

Fourth MODE Workshop on Differentiable Programming for Experiment Design



Contribution ID: 46

Type: **not specified**

Towards the optimization of a Muon Collider Calorimeter

Tuesday 24 September 2024 12:10 (20 minutes)

Setup design plays a pivotal role in experiment development, particularly in high-energy physics, where vast temporal and spatial scales dictate the course of research for decades. Our research, embedded in the MODE Collaboration, aims to generalize Machine Learning tools for creating a differentiable pipeline capable of suggesting optimal configurations for the Muon Collider Electromagnetic Calorimeter geometry. In our presentation we outline the structure of our pipeline, emphasizing the methods employed to ensure full code differentiability. Our primary focus lies in maximizing the reconstruction efficiency of photons amidst Beam-Induced background from muon decays. The approach relies on three core blocks: (I) Signal Event Generator: Responsible for generating signal events; (II) Background Generator: Focused on simulating background events; (III) Reconstruction Algorithm: Adapting the DeepJetCore Object Condensation framework. The talk includes a showcase of performance tests for each core block, shedding light on their efficacy. Additionally, we provide insights into the current status and challenges encountered in implementing the complete pipeline.

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Session Classification: Particle Physics

Track Classification: Particle Physics