

Excess estimation in On/Off measurements including single-event variables

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Signal estimation in the presence of background noise is a common problem in many scientific disciplines. An “On/Off” measurement is when the background itself is imprecisely measured, which is the case for instance of observations performed in astronomy. The ‘frequentist’ and Bayesian approaches for signal estimation in “On/Off” measurements are reviewed and compared, focusing on the weakness of the former and on the advantages of the latter in correctly addressing the Poissonian nature of the problem. We propose a new method for estimating the signal rate based on the Bayesian formalism. It uses information on single-event variables and their distribution for the signal and background population. Events are thereby weighted according to their likelihood of being a signal or a background event and background suppression can be achieved without performing data selection cuts. Simulating “On/Off” measurements from imaging atmospheric Cherenkov observations, we conclude that this new method is capable of increasing the resolution of the signal estimation, in particular for background dominated observations.

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Collaboration

other Collaboration

Subcategory

Experimental Methods & Instrumentation

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