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Advanced Controls for Particle Accelerators (15' + 5')

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Particle accelerators are host to myriad nonlinear and complex physical phenomena, involve a multitude of interacting systems, are subject to tight performance demands, and should be able to run for extended periods of time with minimal interruption. Machine learning and artificial intelligence constitute a versatile set of techniques that are particularly well-suited to modeling, control, and diagnostic analysis of complex, nonlinear, and time-varying systems, as well as systems with large parameter spaces. Consequently, the use of adaptive, machine learning-based modeling and control techniques could be of significant benefit to particle accelerators and the scientific endeavors that they support. Here, we discuss our efforts to develop and deploy machine learning-based tools specifically to address control challenges found in particle accelerators, with a focus on neural networks.

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