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Falsifying the pMSSM with Genetic Algorithms

Monday, 23 July 2018 15:00 (20 minutes)

Current experimental searches for new physics seem to have cornered the simplest versions of the Minimal Supersymmetric Standard Model (MSSM). Then, we are compelled to consider less constrained scenarios such as the phenomenological MSSM (pMSSM). However, scanning the parameter space of the pMSSM looking for configurations that fulfil all the experimental bounds is known to be a computationally intensive task, due to the high dimensionality of the model and because its predictions must be contrasted with an increasing number of datasets. We address this task, which is indeed an optimization problem, with a heuristic search technique, genetic algorithms (GAs). We consider the effectiveness of GAs, in assessing and analysing the pMSSM with its parameters defined at high energy. We demonstrate that with this approach it is entirely feasible to exclude the pMSSM at a relatively low computational cost, and to identify the main culprit that apparently it cannot be reconciled with the anomalous magnetic moment of the muon. Finally, this technique can be used to test new observables, we consider as an example the Fermi-LAT Galactic Centre excess and show that it is also not accommodated by the pMSSM, at least, within the region of the parameter space considered in this work.

Parallel Session

Supersymmetry: Models, Phenomenology and Experimental Results

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