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ML biases in background subtraction to measure jet quenching

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Jet quenching measurements in central ultra-relativistic heavy ions collisions are a principle experimental probe of the quark-gluon plasma (QGP). The measurement resolution is limited, particularly at lower values of transverse momentum, by the high density of background particles. Many recent studies have demonstrated that neural networks (NNs) trained on jet substructure are capable of significantly increasing the resolution of jet background corrections relative to the standard area-based method. However, the modification of substructure in quenched jets biases these NN corrections. It is essential to understand and quantify these biases to qualify using NNs in jet quenching measurements. To this end, we use the JETSCAPE framework with MUSIC to simulate realistic hydrodynamically modelled QGP in central Au+Au collisions at RHIC energies with associated jet quenching. This quenching is compared to the quenching in computationally simpler fixed-length bricks of QGP. We train NNs for background subtraction using unquenched jets embedded into realistic backgrounds from JETSCAPE+MUSIC and present the biases of the NNs'background corrections for quenched jets. To demonstrate the propagation of these biases in measurement, we present an R_{AA} calculated using NNs for background correction and compare it to the generator-level R_{AA} of a JETSCAPE MC spectrum of quenched jets.

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