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Data-driven quark and gluon jet modification

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Distinguishing between the modification of quark- and gluon-initiated jets in the quark-gluon plasma (QGP) remains an unresolved challenge without a definitive answer from experiment. We demonstrate that a fully data-driven technique, known as topic modeling, may be used to study the separate modification of quark and gluon jets experimentally. Our proof-of-concept study is based on proton-proton and heavy-ion collision events from the Pyquen generator with statistics accessible in Run 4 of the Large Hadron Collider. We use topic modeling to extract the separate modification of quark and gluon jet substructure in the QGP. We show that this data-driven technique is robust to large backgrounds in heavy-ion collisions by smearing our input distributions and obtaining similar results. These results suggest the potential for an experimental determination of quark and gluon jet substructure and their modification.

Experiment/Theory

Theory/Phenomenology

Affiliation

MIT, CERN

Hauptautoren: Dr. BREWER, Jasmine (CERN); YING, Yueyang; CHEN, Yi (Massachusetts Institute of Technology); LEE, Yen-Jie (Massachusetts Institute of Technology)

Vortragende(r): Dr. BREWER, Jasmine (CERN)

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