

Universidad de Oviedo

Design-Space Exploration and Integer Quantization of Graph Neural Networks for Real-Time FPGA Track Finding

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25TH IEEE
REAL TIME
CONFERENCE
La Biodola, Elba, Italy

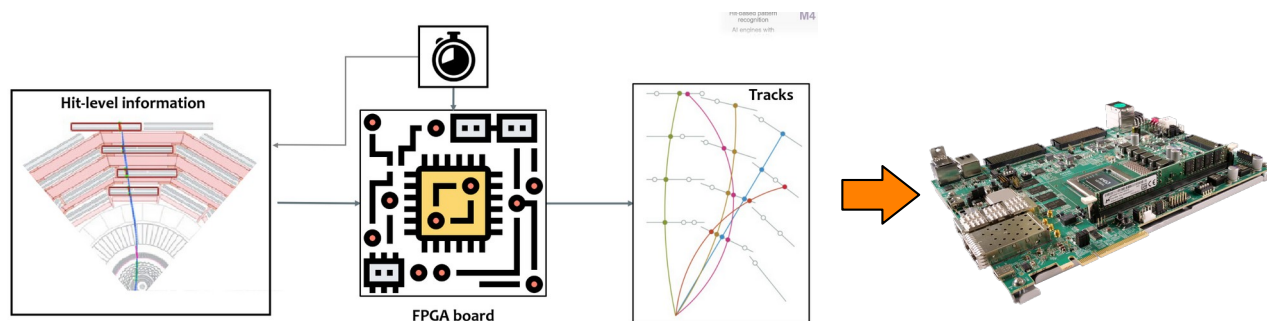


The INTREPID team



INnovative TRiggEr techniques for beyond the standard model PhysIcs Discovery at the LHC

- > LLP signals might be easily missed or misinterpreted in LHC data → and especially at the HL-LHC
- > Our goal: deploy a more complex algorithm at the L1 trigger of the CMS experiment compatible with the FPGA chips that will be used during the upgrade of the CMS Detector



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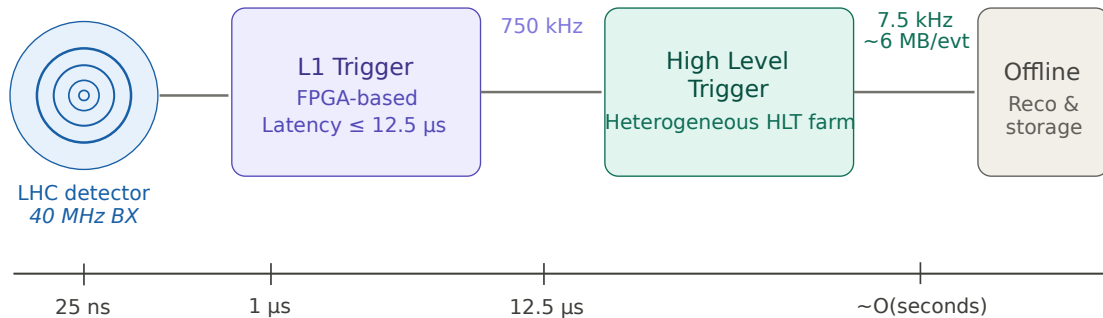
intrepid.uniovi.es/about-us/



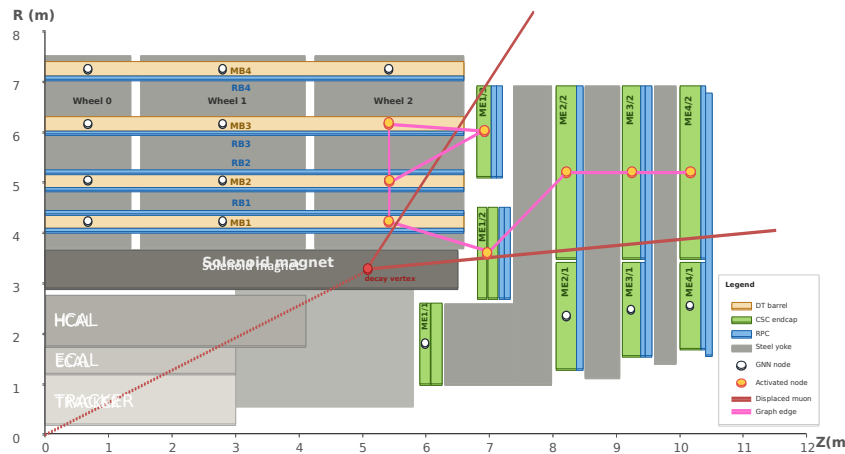
GNN at the CMS L1 trigger + weight quantization



At the HL-LHC there will be 140–200 collisions every 25 ns → decisions at L1 trigger must be taken in $\sim 1 \mu\text{s}$

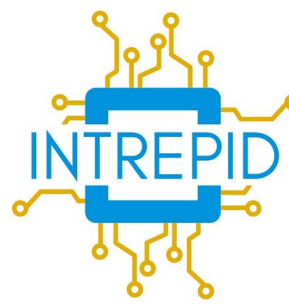


CMS Phase-2 (HL-LHC Run 4, ≥ 2030) — 140–200 pileup interactions per bunch crossing



We constructed a GNN to identify rare signatures of new physics → problem: it must fit within FPGA specifics

- The poster shows a comparison of various techniques used to quantize the GNN weights so as to fit within the FPGA resources
- What we learned will allow us to deploy a more complex algorithm at the CMS L1 trigger during the HL-LHC data-taking potentially helping discover signs of new physics



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Come see the poster

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