

# Taehoon Hwang

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## EDUCATION

### Columbia University

*B.S. in Computer Science*

**Relevant Courses** *Computer Science Theory, Programming Languages and Translators, Introduction to Databases, Projects in Computer Science*

New York, NY

Aug. 2025 – Present

### Purdue University

*B.S. in Computer Science, Minor in Mathematics; GPA: 4.00 / 4.00*

**Relevant Courses** *Linear Algebra, Probability, Discrete Mathematics, Computer Architecture, Data Structures, Statistical Methods, Competitive Programming I & II, Foundations of Deep Learning, Data Mining & Machine Learning, Introduction to Artificial Intelligence*

West Lafayette, IN

Aug. 2023 – May. 2025

## EXPERIENCE

### Research Assistant

*Columbia University*

Sep. 2025 – Present

New York, NY

- Currently working as at Columbia's NLP laboratory researching LLMs and reinforcement learning mechanisms

### Artificial Intelligence Research Intern

*Asteromorph*

May. 2025 – Aug. 2025

Seoul, South Korea

- Worked with fine-tuning and hosting LLMs (>200B parameters) on multi-GPU servers using vLLM and llama.cpp
- Developed an LLM fine-tuning framework by writing kernel code with PyTorch, Unsloth, and Hugging Face
- Deployed a parallel LLM fine-tuning scheduler and metric dashboard using Ray, Grafana, Prometheus, and Docker

### Teaching Assistant

*Purdue University*

Jan. 2025 – May. 2025

West Lafayette, IN

- Held office hours and lab sessions for students in Discrete Mathematics and Programming in C courses
- Reviewed and conducted problem solving sessions for discrete mathematics on first order logic, set theory, etc
- Answered students' questions during lab sessions on UNIX systems, file IO, dynamic memory allocation, etc

### Research Assistant

*Purdue University*

Jan. 2024 – Dec. 2024

West Lafayette, IN

- Engineered demand forecasting pipeline integrating probability curves with LSTM encoding for enhanced accuracy
- Optimized inference storage by achieving a reduction of >99% compared to traditional deep learning models
- Conducted latent space analysis and illustrated composite encoding of demand features using LSTM models

### Machine Learning Intern

*Quantum Research Sciences*

Sep. 2023 – Aug. 2024

West Lafayette, IN

- Employed ML algorithms and statistical techniques to deploy software for the United States Air Force
- Produced Monte Carlo simulations to test and tune quantum algorithms for inventory management
- Developed end-user interface for data analytics in quantum inventory management software

### Student Researcher

*Seoul Science High School*

Mar. 2022 – Dec. 2022

Seoul, South Korea

- Explored enhancements in real-time landmark tracking algorithms using machine and deep learning
- Improved Google MediaPipe performance by reducing untracked frames by 91.7% through U-Net segmentation
- Designed a versatile multi-headed software solution adaptable to various hardware specifications

### Research Assistant

*Sungkyunkwan University*

May 2021 – Dec. 2021

Seoul, South Korea

- Engaged with research team to boost open set recognition in ResNet models by 9%p via latent space manipulation
- Developed and deployed a remote automated testing and optimization framework for models using PyTorch
- Presented research findings at the Korean Science High School R&E Conference

### Student Researcher

*Seoul Science High School*

Apr. 2020 – Jun. 2021

Seoul, South Korea

- Investigated topics on advertisement classification and recommendation using OCR and clustering algorithms
- Refined k-means clustering to enhance classification accuracy, adapting to the temporal dynamics of user interests
- Demonstrated algorithm adaptability to temporal features through rigorous testing and analysis

## PROJECTS

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- Rotationally Equivariant Spatio-temporal Prediction** Feb. 2025 – Apr. 2025
- Developed spatio-temporal predictive models with rotational equivariance to adapt to out-of-distribution inputs
  - Constructed training infrastructure using PyTorch Lightning and distributed high-performance computing nodes
  - Compared methods for equivariance using steerable wavelet filters, G-CNNs, and equivariant attention modules
- Financial Anomaly Detection with Modified Benford's Law** Jan. 2025 – Present
- Suggested novel alteration of Benford's Law applicable to stock return data based on the Student-Lévy process
  - Proved algorithm utility with real-life stock data and demonstrated 60% improvement over conventional methods
  - Utilized new algorithm to detect financial anomalies in stock returns based on fitted location-scale t-distributions
- WUMT: Wavelet U-Net Motion Transformer** Jul. 2024 – Present
- Investigated spatio-temporal encoding methods of videos using discrete wavelet transforms and NAFNet blocks
  - Utilized 4D motion tensor computations and predictions with transformers for U-Net latent space operations
  - Built training infrastructure with PyTorch Lightning and leveraged Docker and MLFlow for streamlined research
- RL Wildfire Optimization** May. 2024 – Dec. 2024
- Utilized Convolutional DQN models to optimize firefighting efforts and evacuation routes with wildfires
  - Developed complex wildfire simulation incorporating population density, terrain, weather, and crowd dynamics
  - Theorized dynamic custom action and state space utilizing one-hot encoding and action masks
- Contextual-Diffusion** Feb. 2023 – Aug. 2023
- Improved cohesion and features of Stable Diffusion model output utilizing spacial context from LLMs
  - Developed pipeline incorporating Mask-RCNN models as translation layers between LLMs and Stable Diffusion
  - Generated and annotated image segmentation datasets for supervised learning of Mask-RCNN models
- Minimax-based Animal Shogi AI** Mar. 2021 – Nov. 2021
- Programmed an Animal Shogi bot using a minimax algorithm with alpha-beta pruning in C++
  - Implemented interactable game GUI and cross-language translation mechanism with Python
  - Demonstrated bot with live play-testing at school festival to 350+ students and faculty

## ACTIVITIES

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- Purdue Hackers Club Member** Jan. 2025 – Present  
*Purdue University* *West Lafayette, IN*
- Participated in weekly 'hack' sessions and developed projects involving full-stack web development.
  - Developed website for course scheduling at Purdue with Next.js, MongoDB, and Python among team of 3.
- Purdue IGDC Club Member** Jan. 2024 – Present  
*Purdue University* *West Lafayette, IN*
- Participated in various in-person game development sessions with other club members.
  - Developed game with Unity centered around creating gravitational wells to enduce fast-paced gameplay.
  - Gave feedback on other games being developed and participated in play testing.
- ICPC 2023 ECNA Regional Participant** Sep. 2023  
*Purdue University* *West Lafayette, IN*
- Ranked in the Top 20 in Purdue's ICPC participant selection contest
  - Lead team of 3 in the ICPC East Central North America regional contest among 5 other Purdue ICPC teams
  - Solved problems utilizing competitive programming techniques such as dynamic programming and backtracking
- Hello World Hackathon Participant** Sep. 2023  
*Purdue University* *West Lafayette, IN*
- Led a team of 4 in a 24-hour hackathon driving project development and collaboration
  - Built a software pipeline utilizing LLMs to deliver personalized dietary text feedback to users
  - Built a full-stack web app with a React front-end and ExpressJS back-end integrating MongoDB RestAPIs
- ML@Purdue Club Member** Mar. 2023 – Present  
*Purdue University* *West Lafayette, IN*
- Engaged in club discourse on AI and ML topics for research and software development.
  - Participated in paper reading and workshops on various topics, such as transformers, GNNs, etc.

## Compute Infrastructure Manager

Nov. 2021 – Feb. 2022

*Seoul Science High School*

*Seoul, South Korea*

- Allocated funding and purchased a multi-GPU cloud computing server for deep learning model training purposes.
- Managed and tested training infrastructure for research by setting up various software such as job managers.

## Published Author on Neural Network Fundamentals

Sep. 2021 – Mar. 2022

*Barun Books Co.,Ltd*

*Seoul, South Korea*

- Authored a 160-page book on neural networks covering backpropagation, gradient descent, and parallelization
- Distributed to 13 retailers, selling 300+ copies in the first year
- Ranked as a top 4 entry in the “Weekly Top Releases” by the second-largest South Korean book retailer

## Artificial Intelligence Lecturer

May 2021 – Apr. 2023

*Seoul Science High School*

*Seoul, South Korea*

- Presented 8 deep learning-focused lectures to an audience of 200+ students and faculty
- Delivered lectures on topics including linear algebra, conventional neural networks, and transformers
- Conducted 10 additional interdisciplinary volunteer lectures focused on mathematics and artificial intelligence

## Artificial Intelligence Club President

Mar. 2021 – Feb. 2023

*Seoul Science High School*

*Seoul, South Korea*

- Authored 4 different entry exams on mathematical deep learning and essays on model selection
- Curated literature and project content with paper readings and specialized datasets
- Supervised and managed the acquisition of a multi-GPU deep learning server for club research and projects

## HONORS & AWARDS

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### Purdue Office of Undergraduate Research Grant

*Purdue University, 2024*

*\$ 500*

### Deans List & Semester Honors

*Purdue University, 2023 & 2024 & 2025*

### Excellence Award in the Gifted School Research Conference

*Pohang University of Science & Technology, 2022*

### Top Award for R&E Research in Computer Science

*Seoul Science High School, 2022*

### Azure AI Fundamentals Certification

*Microsoft, 2022*

### Top Award for Independent Research on Computer Science

*Seoul Science High School, 2021*

## TECHNICAL SKILLS

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**Languages & Frameworks:** C/C++, Express.js, Flask, HTML/CSS, Java, JavaScript, Python, React, x86 Assembly

**Dev & Research Tools:** Docker, Git/GitHub, IntelliJ, LaTeX, MLfLow, Overleaf, PyCharm, Slurm, VS Code

**Libraries:** Keras, NumPy, OpenCV, Pandas, PyTorch, Scikit-learn, TensorFlow, Transformers, Unsloth, trl, vLLM