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A novel approach to Higgs boson mass reconstruction in four-jet final states from e^+e^- collisions in CEPC at $\sqrt{s}=240$ GeV

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The measurement of the Higgs boson parameters constitutes a significant part of the CEPC program. This work is devoted to studying the process $e^+e^- \rightarrow ZH$ at $\sqrt{s} = 240$ GeV with all-hadronic, four-jet final states. The CEPC detector fast simulation and event reconstruction using the Delphes package have been performed for the signal and different background processes. A novel approach to four-jet final state analysis has been implemented, which allows better reconstruction of boson mass by combining information from dijet invariant mass and recoil mass to another dijet. The cut-based approach was applied to reject leptonic and semileptonic backgrounds. For effective suppression of the four-jet background, a Transformer-based classifier was trained using the PyTorch framework for binary classification on the mixed dataset before or after kinematic cuts. Different combinations of signal efficiencies and purities are considered and their impact on the accuracy of Higgs boson mass measurement is estimated.

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