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Comparative study of the power of goodness-of-fit algorithms

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A Toolkit for Statistical Data Analysis has been recently released. Thanks to this novel software system, for the first time an ample set of sophisticated algorithms for the comparison of data distributions (goodness of fit tests) is made available to the High Energy Physics community in an open source product. The statistical algorithms implemented belong to two sets, for the comparison of binned and unbinned distributions respectively; they include the Chi-squared Test, the Kolmogorov-Smirnov Test, the Kuiper Test, the Goodman Test, the Anderson-Darling Test, the Fisz-Cramer-von Mises test, the Tiku Test.
Since the Toolkit provides the user a wide choice of algorithms, it is important to evaluate them comparatively and to estimate their power, to provide guidance to the users about the selection of the most appropriate algorithm for a given use case.
We present a study of the power of a variety of mathematical algorithms implemented in the Toolkit. The study is performed by evaluating the behaviour of the various tests in a set of well identified use cases relevant to data analysis applications. To our knowledge, such a comparative study of the power of goodness of fit algorithms has never been performed previously.

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