

Peer Review

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

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1. Independent researcher

The manuscript is clearly written and well-structured. However, detailed explanations and modifications are needed:

1. Do not use “we” in the content.
2. Highlight the novelty of their approach compared to existing methods.
3. The dataset used for training and validation is relatively small, with only nine training points. Authors should discuss in more detail how this affects the generalization of the model, especially for extrapolation beyond the training range.
4. The authors should more clearly state the specific gaps in the literature that their work addresses (how their proposed POD-GPR model overcomes these limitations compared to trial-and-error and FEM). How does it improve upon current distortion prediction methods?
5. Why are methods like POD-GPR particularly well-suited for this problem?
6. Explain why they chose a radial basis function (RBF) kernel for the GPR and whether the authors explored other kernel options.
7. Provide more details on the architecture of the GCA, including the number of layers, the size of the latent space, and the specific graph convolution operations used. The authors should discuss why they chose a graph-based approach over other types of neural networks.
8. What are the practical implications of achieving ± 0.001 mm accuracy in distortion prediction? Are there trade-offs between accuracy and computational efficiency that should be considered?
9. What strategies did the authors consider to mitigate overfitting in the GCA model?
10. What are the main limitations of this study and how to address them in future work?

11. Can the authors provide side-by-side comparisons of the distortion fields predicted by the POD-GPR model, the GCA model, and the high-fidelity simulations?

Declarations

Potential competing interests: No potential competing interests to declare.