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Classifying importance regions in Monte Carlo simulations with machine learning

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We attempt to extend the typical stratification of parameter space used during Monte Carlo simulations by considering regions of arbitrary shape. Such regions are defined by directly using their importance for the simulation, for example, a likelihood or scattering amplitude. In particular, we consider the possibility that the parameter space may be high dimensional and the simulation costly to compute. With this in mind, we suggest using data already obtained from the simulation to train a neural network to separate a larger set of points into guessed regions. The simulation would later be applied only on points that are deemed important for the final result, for example, variance reduction. We will discuss the particularities and complications of dividing the parameter space in this way and the role of the neural network in this process. Moreover, we illustrate the process with a few examples, including scattering and event generation, and compare with other known techniques for Monte Carlo simulations.

Track

Detector simulation & event generation

Authors: BAN, Kayoung (Korea Institute for Advanced Study); PARK, Myeonghun (Seoultech); RAMOS, Raymundo (Korea Institute for Advanced Study)

Presenter: RAMOS, Raymundo (Korea Institute for Advanced Study)

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