lessons from our RECAST discussion

M. E. Peskin
April 2011

What are we trying to achieve ?

Before discovery, exploratory theoretical studies:

Is my model still alive ? Will my model be constrainted by current searches, or does it require study of a new signature ?

After discovery, evaluating models:

Does my model give the correct pattern of observed anomalies ? How do I improve its agreement with the data ?

Archiving of published experimental analyses:

If, in the future, a new model becomes highly motivated, will the experiments be able to test this model against LHC data ?

Levels of analysis for the computation of signals from models:

Run PGS.

Run the fast detector model validated by the collaboration.

With full simulation, compute efficiencies for simplified models over a relevant parameter grid. Use these efficiencies to estimate efficiencies in a more general model. (RECAST might automate the process of generating these.)

Use full simulation to do a complete efficiency calculation for the full model. (Systematize the process with RECAST.)

Experimenters make Ntuples and analysis tools public.

We should be clear on what simplified modes are useful for.

explorations in model space, evaluating search strategies, basis for progressive refinement in relation to data

Simplified models are not meant for obtaining the best limits on full models! The "closure test" is a tautology, but only in complex combinations of models.

It is good to have a single-minded focus on efficiencies.

Experimenters choose search regions and binning in relation to background systematics (esp. data driven). Changing these parameters of an analysis is hard. Theorists should live with these choices.

In this context, it is interesting to ask: What is the efficiency for a model to produce signal in each bin of each final histogram? These efficiencies can be evaluated systematically at least for simplified models. This approaches reduces "shape analyses" to "counting experiments".

There is a connection between model exploration with data and the archiving and publishing of large databases.

We should exploit this connection to build support for systematic approaches to opening the LHC data. Governments and the CERN directorate have declared support for "open access" publishing. Large experimental collaborations -- especially those that are disappearing -- see the importance of long-term data archiving with needed analysis tools.

We need a solution to this problem for the complex LHC data sets. RECAST is a solution -- and, today, the only one on the table.

I thank Jack Gunion and the U C Davis group for setting up this workshop. We need to have a free community discussion of these issues. I am grateful that HEFTI has brought us together to do that.