Master Thesis - “Sequence Predictions for Laser Metal Deposition Process Monitoring data”

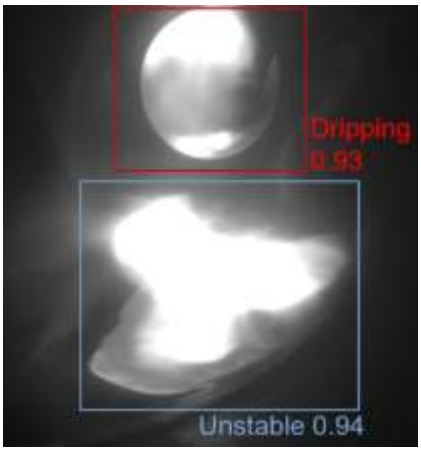
(30 credits/20 weeks –1 student)

About us

GKN Aerospace is the world’s leading multi-technology tier 1 aerospace supplier. With 55 manufacturing locations in 15 countries, we serve over 90% of the world’s aircraft and engine manufacturers. We design and manufacture innovative smart aerospace systems and components. Our technologies are used in aircraft ranging from the most used civil aircraft to the world’s advanced 5th generation fighter aircraft and the Ariane orbital rockets used by ESA.

This thesis work will be conducted at GKN Aerospace Engine Systems, Sweden, Trollhättan.

Project Background



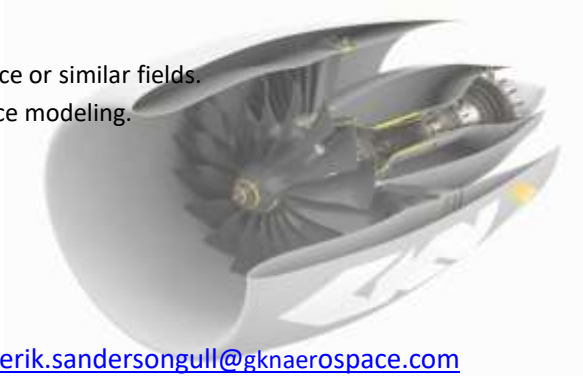
Laser metal deposition (LMD) also known as laser direct energy deposition (L-DED) is an additive manufacturing (AM) process that utilizes a high power laser, a motion control system (e.g. gantry or robot) and a feed stock material (wire or powder) to build up three dimensional structures. To achieve a stable deposition, the process is continuously monitored and controlled during the deposition. Yet variation occurs due to inaccuracy from the equipment, deformations, thermal variations and imperfectly tuned process parameters. One of the ways to analyze the deviations in the welding process is through visual inspection of melt-pool images captured by cameras during the process, and analyzing data (X-ray/CT) from inspection methods (Non destructive testing, NDT). However, this is a very time-consuming verification procedure if done manually since a large amount of data is generated from every built component, and it is also prone to human-inaccuracy from being a long and tedious task. Therefore, there is need to develop methods to support operators for facilitating validation and certification of AM components. A real-time AI model is used to verify image data during the process.

The aim of the master thesis is to explore deep learning based solutions to train sequence models using LMD process monitoring data that has anomalies information. The purpose of the sequence model is to guess what will happens next during process and prevent anomalies before they can occur during the process. Furthermore, reasoning why they occur and try to adjust the data accordingly for a smooth metal deposition to support quality assurance of DED products.

Assignment Description

- Familiarize with topics, additive manufacturing and aerospace engineering.
- Understanding process/manufacturing data, and what data needed for sequence modelling.
- Design or discover a sequence model to predict when an anomaly occur based on current data.
- Implementing and validating the developed models.
- Documenting results in thesis and presenting thesis work at GKN.

Qualifications and Skills



- Be a final year master thesis student in Machine learning or data science or similar fields.
- Great interest in image analysis, data analytics, deep learning, sequence modeling.
- Knowledge in probability theory, statistics and mathematics.
- Knowledge in sequence, time series predictions.
- Practical experience in Python programing.

Apply by

Send your resume and cover letter to siva.wejletorp@gknaerospeace.com and erik.sandersongull@gknaerospace.com