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Tensor Decomposition: A Mathematical Tool for Data Analysis.

Tensors are multiway arrays, and tensor decompositions are powerful tools for data analysis. In this talk, we demonstrate the wide-ranging utility of the canonical polyadic (CP) tensor decomposition with examples in neuroscience and chemical detection. The CP model is extremely useful for interpretation, as we show with an example in neuroscience. However, it can be difficult to fit to real data for a variety of reasons. We present a novel randomized method for fitting the CP decomposition to dense data that is more scalable and robust than the standard techniques. We further consider the modeling assumptions for fitting tensor decompositions to data and explain alternative strategies for different statistical scenarios, resulting in a *generalized* CP tensor decomposition. (Received September 20, 2017)