Statistical analysis of selected high-energy physics events for determination of an asymmetry in the event rate.

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The experimental high-energy physics processes are a brilliant case of application of the rules and methodologies of statistics. It comprises of multitude of processes each having a unique topography and physical kinematics. Some of the processes are called the signal for their specific treatment for extraction of a physical quantity. The other processes are mainly categorized as a bunch of background processes each contaminating the signal processes. The signals and background processes can cross-feed each other in the measurement of the yield for each of the process. There are errors associated with yield measurements and these propagate through the estimation of the yield and the efficiencies of the cross-feed associated with each yield [signal and background]. **[Ref 1, Ref 2]**

The author has performed data-analysis in such a framework and seeks to formulate a specific strategy for determination of the asymmetry in the branching rate of the signal processes. An analysis that has been performed with a relatively small yet statistically significant data size is available with yields for each of the signal and background mode performed in Monte Carlo simulation of the entire physical system. **[Ref 3]** While an up-gradation of the size of the data is possible due to the data that is available with the operation of the experimental facility, a method to extract the possible asymmetry present in these events is not at hand and it's a much sought after piece of effort which is needed to put all the bit and pieces of the measurement in perspective. How exactly the yields will be calculated, the errors will be identified and treated, is the purpose of this study and once the determination of the asymmetry is formulated conceptually, it's a much suitable course of action to increase the size of the data for the purpose of recording a result of great statistical significance.

Reference:

1. Simultaneous Least Squares Treatment of Statistical and Systematic Uncertainties, Werner M. Sun, arXiv: physics/0503050 v2 19 Dec 2005
2. Chapter 32. “Statistics” , C. Amsler et al., PL **B667**, 1(2008) and 2009 partial update for the 2010 edition (http://pdg.lbl.gov)
3. Colloquium given by Manmohan Dash at Institute for Mathematics and Applications, Bhubaneswar, Orissa on 13 April 2010