

Bilevel Optimization for Tuning the Parameters of HEP Event Generators

Scientific Achievement

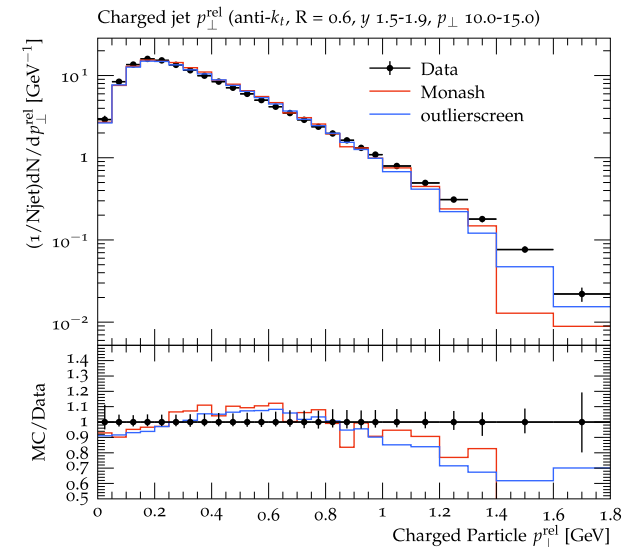
Developed bilevel optimization formulation to automatically determine the importance of observables in optimization and optimize the tuning parameters.

Significance and Impact

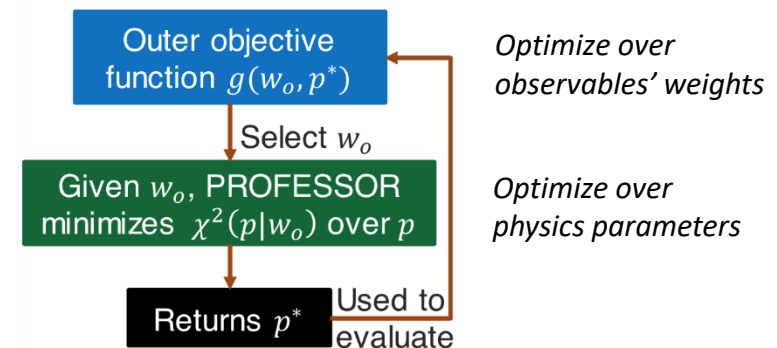
Bilevel optimization takes the expert out of the optimization loop, thus reducing the amount of human hours spent on hand-tuning the parameters while finding better solutions.

Research Details

- Assigning weights to observables before parameter optimization requires high degree of expert knowledge and experience; human is slowest part in this optimization loop and process is prone to mistakes/disagreements
- Upper level: optimize weights for each observable using derivative-free optimization
- Lower level: PROFESSOR software solves tuning problem for given weights



Example of an optimized observable; Monash = fit with current tune; outlierscreen = fit with bilevel approach after filtering



Flowchart of bilevel optimization