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Machine Learning Techniques for Neutrino Reconstructions in IceCube

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Advancements in machine learning have improved event reconstruction in the analyses of IceCube data, providing fast and accurate estimations of neutrino properties. These methods typically use pulse series data and the spatial information of digital optical modules as inputs to neural networks. I will discuss current reconstruction techniques in IceCube and their applications to physics analyses. Increasingly more complex models like graph neural networks and transformers are being explored as improvements over convolutional neural network-based reconstructions. I will introduce state space models as a promising approach for efficiently reconstructing very long data sequences, removing the need for compression techniques and avoiding the quadratic complexity of attention. Additionally, efforts are ongoing to integrate these new models into the open-source reconstruction framework GraphNeT, which could extend these techniques to other experiments.

Type of Contribution

talk

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