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Detector optimization in Muon scattering Tomography

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Muon Scattering Tomography (MST) has been through a fruitful period of development which led to many applications in various fields such as border controls, nuclear waste characterization, nuclear reactor monitoring and preventive maintenance of industrial facilities. Whatever the use case, MST detector conception aims at reaching the best performance that respects specific constraints, whether in terms of budget, or data acquisition time. In this context, the recent work of the MODE collaboration led to the creation of TomOpt, an end-to-end differentiable pipeline aiming at optimizing muon scattering tomography detectors conception.

This presentation will illustrate which parameters of an MST experiment, from the detector geometry and technology to hidden parameters of image reconstruction and material classifier algorithms, can be included in such an optimization. I will give hints on how to evaluate the cost and performance of a MST tracking system based on its conception features. The inclusion of muon energy spectrometer within border guard MST experiments and its effect on imaging performance will also be discussed.

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