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The limitations of model-based experimental design in sloppy systems[1] ANDREW WHITE, MARK TRANSTRUM, Brigham Young Univ - Provo — Mathematical models can help us understand complex biological systems such as gene regulatory networks and signaling pathways. These models can include hundreds of unknown parameters. Data fitting typically leads to huge uncertainties in the inferred parameter values, a phenomenon known as sloppiness. It has been suggested that model-based experimental design can help overcome this challenge. However, models of complex systems, such as those in biology, never account for all of the system's details. Designing experiments to make previously irrelevant model details become more relevant may result in the model no longer being able to fit all the data. If such is the case, the conditions would necessitate a change in the model itself. We test this by considering two models of the same cell-signaling process, each of varying complexity. Performing experimental design guided by the simple model but using the complex model as a surrogate for the actual system, we determine the limits of model-based experimental design for accurate parameter inference.

[1]The limitations of model-based experimental design in sloppy systems

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