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TomOpt: Differentiable Muon-Tomography Optimization

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We propose to employ differentiable programming techniques in order to construct a modular pipeline that models all the aspects of a muon tomography task, from the generation and interaction of cosmic ray muons with a parameterized detector and passive material, to the inference on the atomic number of the passive volume.

This enables the optimization of the detector parameters via gradient descent, to suggest optimal detector configurations, geometries, and specifications, subject to external constraints such as cost, detector size, and exposure time.

The eventual aim is to release the package open-source, to be used to guide the design of future detectors for muon scattering and absorption imaging.