- **Keras From Scratch:** Rebuilt the deep neural network functionality of Keras from scratch (Python).

PUBLICATIONS (preprint)

- Malvar, S., **Bhagavathula, A.,** Balaguer, M., Sharma, S., and Chandra, R. (2022). *Machine learning can guide experimental approaches for protein digestibility estimations.* arXiv:2211.00625 [cs, q-bio]. [online]