



Canadian Association
of Physicists

Association canadienne
des physiciens et physiciennes

Contribution ID: 3464

Type: **Invited Speaker / Conférencier(ère) invité(e)**

(I) AI-assisted design of the EIC Detector

Tuesday 7 June 2022 15:15 (30 minutes)

The Electron-Ion Collider (EIC) is a cutting-edge accelerator experiment proposed to study the origin of mass and the nature of the “glue” that binds the building blocks of the visible matter in the universe. The proposed experiment will be realized at Brookhaven National Laboratory in approximately 10 years from now, with the detector design and R&D currently ongoing. Notably EIC can be one of the first facilities to leverage on Artificial Intelligence (AI) during the design phase. Optimizing the design of its tracker is of crucial importance for the EIC Comprehensive Chromodynamics Experiment (ECCE), which proposed a detector design based on a 1.5T solenoid. The optimization is an essential part of the R&D process and ECCE includes in its structure a working group dedicated to AI-based applications for the EIC detector. In this talk I describe the implementation of an AI-assisted detector design using full simulations based on Geant4. Our approach deals with a complex optimization in a multidimensional design space driven by multiple objectives that encode the detector performance, while satisfying several mechanical constraints.

We describe our strategy for optimisation, discuss the exploration of different AI-based approaches, and illustrate the set of tools developed to “navigate” interactively the obtained Pareto front. We finally show the results of the AI-assisted tracking system in ECCE.

Authors: FANELLI, Cristiano (Massachusetts Institute of Technology); SURESH, Karthik (University of Regina); PANDREOU, Zisis

Presenter: FANELLI, Cristiano (Massachusetts Institute of Technology)

Session Classification: T4-6 Physics at the EIC Symposium: Experimental Opportunities at the EIC (DNP) | Symposium sur la physique à l'EIC: opportunités expérimentales à l'EIC (DPN)

Track Classification: Symposia Day (Tues. June 7) / Journée de symposiums (mardi, le 7 juin): Symposia Day (DNP) - Physics at the Electron-Ion Collider (EIC)