

Artificial Proto-Modelling: Building Precursors of a Next Standard Model from Simplified Model Results

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We present a novel algorithm to identify potential dispersed signals of new physics in the slew of published LHC results. It employs a random walk algorithm to introduce sets of new particles, dubbed “proto-models”, which are tested against simplified-model results from ATLAS and CMS (exploiting the SModelS software framework). A combinatorial algorithm identifies the set of analyses and/or signal regions that maximally violates the SM hypothesis, while remaining compatible with the entirety of LHC constraints in our database. Demonstrating our method by running over the experimental results in the SModelS database, we find as currently best-performing proto-model a top partner, a light-flavor quark partner, and a lightest neutral new particle with masses of the order of 1.2 TeV, 700 GeV and 160 GeV, respectively.

The corresponding global p-value for the SM hypothesis is approximately 0.19; by construction no look-elsewhere effect applies.

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