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Big data challenges for physics in the next decades

DAVID HOGG, New York University

The problem of big data is not really a problem of data volume and data management per se; it is a problem of inference or learning. As data sets grow, the numbers of and subtleties of questions we might want to ask grow, the required or supported complexities of models we might want to use grow, and the precision requirements and expectations for experimental results grow. The dot-com world has settled on a framework for big data analysis that will not satisfy the needs of physics; we are going to have to create new methods if we are going to succeed. I will give some examples from astrophysics, but these problems appear in almost all areas of contemporary experimental physics.