How will AI enable autonomous particle accelerators?

Wednesday, 1 November 2023 09:00 (15 minutes)

The need for greater flexibility, faster turnaround times, reduced energy consumption, reducing operational cost at maximum physics output and the sheer size of potential future accelerators such as the FCC ask for new particle accelerator operational models with automation at the center. AI/ML is already playing a significant role in the accelerator domain with numerous applications in design, diagnostics and control. This contribution will define the building blocks for autonomous accelerators as had been discussed in the CERN accelerator sector initiative called the Efficiency Think Tank and outline where AI would need to be applied for reaching quasi full automation. Equipment design considerations, control system requirements as well as necessary software frameworks will be summarized. And finally the remaining questions and challenges will be mentioned.

Brainstorming idea [title]

Designing uncertainty-aware Auto-Pilots: Ensuring safe Human-Machine interfaces for seamless switching to manual control

Brainstorming idea [abstract]

How to understand the limits of automation and acknowledging the inherent uncertainties in our environments to design auto-pilots that can gracefully hand control back to human operators when necessary. Robust decision-making algorithms are needed that can assess the reliability of automated systems in real-time. Such algorithms should detect uncertainties and potential risks, prompting a smooth and safe transfer of control to the human operator.

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