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Identifying the Quantum Properties of Hadronic Resonances using Machine Learning

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With the great promise of deep learning, discoveries of new particles at the Large Hadron Collider (LHC) may be imminent. Following the discovery of a new Beyond the Standard model particle in an all-hadronic channel, deep learning can also be used to identify its quantum numbers. Convolutional neural networks (CNNs) using jet-images can significantly improve upon existing techniques to identify the quantum chromodynamic (QCD) ('color') as well as the spin of a two-prong resonance using its substructure. Additionally, jet-images are useful in determining what information in the jet radiation pattern is useful for classification, which could inspire future taggers. These techniques improve the categorization of new particles and are an important addition to the growing jet substructure toolkit, for searches and measurements at the LHC now and in the future.

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