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:** ECBM 4040 (**A+**), ELEN 4720, IEOR 6617, CSOR 4231
- Ranked **1st/40** in final exam of ELEN 4720
- Ranked **3rd/130** in Kaggle competition of ECBM 4040 on the topic of CNN Image Recognition

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

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
- Designed & Conducted 10+ representative experiments, including PDE solving, high-dimensional function fitting, and symbolic regression, achieving up to 35% accuracy improvement and validating KAN's interpretability and adaptability in the background of AI for Science
- 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

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

Researcher | 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 thorough experiments on the CIFAR-100 dataset, analyzing the trade-offs between absolute and rotary positional embeddings in both classical attention architecture and sparse attention architecture
- Reduced quadratic complexity to near-linear levels by leveraging efficient kernel-based transformations, enabling scalable processing for large token dimensions while maintaining robust performance

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

PROJECT EXPERIENCE

- Trolley Control Based on LabView and **MyRIO** — Mar 2023 - May 2023
- Helicopter Attitude Control under **PID Algorithm** with LabView — Mar 2023 - Apr 2023
- **Speech Recognition** Based on Digital Signal Processing (DSP) Technology — Sep 2022 - Dec 2022
- Unity-3D Motion-Control based on **Reinforcement Learning** — Sep 2022 - Jan 2023

PUBLICATION & 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.

Haoyu Dong. *Research and Implementation of Filtering Methods for Non-Gaussian Noise Dynamic Systems.* Bachelor's Thesis at Xian Jiaotong University.

Bai Yu, **Haoyu Dong**, and Qiwei Lian. *Comparative Analysis of Reinforcement Learning Algorithm based on Tennis Environment.* Accepted to CMLAI2023 conference. Published by Highlights in Science, Engineering and Technology 39 (2023): 1146-1152.

SKILLS

Programming: Python, C, Matlab, Shell, Assembly Language, TensorFlow, Torch
Language: English, Chinese(Native), Japanese(Intermediate)