## Development of a Digital-Twin System in Laser-Based Additive Manufacturing for AI-based Online Quality Monitoring

Digital Twins (DTs) are among the most promising key technologies for leveraging digital manufacturing. However, the potentials of DT can only be utilized if all information and data from the plant, machines, and stakeholders can be collected, integrated, ex-changed, and processed in real time.

The real-time requirements of DTs constitute a significant obstacle, especially for data processing and Artificial Intelligence. Huge amounts of data are collected in production and must be pre-processed, structured, and fed to AI models. This requires tiny algorithms and high-performance computing systems.
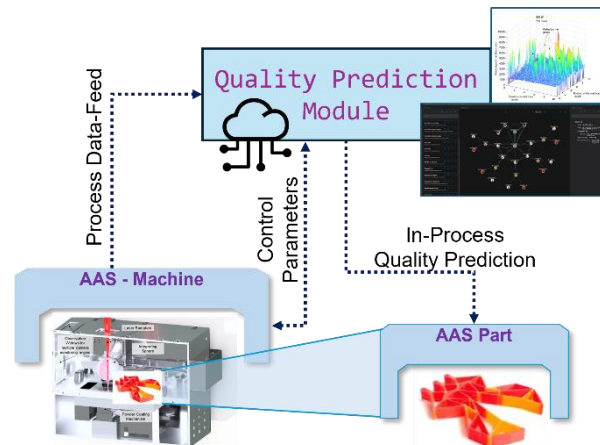
This project seminar considers an additive manufacturing process to produce workpieces for the aerospace industry. The students are guided by experienced researchers from the Institute of Automation and Information Systems and the Professorship of Laser-based Additive Manufacturing in designing, implementing, and using a Digital-Twin System for Laser-Based Additive Manufacturing for AI-based Online Quality Monitoring.

Industrial Standards such as the Asset Administration Shell (ASS) are explored to develop formalized models that can be seamlessly integrated between the different stakeholders. An ASS must be implemented to collect real data from the additive manufacturing process. The students learn to structure, process, and analyze these big data sets. Based on the insights generated from the data, AI models are developed for real-time quality monitoring and process optimization. Therefore, new approaches from the research in processing and analyzing data in real-time using tiny algorithms and developing self-learning AI models are integrated into the perfect seminar.

Prerequisites:

- Interests in AI, Digital Twins and analysis of real data
- High motivation, team player, reliable way of working
- Passion to learn new technologies relevant to industry

Project supervisors:

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