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A Track-Based Jet Finding Algorithm for the CMS Phase-2 Level 1 Trigger SAMUEL LEIGH, YURI GERSHTEIN, Rutgers University-New Brunswick, COMPACT MUON SOLENOID (CMS) EXPERIMENT COLLABORATION — From early 2025 to mid 2027, the Large Hadron Collider (LHC) will undergo a series of upgrades which increases its collision rate. In its final form, the instantaneous collision rate of the collider will be 7.5 times its initial design value. This prompts the development of the Phase-2 Level 1 Trigger for the Compact Muon Solenoid (CMS) particle detector, which will decide in real-time which data from the upgraded LHC will be saved for further analysis. The focus of this talk is on the development of the firmware and software of a track-based jet finding algorithm, which is designed to run in real-time on a Field Programmable Gate Array (FPGA) board. This algorithm converts tracks (experimental signatures of quarks and gluons) into jets (collimated sprays of hadrons) through a nearest-neighbor clustering approach. The produced track-jets will be used to compute various quantities, such as H_T and H_T^{miss}, which can be used by the Trigger for online event selection. We demonstrate that the algorithm is a valuable addition to the Trigger, exhibiting promising jet reconstruction performance. We also show that the firmware meets timing and resource constraints, and that we achieved an easily adjustable latency.

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