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Biology-inspired neural networks with multi-directional propagation of values and distributions

While biological axons can propagate in both directions, current ANNs are focused on unidirectional propagation. Also usually they only propagate values, while uncertainty is shown also crucial for making decisions of biological organisms - suggesting to propagate also variance, probability distributions. I will talk about novel KAN-like approach to ANNs repairing these lack by using neurons containing inexpensive local joint distribution model as polynomial, allowing to freely change propagation direction by just switching indexes, also propagate entire probability distributions represented by vectors of moments. Beside backpropagation, it also allows many additional training approaches, like direct estimation, tensor decomposition, and through information bottleneck.