Technische Universität Dresden

Fakultät Maschinenwesen Institut für Mechatronischen Maschinenbau
Professur für Werkzeugmaschinenentwicklung und adaptive Steuerungen

Master Thesis

Vertical Federated Learning in Additive Manufacturing Chains

Data is rarely shared in industrial process chains. This makes data-driven process optimization difficult. The reason for the lack of data sharing is that process secrets should not be disclosed or that no interfaces are available. This challenge arises in all industrial process chains. In additive manufacturing in particular, there is the additional problem that very few components are manufactured and therefore very little production data is available for a large number of process parameters that need to be optimized. Vertical federated learning could be a solution to both challenges. This method combines machine learning models of individual processes into an overall model without passing on data from the individual processes. This allows process knowledge to remain secret while still being optimized across the entire process chain. In addition, the number of process parameters to be optimized for the individual process models is significantly lower than if all parameters of the process chain were optimized within a single model.

Examples of additive manufactured ceramic components

Required knowledge and skills of the student

- Knowledge of machine learning

Main tasks

- Literature research on vertical federated learning algorithms
- Benchmarking of various vertical federated learning algorithms on an existing data set from the additive manufacturing of ceramic components

Your advantages

- Insight into data-driven process optimization with real manufacturing data
- In-depth knowledge of the rapidly growing research field of federated learning

Contact

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