Beyond MLPs: Kolmogorov-Arnold Networks, Their Approximation Theory, and Inspired Architectures

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ABSTRACT

n this talk, we will discuss our research progress on the mathematical foundations of Kolmogorov-Arnold Networks (KANs) and their inspired architectures. Starting from the classical Kolmogorov-Arnold Representation Theorem, we investigate the approximation capabilities of KANs across different function classes, including smooth, polynomial, and discontinuous functions, and clarify their theoretical relationship with multilayer perceptrons (MLPs). Going beyond this comparison, a central contribution is a KAN-inspired discontinuous network architecture designed for functions with irregular interfaces. By replacing standard summation operators with sigmoid-weighted regional MLPs, the proposed method identifies and tracks discontinuous interfaces through a structured three-stage training pipeline. Numerical experiments on petal-shape and dual-circle interface problems demonstrate significant improvements over standard MLPs in accuracy, parameter efficiency, and training stability.