Chair of Computational Modeling and Simulation
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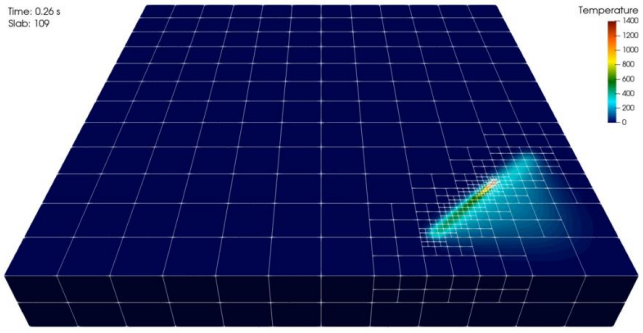
Modeling:
Mathematics:
Programming:
Science:

Software Lab:

Surrogate model for single layer simulation of Selective Laser Melting (SLM)

Description

Selective Laser Melting (SLM) is one type of metal additive manufacturing technique, that melts and fuses layers of metal to form the final part using a high power-density laser. Performing simulation of this process, capturing the high gradient of temperature around the laser demands huge computational power, even for a small volume. In order to reduce the computational effort, a surrogate modelling strategy to predict the temperature field, or to accelereate high-fidelity FEM simulation is explored using three ML/model-reduction techniques : Neural network, POD and SINDy.



High-fidelity FEM simulation of single layer SLM

Task

With the single-layer high-fideltiy FEM simulation results (temperature field) for different laser scan strategies, a surrogate model using Neural network, POD and SINDy have to be developed/explored. Temperature fields to train the model will be provided. Following are the estimated tasks

- Data analysis of the temperature fields
- Develop, train a neural network (possibly CNN) and and analyse its accuracy in predicting accurate temperature values for different spatial , temporal and laser scanning data
- Study and apply Proper orthogonal decomposition on the temperature fields-snapshots and analyse its accuracy
- Explore the possibility of discovering the PDE out of the given temperature field dataset

Supervisor

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References

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2. de Gooijer, Boukje M., et al. "Evaluation of POD based surrogate models of fields resulting from nonlinear FEM simulations." *Advanced Modeling and Simulation in Engineering Sciences* 8.1 (2021): 1-33.