MSc thesis Proposal

Edge Analytics for Real-Time Defect Detection in Laser Powder Bed Fusion

Metal additive manufacturing (3D printing) is a large and rapidly growing market. The main advantages of the technology are in creating complex geometries, consolidating assemblies into one piece, reducing weight and optimizing functional design. Machine learning (ML) algorithms as a part of artificial intelligence are actively and successfully applied in different steps of additive manufacturing especially in laser powder bed fusion technology (LPBF). The LPBF technology has more than 50 parameters that have an impact on the properties of built components. Applications of ML, such as support vector machines, decision trees, and shallow and convolutional neural networks, etc., to LPBF, have generally identified process anomalies by classifying process conditions from sensor data alone or based off post-build inspection techniques.

In this thesis, the student is expected to acquire knowledge about advanced manufacturing technology, understand neural networks performing with different data types for process flaws detection.

The main goal of the thesis is to deploy a **defect classification algorithm** together with the monitoring system for online classification of defects during the printing phase. To do so, the student is using an existing offline model and adapting it for deploying that model in an **edge platform** that is connected to the printer **machine monitoring system**. The tasks involve data processing in real-time for defect detection in Nvidia edge device or similar. Thesis work also includes checking the model for correctness and sensor faultiness as well as **drift detection**. Develop and analyse the generalizability of different algorithms. Develop the ability to solve complex tasks, manage and process large datasets. Well trained ML model will be used **in situ with the melting process**

MSc thesis Proposal

Deep Learning-Based Sensor Fusion for Defect Classification in Laser