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# Going off topics to demix quarks and gluons when extracting alphaS

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Quantum chromodynamics is the theory of the strong interaction between quarks and gluons; the coupling strength of the interaction, $\alpha_S$, is the least precisely-known of all interactions in nature. An extraction of the strong coupling from the radiation pattern within jets would provide a complementary approach to conventional extractions from jet production rates and hadronic event shapes, and would be a key achievement of jet substructure at the Large Hadron Collider. Presently, the relative fraction of quark and gluon jets in a sample is the limiting factor in such extractions, as this fraction is degenerate with the value of $\alpha_S$ for the most well-understood observables. To overcome this limitation, we apply recently proposed techniques to statistically demix multiple mixtures of jets and obtain purified quark and gluon distributions based on an operational definiton. We illustrate that studying quark and gluon jet substructure separately can significantly improve the sensitivity of such extractions of the strong coupling. We discuss how using machine learning techniques or infrared- and collinear-unsafe information can improve the demixing performance without the loss of theoretical control.

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