Kolmogorov Arnold Networks: Project Overview

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1 Introduction

Traditionally Deep Learning(DL) models are built from the Multilayer Perceptron Model(MLP). Recently [[LWV+24], [LMW+24]] introduced the Kolmogorov Arnold Networks(KANs) as an alternative to the MLPs. While MLPs have fixed *nodes*("neurons") activation functions, KANs have learnable activation functions on *edges*("weights"). The authors claim that this small change makes KANs outperform MLPs in terms of accuracy and interpretability [LWV+24].

2 Necessity

As Deep Learning models grow more complex with additional layers, GPU resources are increasingly strained. Optimal solutions are needed to reduce this load while boosting model speed. KANs may offer these speedups, but further research and testing on larger models across various applications are necessary to validate this hypothesis[HK24].

3 Objectives

Present Kolmogorov-Arnold Networks (KANs) as a better deep learning model alternative to Multi-Layer Perceptrons (MLPs) through experiments, emphasizing their learnable activation functions on edges for improved interpretability and accuracy.

4 Expected Outcomes

By the end of this project we would have achieved the following outcomes:

1. A comprehensive understanding of the theoretical foundations, architecture, and real-world applications of KANs.
2. A critical analysis of the strengths, weaknesses, and potential improvements in the design and implementation of KANs.
3. Hands-on experience in developing, simulating, and optimizing KANs using libraries such as Pytorch.

References

[HK24] Bochra Hadj Kilani. Kolmogorov-arnold networks: Key developments and uses. *Qeios*, 2024.

[LMW+24] Ziming Liu, Pingchuan Ma, Yixuan Wang, Wojciech Matusik, and Max Tegmark. Kan 2.0: Kolmogorov-arnold networks meet science, 2024.

[LWV+24] Ziming Liu, Yixuan Wang, Sachin Vaidya, Fabian Ruehle, James Halverson, Marin Soljačić, Thomas Y. Hou, and Max Tegmark. Kan: Kolmogorov-arnold networks, 2024.