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## The NextGen Triggers project: overview, plans and first actions

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The Next Generation Triggers project (NextGen in short) is a five-year collaboration across ATLAS and CMS (with contributions from LHCb and ALICE) and the Experimental Physics, Theoretical Physics, and Information Technology Departments of CERN to research and develop new ideas and technologies for the experiment trigger systems for HL-LHC and beyond. After more than a year of preparation in 2022-2023, the project started in January 2024 and involves the effort of more than 100 researchers and engineers working on four interacting areas: (1) online data processing, modern computing architectures, novel algorithmic concepts, machine learning and the direct interplay of experimental approaches and theory simulation; (2) enhancing the ATLAS trigger and data acquisition to focus on improved and accelerated filtering and exotic signature detection; (3) rethinking the CMS real-time data processing to design a novel AI-powered real-time processing workflow to analyze every single collision produced in the LHC; and (4) designing novel education and training programmes to support the experiment research plans. Investigations of the use of ML from front-end systems inference to development of workflows for large-scale training on local, cloud and HPC systems are among the objectives of the project. Explorations of novel quantum-inspired methods for event generators, optimization in data structures, compression, processes and pipelines are all areas in scope of the research programme. This presentation describes the overall concepts and objectives of the project and the preliminary results and lessons learned after NextGen's first 10 months.

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