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Flavour Tagging with Graph Neural Networks with the ATLAS experiment

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Flavour-tagging, the identification of jets originating from b and c quarks, is a critical component of the physics programme of the ATLAS experiment. Current flavour-tagging algorithms rely on the outputs of "low level" taggers, which are a mixture of manually optimised, physically informed algorithms and machine learning models. A new approach, instead uses a single machine learning model which is trained end-to-end and does not require inputs from existing low level taggers, leading to reduced overall complexity and enhanced performance. The model uses a Graph Neural Network/Transformer architecture to combine information from a variable number of tracks within a jet in order to simultaneously predict the flavour of the jet, the partitioning of tracks in the jet into vertices, and information about the physical origin of the tracks. The auxiliary training tasks are shown to improve performance, whilst also providing insight into the physics of the jet and increasing the explainability of the model. This approach compares favourably with existing state of the art methods, in particular in the challenging high transverse momenta environment, and for b- vs c-jet discrimination leading to improved c-tagging.
Please note that this is an ATLAS talk. If selected, a spaker will be appointed later on.

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