

Peer Review

Review of: "Data-Driven, Parameterized Reduced-order Models for Predicting Distortion in Metal 3D Printing"

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It is a very well-written paper, discussing a very interesting topic. At the same time, some details could be further discussed:

1. I think the conventional method for computing the explained variance (energy retention) is to either use the squares of the singular values or the eigenvalues (without the squares). I haven't seen the squared eigenvalues being used. Please add a discussion on why a square-sum of the eigenvalues was used.
2. The description of the POD approach in this work assumed time-dependence, whereas starting from the description of the GP, it is assumed that only the last time step is investigated. Please add a discussion on how this could be extended to time-dependent cases and why it is enough to only consider the last time step.
3. For GPR of POD coefficients, a multi-output GP is used most often. Please consider adding a short description of why this work assumed independent GPs for the POD expansion coefficients.
4. It is unclear how the deformation was determined in the simulation tool; please consider adding a short description of the method. Did it assume linear elasticity or some more complicated material model?
5. I would not recommend exploring extrapolation with GPR; it is a well-documented topic with a consensus that it is not ideal.
6. Were the hyperparameters of the GP optimized using a log-likelihood function? If yes, please add a short description of the optimization process.

Minor comments that would increase readability:

1. If possible, please add numbering to the equations.
2. If possible, use scientific notation in the figures instead of 0.0004 (just an example).
3. The mathcal version of GP in the definition does not render properly in the online version.

Declarations

Potential competing interests: No potential competing interests to declare.