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Confidence intervals in particle physics

This three-lecture series will explore the construction and interpretation of confidence intervals within the context of particle physics. We will begin by defining the likelihood function and highlighting its central role in statistical inference. Through a concrete example, we will examine how the likelihood depends on the number of observed events, with special attention to the challenges and appropriate strategies in the low-statistics regime typical of particle physics experiments. We will then review various methods for constructing confidence intervals, comparing their assumptions and practical applications. Finally, we will discuss the connection between the likelihood function and the least-squares method, and how a quantity following a chi-squared distribution can be used to assess the significance of results or to set exclusion limits.

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