Haoyu Dong

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EDUCATION

Columbia University New York, NY

M.S. in Electrical Engineering, GPA: 4.08/4.0 Aug 2024 - Dec 2025

- **Concentration:** Deep Learning, Signal Processing, Computer Vision
- **Courses:** Deep Learning & Neural Networks (A+), Machine Learning, Transformer-based ML

Xi'an Jiaotong University (XJTU) Shannxi, CN

B.S. in Automation, GPA: 3.51/4.3 Sep 2020 - Jul 2024

- **Honors:** Awarded 'Excellent Student' Scholarship, XJTU, Academic Year 2022-2023 for top 10% students
- **Concentration:** Machine Learning, Control Theory, Signal Processing
- **Courses:** Modern Control Theory, Signal & DSP, Embedded System, Computer Principle

RESEARCH EXPERIENCE

Visual Reasoning Model with Chain of Thought for Robust Vision-Language Understanding New York, NY

Research Assistant, Group Leader | Advised by Prof. Zoran Kostic Feb 2025 - Now

- Initiated a project building upon the AAAI'24 "Multimodal-CoT" framework to improve vision-language reasoning
- Reproducing baseline results on ScienceQA and A-OKVQA to address single-benchmark overfitting; expanding to VQA-v2 and GQA
- Investigating vision backbone replacement (e.g., InstructBLIP, BLIP-2) and rationale alignment via RLHF-based reward modeling
- Aiming to reduce hallucination and improve reasoning robustness via better vision-language fusion and rationale filtering mechanisms

Rotary Positional Embedding Mechanism on Sparse Attention Architecture New York, NY

Research Assistant | Advised by Prof. Krzysztof Choromanski Sep 2024 - Dec 2024

- Implemented *RoPerformer,* a 2D RoPE mechanism to encode relative positional information, achieving improved spatial representation and scalability for attention-based models
- Conducted controlled experiments on CIFAR-100; compared absolute vs. rotary embeddings under varying attention sparsity
- Reduced quadratic complexity via kernelized attention, supporting long-sequence modeling

Implementation of Filtering Methods for Non-Gaussian Noise Dynamic Systems Shannxi, CN

Researcher | Advised by Prof. Guanghua Zhang Jan 2024 - Jun 2024

- Focused on the improvement of Kalman Filter (KF) in Non-Gaussian Noise Dynamic Systems
- Introduced MCC into KF to cure traditional KF's weakness in Non-Gaussian Noise Systems
- Improved KF and got better performance on Mixture Gaussian Noise, evaluated by RMSE

PROJECTS EXPERIENCE

Enhanced Kolmogorov–Arnold Representation Theorem based Neural Networks (KAN) New York, NY

Researcher, Group Leader | Advised by Prof. Zoran Kostic Sep 2024 - Dec 2024

- Migrated KAN from PyTorch to TensorFlow, redesigning spline-based activations & dynamic grid refinement for scalable and efficient deployment
- Investigated KAN's approximation capabilities under Kolmogorov–Arnold Representation Theorem against UAT of MLP, demonstrating solutions to the curse of dimensionality and advancing understanding of neural network scalability
- Created a comprehensive githubrepo with code, experiments, and documentation, accompanied by a detailed report on implementation and findings

RESEARCH REPORT

Haoyu Dong, Jinfan Xiang, Yunfei Ke. *KAN:Kolmogorov–Arnold Networks.* Final Report for courses ECBM 4040 Neural Networks and Deep Learning.

Haoyu Dong, Jinfan Xiang, Wangshu Zhu, Xudong Chen, Zekai Wen. *Rotary Positional Encodings for ViT and Performer Architectures*. Final Report for courses IEOR 6617 : Machine Learning & High-Dimensional Data Mining.

SKILLS

Programming: Python, C, Matlab, Shell, Assembly Language, TensorFlow, Torch, , LaTeX

Language: English, Chinese(Native), Japanese(Intermediate)