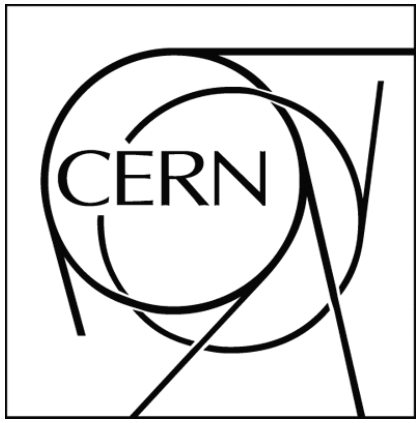
A Modest Proposal* for presenting the results of Exotica Searches



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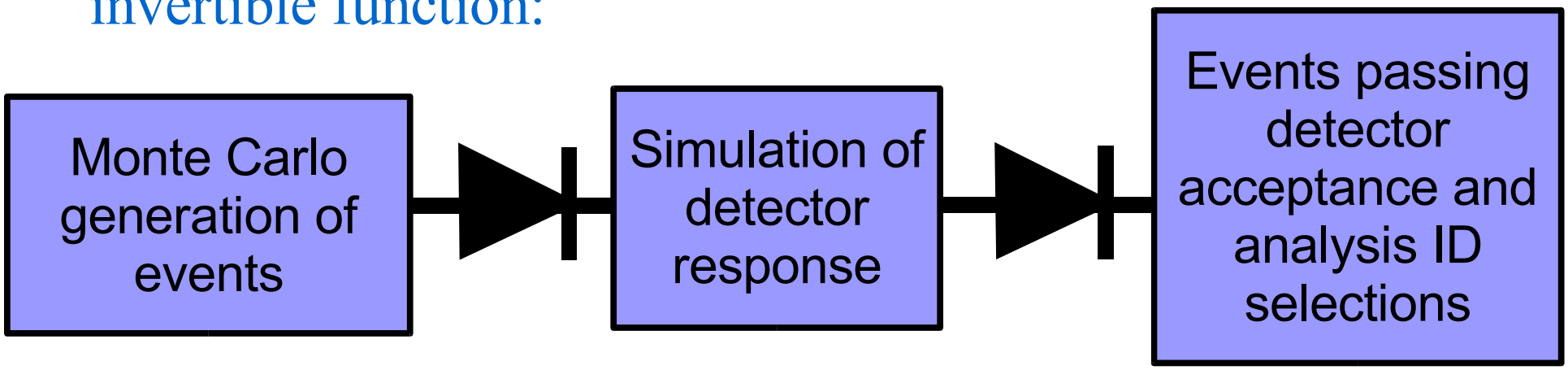
* Jonathan Swift, "A Modest Proposal For Preventing the Children of Poor People in Ireland from being a Burden to their Parents or Country, and for Making Them Beneficial to the Public" (1729) - He proposed that the children be eaten!

As Things Stand Today

- Components of a typical New Physics search:
  - Choose a signature, or set of signatures
  - Determine SM backgrounds, including detector effects
  - Study the data
  - If no significant excess, set limits on some model parameters that can be tested by this signature
- Obvious limitation of this approach:
  - the models tested are only a small fraction of those that could be tested (including models not yet thought of)
- Undesirable consequence:
  - can result in theorists running PGS, trying to re-analyze experimental data to study some other model

Why is it done this way?

- Experimental limits are based on the absence of 'unexpected' events in the data
- Model limits arise from: what values of the parameters are compatible with not producing these events which are not there?
- So we are talking in terms of events which pass the detector acceptance and analysis ID selections
- But the process of detector simulation is essentially a non-invertible function:



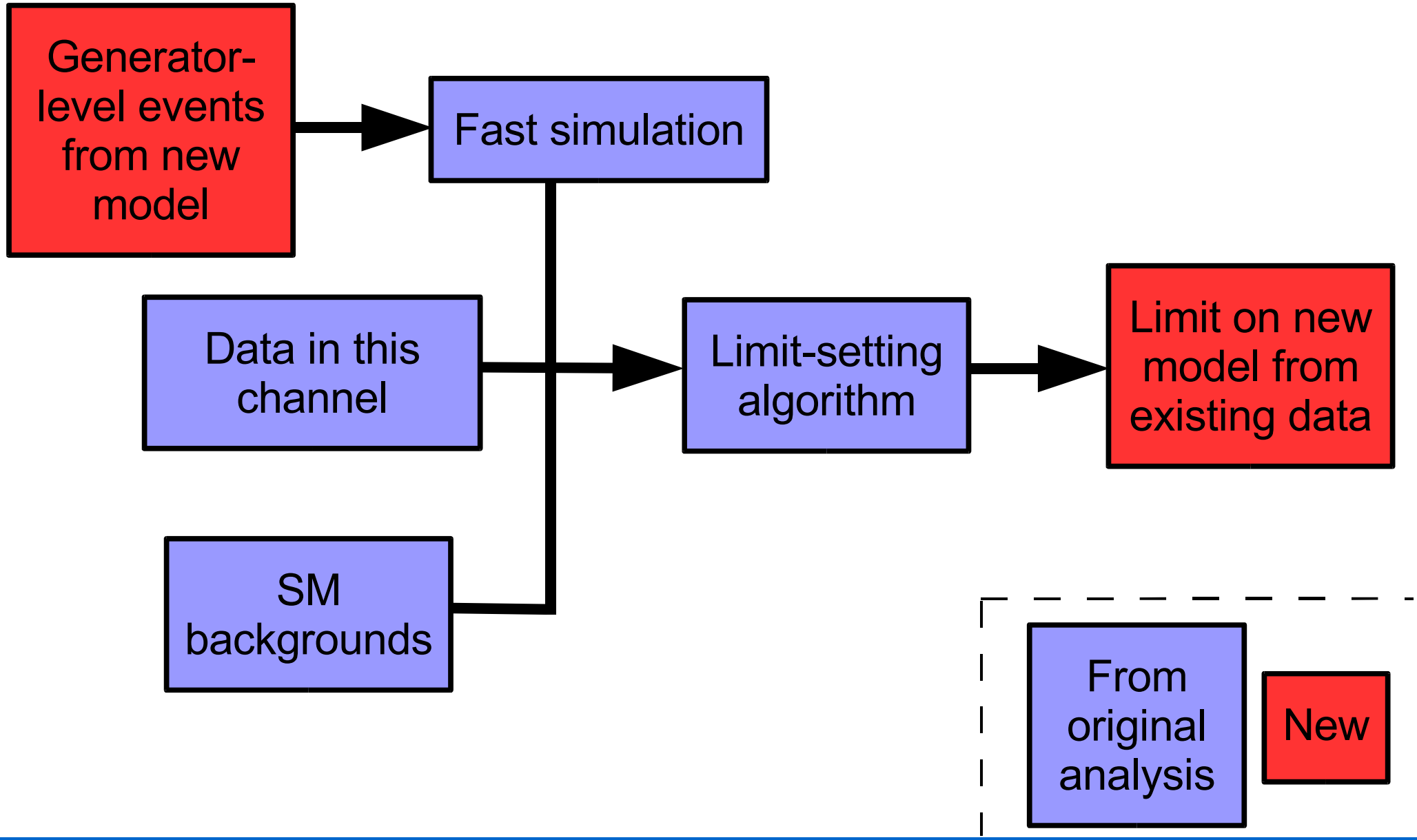
Going with the Grain

- I don't have a general solution to this 'non-invertibility' problem
- Instead I make a Modest Proposal that should enhance the possibility to test other models against the data later
- This approach 'goes with the grain' of model-testing in HEP

A Modest Proposal for Future Searches

- In addition to what is already done, propose that experiments should also:
- Archive the data and SM backgrounds (with uncertainties) for the studied channels as histograms, not as just as plots
- Archive the algorithm(s) to set limits based on comparing data to SM+some specific proposed signal
- Validate that the experiment's Fast Simulation adequately reproduces the detector acceptance for this channel

Flow of Operations



What Difference does this make?

- Makes future model-testing much easier
- The only required input is a new set of signal events; all other needed infrastructure is ready
- So any theorist with a new model to test need simply produce signal events at generator level – everything else happens automatically and out pops the result
- Advantage for the experimentalist: no extra work involved – everything is already done as part of normal analysis process, it's just that now we archive it more usefully

Further Thoughts

- Once this is standard procedure, perhaps we can consider an interface which automatically generates the events (eg using Madgraph with input of new particles/interactions) and runs the whole process?
  - compare QUAERO interface to D0 Run I and H1 data ...
- Need to consider how we publish the new limit: short article by "A. Theorist and the CMS Collaboration"? (obviously must cite original paper that gives the data and SM backgrounds)

Summary

- Presented a Modest Proposal for expanding the use of results from dedicated New Physics searches
- As part of analysis, should archive the data and SM backgrounds as histograms, save the limit-setting code and validate Fast Simulation for the channel
- Then any other model in the future can easily be tested simply from a set of generator-level MC events