

Peer Review

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

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Strengths

Relevance and Novelty:

- The topic is highly relevant to the additive manufacturing community, addressing a critical challenge in distortion prediction.
- The use of both classical (POD-GPR) and modern (GCA) machine learning techniques provides a balanced and insightful comparison.

Performance Metrics:

- The POD-GPR model achieves distortion prediction within ± 0.001 mm and a 1800x speed-up, which is impressive and well-supported by results.

Areas for Improvement

Dataset Size and Generalization:

- The GCA model's performance is limited by the small training dataset (only 9 points). While this is acknowledged, the paper would benefit from a more detailed discussion on how much data might be sufficient for better generalization.

Validation Strategy:

- The POD-GPR model combines validation and test sets, which may raise concerns about overfitting or optimistic performance estimates. A clearer separation would strengthen the evaluation.

Missing Quantitative Comparison:

- While qualitative comparisons are made (e.g., visual plots), a table summarizing quantitative metrics (e.g., RMSE, MAE) for both models would enhance clarity.

Recommendation**Accept with Minor Revisions**

The paper presents a strong contribution to the field of data-driven modeling in additive manufacturing. Addressing the minor issues above—especially around dataset size, validation clarity, and formatting—would significantly improve the paper’s impact and readability.

Declarations

Potential competing interests: No potential competing interests to declare.