Handling model uncertainties via informative Goodness-of-Fit

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In any experimental science, the knowledge available on a given phenomenon is formalized into a statistical model. The latter encapsulates our understanding of its nature, its properties as well as our uncertainties. Experimental measurements are then collected and statistical tests of hypothesis are used to answer the important question: is our model valid? As a result, a variety of tests for goodness-of-fit (GOF) have been proposed in the literature. Despite their usefulness, classical GOF methods are somehow limited by their confirmatory nature. Specifically, when the respective null hypothesis is rejected, they do not allow us to identify the underlying causes which invalidate the model postulated by the scientists, nor they give any indication on how the latter can be improved to obtain a closer representation of the true data distribution. In simple words, they do not provide any insights on what went wrong. In this talk, I will introduce an informative goodness-of-fit (iGOF) approach which aims to address this issue directly. Specifically, when the null model is rejected, iGOF allows us to identify the underlying sources of mismodelling and naturally equip practitioners with additional insights on the underlying data distribution.