Answers to reviewer 1

Our answers to your comments and the corresponding modifications in the article are in red.

This paper is not written for the purpose of being understandable by others than the few people who already know what this is about. After working on this review for quite some time, I do understand the idea of figure 1, but I still don’t know how this is obtained.

- The Figure does not aim to explain how the tensor train decomposition is performed. It solely explained how a given tensor train is evaluated. We have changed the figure and modified the caption for better understanding.

I didn’t understand what $\chi$ is until I got to the example. The readability would improve if you would show the example first and connect the symbols to those in the actual example. For example, you specify a set which is specific to each $\mathcal{A}_\chi$. Later on it turns out, that this is connected to the number of components in the $\chi$th QOI.

- Section 2 has been modified at line 73 to 82.

The definitions of $\langle \mathcal{A}_\chi \rangle_q$ and of $j^*$ and $j^{**}$ are quite puzzling. My current understanding is that $\mathcal{A}_\chi(i_1, \ldots, i_d)$ is one QOI component at one time instant for one parameter setting. Then how can it be that $\langle \mathcal{A}_\chi \rangle_1$ has $n_2 \ldots n_{d-1} n_d^2$ columns?

- The paragraph explaining matricization has been rewritten with additional details. Your understanding of $\mathcal{A}_\chi(i_1, \ldots, i_d)$ is correct, it denotes a single element of the tensor $\mathcal{A}_\chi$. Since $\langle \mathcal{A}_\chi \rangle_1$ is the first matricization of the $n_1 \times n_2 \times \ldots \times n_{d-1} \times n_d^2$ tensor $\mathcal{A}_\chi$, it has indeed $n_1$ rows and $n_2 n_3 \ldots n_{d-1} n_d^2$ columns (precision added in the new version of the manuscript).

I think that at “The Frobenius norm …” a new paragraph should start. I has nothing to do with definition of $\langle \mathcal{A}_\chi \rangle_q$. Anyways, I don’t think it is used anywhere in the rest of the paper.

- A paragraph break has been added as rightfully requested (line 89). The Frobenius norm of a tensor is used in Proposition 1, equation (16).

In 87-108: Is there a connection between $\mathcal{A}$ and $A$ or is $A$ just any matrix? Or is it may be defined in (7)?

- $A$ denotes an arbitrary matrix. But in the context of the present work, especially Algorithm 1, $A$ will always be some matrix $A^X_k$ as defined in equation (7) for the special case $k=1$, and equation (13) for other values of $k$. A remark has been added in the paragraph from line 94 to 102 in order to clarify that point.

line 112: “the column sampling is restricted to indices $i_{q+1}, \ldots i_{d-1}$ and is replicated for all values of $is$ in $D^X_d$. ” Does that mean, that for each QOI a different sampling is performed, even though one integration of your DAE yields values for all QOI’s?

- The previous wording was confusing to say the least. It has been changed (line 116), hopefully for the better.

Appendix A: The final objective is to be able to estimate parameters when experimental data are available. The experiments that you describe in relation to the model you use to describe the results of the experiments, will give you only one observable quantity: $\sigma_1$.

- The final objective of our proposed approach is not "to be able to estimate parameters when experimental data are available" but rather to be able to construct a surrogate model enabling to predict the quantity of interest of complex models. In order to illustrate the relevance of our approach, we have chosen this application for the following reasons 1) We
believe that using a well-known mechanical model (with existing analytical solution in our case) can help the reader not to concentrate on details unlinked to our approach. 2) This model has many parameters and feature highly nonlinear behaviors which makes it difficult to construct an accurate surrogate model of.

Dear authors, from my questions it may be clear, that I didn’t understand much from your paper. I think that should worry you.