# Ayush Khot

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## Education

**University of Illinois at Urbana-Champaign, *Urbana-Champaign, IL*** *August 2025 - Present*

***Doctor of Philosophy:*** Computer Science ***GPA: na/4.00***

*Potential Advisor:* Shaowen Wang

**University of Illinois at Urbana-Champaign, *Urbana-Champaign, IL*** *August 2021 - May 2025*

***Bachelor of Science:*** Computer Science ***GPA: 3.96/4.00***

***Bachelor of Science:*** Engineering Physics

## Experience

**National Center for Supercomputing Applications, *Urbana, IL*** *May 2022 - May 2025*

UNDERGRADUATE RESEARCH ASSISTANT

- Examine, identify shortcomings with, and develop improved explainable AI (xAI) methods on deep neural networks in PyTorch and TensorFlow, reaching a state-of-the-art 93.2% accuracy in top tagging
- Aggregate critical physical characteristics pertinent to top quark decay using xAI metrics like SHAP and LRP
- Compare evidential deep learning (EDL) with baseline methods for uncertainty quantification and anomaly detection in jet tagging causing an increase in AUC by 0.05 in uncertainty quantification and variable improvements in anomaly detection
- Suggest new "Confidence Tuned" variance of EDL that has more accurate uncertainty quantification and similar accuracy
- Examine EDL uncertainties in latent space and the impact of pairwise particle interactions
- Write papers as first author on both applications of XAI methods and EDL on jet tagging (both accepted to MLST)

**Brookhaven National Laboratory, *Upton, NY*** *June 2024 - August 2024*

MACHINE LEARNING GROUP INTERN

- Adopt evidential deep learning (EDL) into storm forecasting to estimate uncertainty in model predictions
- Achieve better calibrated uncertainty using EDL as compared to baseline methods like Ensemble and Monte Carlo Dropout while requiring 10 times less inference time to estimate uncertainties and sustain similar baseline MSE Loss using EDL (0.0044) as compared to baseline methods (0.0036)
- Presented a poster and oral presentation at Brookhaven National Laboratory, and presented a NeurIPS workshop paper as first author.

**National Center for Supercomputing Applications, *Urbana, IL*** *August 2023 - May 2024*

UNDERGRADUATE RESEARCH INTERN

- Employ multi-gpu training for physics-informed neural operators (PINOs) to model 2D magnetohydrodynamics (MHD) simulations
- Contributed to NVIDIA's Modulus package by implementing new PINO models for modeling MHD and nonlinear shallow water simulations

**Argonne National Laboratory, *Lemont, IL*** *May 2023 - August 2023*

ADVANCED PHOTON SOURCE INTERN

- Implement machine learning models in PyTorch and new post-processing method for xylem vessel segmentation in plant, reaching 93.7% Intersection over Union
- Implement simple test code for a Universal Robot UR3e in Python for use of sample handling at beamline
- Present a poster at Argonne National Laboratory, and wrote a paper as first author

## Publications

1. **A. Khot** *et al*, "Spatial Deconfounder: Interference-Aware Deconfounding for Spatial Causal Inference." Submitted to the 14th International Conference on Learning Representations (ICLR), Sep 2025.
2. **A. Khot** *et al*, "Evidential deep learning for uncertainty quantification and out-of-distribution detection in jet identification using deep neural networks." Machine Learning: Science and Technology, July 2025.
3. **A. Khot** *et al*, "Evidential deep learning for probabilistic modelling of extreme storm events." Machine Learning and the Physical Sciences Workshop at the 38th conference on Neural Information Processing Systems (NeurIPS), Sep 2024.
4. **A. Khot** *et al*, "A detailed study of interpretability of deep neural network based top taggers." Machine Learning: Science and Technology, July 2023.

## Honors & Awards

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| 2025 - 2030 | **NSF Graduate Research Fellowship Program (GRFP)**, National Science Foundation | *Urbana, IL* |
| 2024 | **Philip J. and Betty M. Anthony Undergraduate Summer Research Scholarship**, University of Illinois Department of Physics | *Urbana, IL* |
| 2021 - 2024 | **Shelton M&R Matthews Scholarship**, University of Illinois | *Urbana, IL* |
| 2021 - 2025 | **James Scholar**, University of Illinois College of Engineering | *Urbana, IL* |
| 2021 - 2025 | **Dean's List**, University of Illinois College of Engineering | *Urbana, IL* |

## Skills

**Programming** Python, C/C++, JAVA, LaTeX, Linux, Parallel Computing (CUDA, DDP, Horovod), Machine Learning (PyTorch, TF)

**Relevant Courses** Num. Analysis, Machine Learning, Parallel Programming, Linear Algebra, Data Structures and Algorithms