

# MINGI KANG

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## EDUCATION

### Bowdoin College, ME

B.A. in Computer Science, Minor in Mathematics  
Overall GPA: 3.67 / 4.00

August 2022 - Present

### Aquincum Institute of Technology, Budapest, Hungary

Computer Science Study Abroad Semester

August - December 2024

## PUBLICATIONS, PRESENTATIONS, MEDIA

### Publications

- [1] ZiLU Activation Function for Vision and Language Models  
*Mingi Kang, Zai Yang, Jeová Farias Sales Rocha Neto* In Preparation  
2025
- [2] Attention Via Convolutional Nearest Neighbors  
*Mingi Kang, Jeová Farias Sales Rocha Neto* Under Review  
2025  
[arXiv preprint arXiv:2511.14137](https://arxiv.org/abs/2511.14137)
- [3] Parallel qMRI Reconstruction from 4x Accelerated Acquisitions  
*Mingi Kang* Preprint  
2025  
[arXiv preprint arXiv:2511.18232](https://arxiv.org/abs/2511.18232)
- [4] Structures and process-level lexical interactions in memory search: A case study of individuals with cochlear implants and normal hearing  
*Abhilasha A. Kumar, Mingi Kang, William G. Kronenberger, Michael N. Jones, David B. Pisoni* Conference Publication  
2024  
CogSci 2024. Proceedings of the 46th Annual Meeting of the Cognitive Science Society (Vol. 46).  
DOI: <https://escholarship.org/uc/item/7vn9q9hh>

### Presentations

- [1] Parallel qMRI Reconstruction from 4x Accelerated Acquisitions  
*Mingi Kang* Oral  
July 2025  
McKelvey School of Engineering Summer Symposium, St. Louis, MO
- [2] Convolutional Nearest Neighbors: Reinterpreting Convolution Through K-Nearest Neighbor Selection  
*Mingi Kang* Poster  
October 2025  
IEEE MIT Undergraduate Research Technology Conference (MIT URTC), Cambridge, MA
- [3] Parallel qMRI Reconstruction from 4x Accelerated Acquisitions  
*Mingi Kang* Poster  
July 2025  
McKelvey School of Engineering Poster Palooza, St. Louis
- [4] Structures and process-level lexical interactions in memory search: A case study of individuals with cochlear implants and normal hearing  
*Mingi Kang* Poster  
July 2024  
Annual Conference of the Cognitive Science Society 2024, Rotterdam, Netherlands

### Media

- [1] Mingi Kang '26: Advancing Computers' Ability to See and Understand Our World (November 2025) School Article  
[Bowdoin Article Link](#)

## RESEARCH EXPERIENCE

### Independent Deep Learning Research Group

*Undergraduate Research Assistant (Advisor: Prof Jeova Farias)*

August 2025 - Present  
Brunswick, ME

- Developed **ZiLU** activation function that generalizes ReLU, GELU, and SiLU with learnable parameters for fine-grained control.

- Implemented modular GPT2 architecture allowing plug-and-play activation function swapping, training on OpenWebText to evaluate performance via perplexity metrics.
- Demonstrated 1-2% improvements on image classification on CIFAR-10/100 with VGG19 and ResNet34 compared to baseline ReLU, GELU, and SiLU activations, with consistent gains across architectures.

### **Senior Honors Thesis in Computer Science**

*Honors Candidate (Advisor: Prof Jeova Farias)*

August 2025 - Present  
Brunswick, ME

- Finalizing **ConvNN**, a unified framework bridging convolution and attention through  $k$ -nearest neighbor selection, with first-author paper submitted and currently under review.
- Architected hybrid branching layers combining spatial (Conv2d) and feature-based (ConvNN) aggregation, achieving 4-8% accuracy improvements on CIFAR-10/100 with VGG-11 architecture.
- Demonstrated effective and robust performance across CNN and Transformer through systematic ablation studies on neighbor selection strategies.

### **Computational Imaging Group, Washington University in St. Louis**

*McKelvey Summer Engineering Fellow (Advisor: Prof Ulugbek S. Kamilov)*

May - August 2025  
St. Louis, MO

- Redesigned deep unfolding U-Net architecture for parallel qMRI reconstruction, achieving 4x parameter reduction while maintaining reconstruction quality (37 dB PSNR, 0.923 SSIM) on 4x accelerated scans.
- Developed normalization techniques (ACS region-specific and coil-instance) for undersampled k-space preprocessing, validated on patient dataset from WashU Medical School.

### **Independent Deep Learning Research Group**

*Undergraduate Research Assistant (Advisor: Prof Jeova Farias)*

January - May 2025  
Brunswick, ME

- Developed **Convolutional Nearest Neighbor Attention (ConvNN-Attention)**, an efficient attention mechanism using hard  $k$ -NN and convolutional aggregation, reducing computational cost by 18% (GFLOPS) with accuracy improvement (2.4%) on CIFAR-10/100.
- Implemented modular PyTorch layers compatible with standard Transformer and Vision Transformer architectures, enabling drop-in replacement for self-attention.

### **Christenfeld Summer Research Fellowship**

*Research Fellow (Advisor: Prof Jeova Farias)*

January - August 2024  
Brunswick, ME

- Developed **Convolutional Nearest Neighbors (ConvNN)** algorithm integrating norm-based  $k$ -NN pixel selection into standard convolutional operations for spatial feature learning.
- Built modular PyTorch implementation (1D/2D) with configurable sampling strategies (random, spatial), pixel-shuffling, and positional encoding.

### **Lexicon Lab, Bowdoin College**

*Undergraduate Research Assistant (Advisor: Prof Abhilasha Kumar)*

December 2022 - May 2024  
Brunswick, ME

- Investigated lexical retrieval processes in prelingually deaf cochlear implant users through computational cognitive modeling, contributing to published CogSci 2024 conference proceedings paper (second author).
- Extended Python package, *Forager* with joint semantic embeddings (word2vec, speech2vec) for quantitative analysis, revealing differential reliance on speech-derived representations.

## **TEACHING/MENTORING EXPERIENCE**

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### **Bowdoin College Baldwin Center for Learning and Teaching**

*Quantitative Tutor*

August 2025 - Present  
Brunswick, ME

- Provide one-on-one tutoring in computer science (algorithms, data structures, AI), mathematics (linear algebra, probability, statistics), and economics (microeconomics, macroeconomics).
- Support students in debugging code, understanding theoretical concepts, and developing problem solving strategies for quantitative coursework.

### **Bowdoin College Mathematics Department**

*Learning Assistant (Teaching Assistant) for Statistics and Data Science*

August 2025 - Present  
Brunswick, ME

- Conduct weekly learning assistant hours supporting 20+ students with R programming, statistical analysis, hypothesis testing, data visualization, and data cleaning.

- Guide students through applied projects involving real-world datasets, emphasizing statistical thinking and reproducible analysis.

**Bowdoin College Computer Science Department**

*Learning Assistant (Teaching Assistant) for Intro to Computer Science*

January 2025 - Present  
Brunswick, ME

- Lead weekly learning assistant hours for 40+ students covering Python fundamentals and object-oriented programming.
- Mentor students on debugging techniques, code organization, and developer best practices.

**Bowdoin College Career Exploration and Development Group**

*Sophomore Bootcamp Leader & Pod Leader*

January 2025, January 2026  
Brunswick, ME

- Design and deliver workshops on career development for 400+ sophomores, covering resume, writing, behavioral interviews, internship navigation, personal finance, academic research, graduate school, and fellowships.
- Train and manage a team of 7 senior mentors, overseeing their preparation to deliver specialized workshops and career curricula to the sophomore class.
- Mentored 5 student teams in inaugural Sophomore Bootcamp Hackathon, providing technical guidance on full-stack development, API integration, and project management.

## RELEVANT COURSEWORK

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**Computer Science:** Deep Learning for Computer Vision, Operating Systems, Artificial Intelligence, Computer Systems, Algorithms, Data Structures, Data Science, Cryptography, Computational Game Theory

**Mathematics:** Linear Algebra, Multivariable Calculus, Probability, Statistics, Mathematical Reasoning, Advanced Probability and Statistics

## TECHNICAL SKILLS

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|------------------------------|--|
| <b>Programming Languages</b> | Python, R, Java, C, SQL, JavaScript, Kotlin                            |
| <b>ML &amp; DL</b>           | PyTorch, TensorFlow, Keras, Scikit-Learn, NumPy, Pandas, SciPy, OpenCV |
| <b>Visualization</b>         | Matplotlib, Seaborn, ggplot2   |
| <b>Developer Tools</b>       | Git, GitHub, Bash, Overleaf/LaTeX, Markdown                            |
| <b>HPC</b>                   | Slurm (sbatch), IBM LSF (bsub)   |
| <b>Languages</b>             | English (Native), Korean (Native), German (Conversational)             |

## AWARDS AND HONORS

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1. CRA Outstanding Undergraduate Researcher Award, Honorable Mention  
*National Computing Research Association*  
December 2025  
- Prestigious honor recognizes undergraduate students at North American colleges and universities who demonstrate exceptional potential in computing research.
2. John L. Roberts Fall Research Award (\$ 2,463)  
*Bowdoin College*  
October 2025  
- Awarded for senior honors project on Convolutional Nearest Neighbors & Convolutional Nearest Neighbors Attention
3. Best Poster Presentation Award from McKelvey Engineering Summer Research (\$ 100)  
*Washington University in St. Louis*  
July 2025  
- Awarded for excellence in summer research presentation.
4. McKelvey Engineering Summer Research Fellowship (\$ 7,200)  
*Washington University in St. Louis*  
May 2025  
- Awarded to conduct 10-week full time research with the Computational Imaging Group.
5. Allen B. Tucker Computer Science Research Prize (\$ 50)  
*Bowdoin College*  
May 2025  
- Awarded to a computer science student for excellence in summer research.
6. CRA Undergraduate Award (\$ 4,000)  
*Last Mile Education*  
April 2025  
- Awarded for supplemental assistance for summer research in computer science at Washington University in St. Louis.
7. NYC Stem Award (\$ 1,500)  
*Last Mile Education*  
March 2025  
- Awarded merit-based grant for technical equipment and research support.

8. Google AI 2024 Award (\$ 595) *Local*  
*Last Mile Education* January 2025  
- Awarded for semester research, building on prior work from Bowdoin College Christenfeld Summer Research Fellowship.
9. Christenfeld Summer Research Fellowship (\$ 4,800) *Institutional*  
*Bowdoin College* April 2024  
- Awarded to conduct 8-week full time research in computer vision and deep learning under faculty mentorship.
10. NSF Student Faculty Research Fellowship (\$ 1,800) *National/Institutional*  
*Bowdoin College, National Science Foundation* January 2024  
- Awarded for computational cognitive science research focused on modeling search and retrieval within the mental lexicon.
- II. QuestBridge National College Match Finalist *National*  
*QuestBridge* September 2021  
- Recognized as a finalist for the QuestBridge program, which connects high-achieving students from low-income, first-generation backgrounds with full scholarships to top colleges.