Thoughts on: the interface of theory calculations with experimental methods

Collider Data Analysis Strategies
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LHC Run3 and beyond

- The next runs of the LHC won’t give us any substantial increase in energy. But we will have more and more data.

- The main-stream theoretical focus is on making our tools better and better:
  - we have to make NNLO calculations our standard (loop-results for at least 2→3 topologies; more flexible subtraction schemes; interface with parton showers and/or resummation)
  - we need to upgrade parton-shower simulations to the precision club (log accuracy, colour, higher-order splitting functions)
  - we should have state-of-the art predictions for standard candles (e.g. N^3LO; N^3LL resummation; effects on parton densities)
We all agree that the challenge ahead is to find new and more efficient ways to interrogate the data from exploring less beaten paths...

**Cross-pollination:** bring field-specific developments to the broader pheno community to find new applications

- Jet substructure
- Study quark-gluon plasma
- Extraction of SM couplings
- Determination of PDFs

**Confront new tools:** ML algorithms are reshaping the way we think analyses and searches

- What is the role of expert-knowledge in designing ML algorithms?
- Can we understand what the algorithms is exploiting?
- Is this reachable within our standard approach (pQFT)?
- What about unfolded measurements?

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However, IRC unsafe observables are sometimes incredibly useful (tracks, multiplicities, etc).

Furthermore, for such a basic requirement, its definition is not that precise (from Sterman/Weinberg, to rIRC safety, to event geometry).

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(Unnamed ATLAS speaker @BOOST 2017)

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THANKS FOR LISTENING!

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