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New developments in event generator tuning techniques

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Data analyses in hadron collider physics depend on background simulations performed by Monte Carlo (MC) event generators. However, calculational limitations and non-perturbative effects require approximate models with adjustable parameters. In fact, we need to simultaneously tune many phenomenological parameters in a high-dimensional parameter-space in order to make the MC generator predictions fit the data. It is desirable to achieve this goal without spending too much time or computing resources iterating parameter settings and comparing the same set of plots over and over again.

I will present extensions and improvements to the MC tuning system, Professor, which addresses the aforementioned problems by constructing a fast analytic model of a MC generator which can then be easily fitted to data. Using this procedure it is for the first time possible to get a robust estimate of the uncertainty of generator tunings. Furthermore, we can use these uncertainty estimates to study the effect of new (pseudo-) data on the quality of tunings and therefore decide if a measurement is worthwhile in the prospect of generator tuning. The potential of the Professor method outside the MC tuning area is presented as well.

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