Contribution ID: **653** Contribution code: **contribution ID 653** Type: **Oral**

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

Wednesday 1 December 2021 18:20 (20 minutes)

In view of the null results (so far) in the numerous channel-by-channel searches for new particles at the LHC, it becomes increasingly relevant to change perspective and attempt a more global approach to finding out where BSM physics may hide. To this end, we developed a novel statistical learning algorithm that is capable of identifying potential dispersed signals in the slew of published LHC analyses. The task of the algorithm is to build candidate "proto-models" from small excesses in the data, while at the same time remaining consistent with all other constraints. At present, this is based on the concept of simplified models, exploiting the SModelS software framework and its large database of simplified-model results from ATLAS and CMS searches for new physics.

In this talk, we explain the concept as well as technical details of the statistical learning procedure. A crucial aspect is the ability to construct reliable likelihoods in proto-model space and a robust recipe for how to combine them. We will also discuss various aspects of the test statistic employed in our approach. With the current setup, the best-performing proto-model consists of a top partner, a light-flavor quark partner, and a lightest neutral new particle with masses of about 1.2 TeV, 700 GeV and 160 GeV, respectively, and SUSY-like cross sections; for the SM hypothesis we find a global p-value of 0.19.

Significance

Since the discovery of the Higgs boson, inference of the hypothetical Next Standard Model is one of the greatest challenges of our field. Classical hypothesis testing, the standard approach, starts by postulating a theory, then computes a test statistic, and based on the outcome, refutes or fails to refute that theory. Our approach is unique insofar as it takes the opposite approach: starting with our database of about 100 CMS and ATLAS search results, we first build candidate precursor theories dubbed "protomodels" that identify the most interesting excesses in the data. Only in a second step will we think about the inference of the fundamental theory from these protomodels. While the presented results are, to our minds, interesting in their own respect, it is this novel methodology that we consider to be of significance for this conference.

References

JHEP 03 (2021) 207, arxiv:2012.12246

Speaker time zone

Compatible with Europe

Authors: LESSA, Andre (CCNH - Univ. Federal do ABC); KRAML, Sabine (LPSC Grenoble); WALTENBERGER, Wolfgang (Austrian Academy of Sciences (AT))

Presenter: WALTENBERGER, Wolfgang (Austrian Academy of Sciences (AT))

Session Classification: Track 3: Computations in Theoretical Physics: Techniques and Methods

Track Classification: Track 3: Computations in Theoretical Physics: Techniques and Methods