

OPTIMAL TENSOR ALGEBRAS FOR EFFICIENT DATA REPRESENTATION

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Handling big data in inverse problems and related fields requires efficient representations. Many data are naturally represented as multiway arrays or tensors, and as a result, multilinear data analysis tools have revolutionized feature extraction and data compression. Despite the success of tensor-based approaches, fundamental linear algebra properties often break down in higher dimensions. Recent advances in matrix-mimetic tensor algebra have made it possible to preserve linear algebraic properties and, as a result, to obtain optimal representations of multiway data. Matrix-mimeticity arises from interpreting tensors as t -linear operators, which in turn are parameterized by invertible linear transformations. The choice of transformation is critical to representation quality, and thus far, has been made heuristically. In this talk, we will learn data-dependent, orthogonal transformations by leveraging the optimality of matrix-mimetic representations. In particular, we will exploit the coupling between transformations and optimal tensor representations using variable projection. We will highlight the efficacy of our proposed approach on image compression and reduced order modeling tasks.