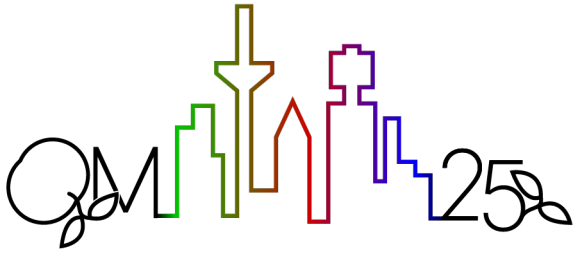

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Deep Learning Methods for Jet Tagging and Process Classification Using Image Processing and Energy Flow Polynomials

The use of neural networks in high-energy physics has rapidly expanded, particularly in jet tagging applications. This study explores two parallel methods, both leveraging convolutional neural networks (CNNs) to classify jets produced in high-energy collisions by differentiating between heavy quark (charm, bottom), light quark (up, down, strange), and gluon jets. The first method constructs image-like representations based on the kinematics of charged decay products, allowing CNNs to analyze visual patterns characteristic of each jet type. The second approach utilizes Energy Flow Polynomials (EFPs) as structured input features to encode jets' energy distribution and substructure, feeding this data into CNNs to enhance classification. Both approaches independently demonstrate strong classification performance, highlighting the versatility of CNN architectures in jet tagging and advancing our understanding of jet substructures through complementary representations.

Category

Experiment

Collaboration (if applicable)

Authors: ALARCON DO PASSO SUAIDE, Alexandre (Universidade de Sao Paulo (BR)); Mr SIQUEIRA, Bruno (Universidade de São Paulo); Mr NEVES FACHIERI, Daniel; Mr MARTINS CAMPOS ALMEIDA ARNEIRO, Jhoao Gabriel (Universidade de Sao Paulo (USP) (BR)); Mr MARTINS CAMPOS ALMEIDA ARNEIRO, Jhoao Gabriel (Universidade de Sao Paulo (BR)); DE MELO PAULINO, Maria Monalisa (Universidade de Sao Paulo (BR)); MARTINES DE AZEVEDO DA SILVA, Matheus (Universidade de São Paulo)

Presenter: Mr MARTINS CAMPOS ALMEIDA ARNEIRO, Jhoao Gabriel (Universidade de Sao Paulo (USP) (BR))

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