MINGI KANG

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EDUCATION

Bowdoin College, ME *August 2022 - Present*
B.A. in Computer Science, Minor in Mathematics
Overall GPA: 3.67 / 4.00

Aquincum Institute of Technology, Budapest, Hungary *August - December 2024*
Computer Science Study Abroad Semester

PUBLICATIONS, PRESENTATIONS, MEDIA

Publications

[1] ZiLU Activation Function for Vision and Language Models (2025) *In Preparation*
Mingi Kang, Zai Yang, Jeová Farias Sales Rocha Neto

[2] Attention Via Convolutional Nearest Neighbors (2025) *Under Review*
Mingi Kang, Jeová Farias Sales Rocha Neto
arXiv preprint arXiv:2511.14137

[3] Parallel qMRI Reconstruction from 4x Accelerated Acquisitions (2025) *Preprint*
Mingi Kang
arXiv preprint arXiv:2511.18232

[4] Structures and process-level lexical interactions in memory search: A case study of individuals with cochlear implants and normal hearing (2024) *Conference Publication*
Abhilasha A. Kumar, Mingi Kang, William G. Kronenberger, Michael N. Jones, David B. Pisoni
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 *Oral*
Mingi Kang
McKelvey School of Engineering Summer Symposium, St. Louis, MO. July 2025

[2] Convolutional Nearest Neighbors: Reinterpreting Convolution Through K-Nearest Neighbor Selection *Poster*
Mingi Kang
IEEE MIT Undergraduate Research Technology Conference (MIT URTC), Cambridge, MA. October 2025

[3] Parallel qMRI Reconstruction from 4x Accelerated Acquisitions *Poster*
Mingi Kang
McKelvey School of Engineering Poster Palooza, St. Louis, MO. July 2025

[4] Structures and process-level lexical interactions in memory search: A case study of individuals with cochlear implants and normal hearing *Poster*
Mingi Kang
Annual Conference of the Cognitive Science Society 2024, Rotterdam, Netherlands. July 2024.

Media

[1] Mingi Kang '26: Advancing Computers' Ability to See and Understand Our World *School Article*
Bowdoin Article Link

RESEARCH EXPERIENCE

Independent Deep Learning Research Group August 2025 - Present
Undergraduate Research Assistant (Advisor: Prof Jeova Farias) *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 August 2025 - Present
Honors Candidate (Advisor: Prof Jeova Farias) *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 May - August 2025
McKelvey Summer Engineering Fellow (Advisor: Prof Ulugbek S. Kamilov) *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 January - May 2025
Undergraduate Research Assistant (Advisor: Prof Jeova Farias) *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 January - August 2024
Research Fellow (Advisor: Prof Jeova Farias) *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 December 2022 - May 2024
Undergraduate Research Assistant (Advisor: Prof Abhilasha Kumar) *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

Bowdoin College Baldwin Center for Learning and Teaching August 2025 - Present
Quantitative Tutor *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 August 2025 - Present
Learning Assistant (Teaching Assistant) for Statistics and Data Science *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 January 2025 - Present
Learning Assistant (Teaching Assistant) for Intro to Computer Science *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 January 2025, January 2026
Sophomore Bootcamp Leader & Pod Leader *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

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

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

TECHNICAL SKILLS

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

AWARDS AND HONORS

1. CRA Outstanding Undergraduate Researcher, 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) *Institutional*
   Bowdoin College October 2025
   - Awarded for senior honors project on Convolutional Nearest Neighbors & Convolutional Nearest Neighbors Attention
3. Best Poster Presentation in the McKelvey Engineering Summer Research ($ 100) *Institutional*
   Washington University in St. Louis July 2025
   - Awarded for excellence in summer research presentation.
4. McKelvey Engineering Summer Research Fellowship ($ 7,200) *Institutional*
   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) *Institutional*
   Bowdoin College May 2025
   - Awarded to a computer science student for excellence in summer research.
6. CRA Undergraduate Award ($ 4,000) *Local*
   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) *Local*
   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.

11. 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.