Referee's comments:
Low-rank, Orthogonally Decomposable Tensor Regression with Application to Visual Stimulus Decoding of fMRI Data

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This paper proposes a generalized scalar-to-tensor regression model with applications for fMRI data. The authors reduce the number of parameters by assuming the coefficient tensor is orthogonally decomposable (odeco) and adding a sparsity penalty that controls the CP rank of the tensor. In general,

1. Using penalization to relax the fixed-rank assumption is an interesting idea. However, the theoretical properties of the penalized tensor regression model and the comparison with fixed-rank models are unclear. For example, the convexity of PODTR should be discussed. Since the penalized matrix model (2) deduces a convex problem, the convexity of PODTR may be a strong advantage over fixed-rank models. On the other hand, the criterion for selecting the tuning parameter λ should also be involved. Though the PODTR avoids the priori specification of the rank, the newly introduced parameter λ needs to be priorly specified in practice. Since the tuning parameter is more flexible than rank, the difficulties in selecting a proper λ may be the disadvantage of PODTR. More discussions on the theoretical properties of the penalization would make the model more convincing. Besides, making a clear statement about when we use the PODTR versus the fixed-rank models may strengthen the paper.

2. The numerical performance of the penalized model also needs more discussions to support. In the algorithm for PODTR, the projection step implements a higher-order HOSVD with a rank that is equal to the dimension of the coefficient tensor. The high rankness may lead to a larger computational complexity than the algorithms for fixed-rank models. Discussions about the algorithm complexity, running time, and local convergence would be helpful. In simulations, the results imply that LODTR performs better than PODTR in all cases, which discourages the practical usage of the penalized model. Moreover, as the paper mentions, the superior performances of LODTR and PODTR over CPD may attribute to the algorithms. The comparison between PODTR and CPD does not verify the benefits from the penalization, either. Therefore, more experiments showing the advantages of using penalization should be imposed.

3. The simulations settings should be more comparable. In simulations, the authors compare the rank-4 non-odeco case and the rank-9 odeco case. This experiment mixes the effects of orthogonality and effects of the high rankness. An experiment distinguishing the effects of each factor would be more favorable.

Given these limitations, I would be hesitant to decide that this paper is suitable for the venue.