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First Prototype of a Machine Learning Trigger Algorithm on FPGA for Micromegas detectors

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High Energy Particle Physics is constantly evolving towards increasing the complexity of the detectors and the amount of experimental data. Micromegas-type detectors offer great resolution and are able to operate reliably at high data-taking rates. We trained a convolutional neural network using simulated muons to identify their tracks and determine if they originate from the supposed interaction point. The main goal of this study is to investigate the feasibility of using machine learning models on FPGA for online trigger algorithm implementations.

This approach provides an automated, high speed trigger processor that shows increased adaptability by being more resilient to electronic noises and background radiation, thus providing an error tolerant solution. Our results show this method to be suitable for an assembly of Micromegas detectors both in terms of trigger efficiency and the very good precision offered.

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