Agenda – Artificial Intelligence for Additive Manufacturing at Amexci

Amexci - introduction

Our AI use case for AM

AI used techniques

Speaker

Maud develops strategy on the use of AI for AM.

Prior to Amexci, she was involved in the development of 3D printed autonomous shuttles in Berlin and developing the intelligent transport industry in Paris on connected road infrastructures and autonomous underwater drones using AI.

Amexci – Introduction

Founding shareholder

Our offer

RESEARCH

Individual projects

Multi-owner studies

Parameter Development

DEVELOPMENT

Re-design of products

Manufacturing trials

Hardware assessment

INNOVATION

Application Development

Educational Programs

Open Trainings

In-house capacity

METAL

2 x EOS M290

ACONITY MIDI

POLYMER

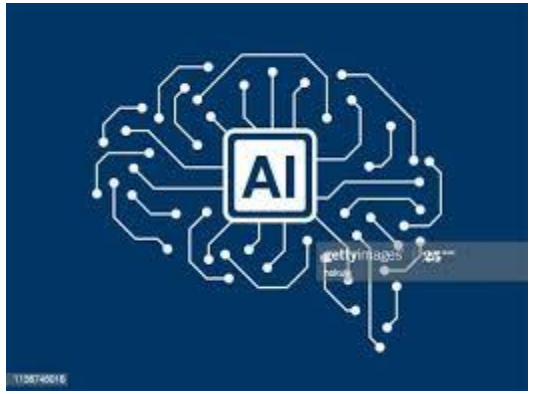
EOS P396

Markforged X7

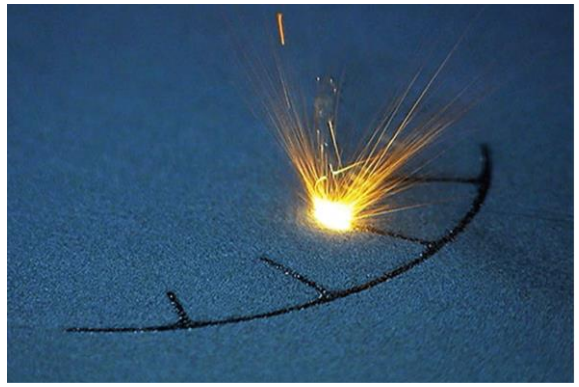
Artificial Intelligence for Additive Manufacturing – our use case

Bringing together two still immature technologies

Artificial Intelligence (AI)



Additive Manufacturing (AM)



Challenges:

Understanding the potential of overlapping the two technologies – what use case makes sense for AM and what is feasible based on AI available techniques

Make sure the deep learning model outcomes are relevant from an AM perspective, in a production context

Bring together experts from AM and from AI and make them understand each other

General challenge : why AI for AM

Qualification in additive manufacturing is currently one of the main challenges for companies moving from prototyping into production

Traditional qualification methods
Costly Destructive methods
Long testing
Expensive CT scans

New Monitoring systems
Giving in-depth understanding of the build process, but no automated way to analyse those data unless you take one skilled operator to go through terabytes of files

Artificial Intelligence techniques
With AI, we have the opportunity to **automate the quality control based on Monitoring data** to understand what possible defects occurred in a part

The data side of an Additive Manufactured part

SCENARIO

Components with complex design but no way to understand what happened in the part without using conventional destructive methods

4129 layers part generating **4129 Optical Tomography** pictures recording the light intensity of the laser

8258 Powder bed pictures showing the recoated build area

Sensor data from 14 different sensors up to 10.000 values

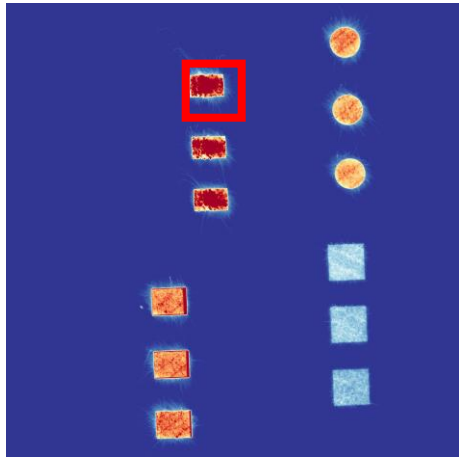
POTENTIAL

A deep learning model can detect defects happening in the metal L-PBF process based on input monitoring pictures

Artificial Intelligence for Additive Manufacturing – used techniques

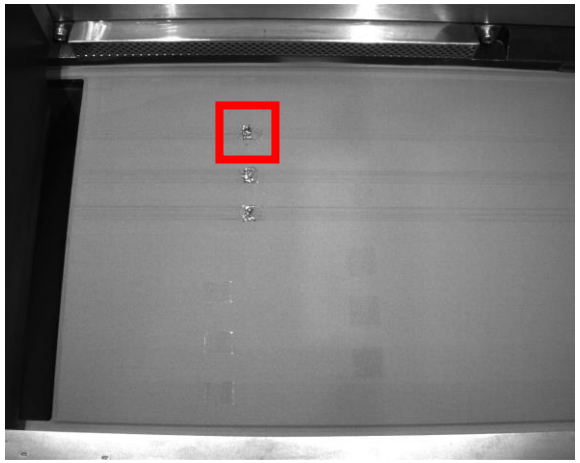
Detecting and defining the defects

OT picture

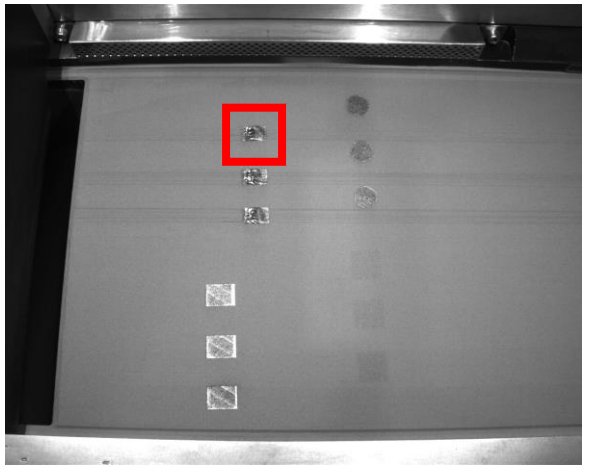


OT light emission
Grey Value 26,968
Shows indication with red scale

Powder bed



Recoating end
Shows recoating problems that can be a sign of a process deviation



Exposure end

Using two different AI techniques

Metal L-PBF data is rare in the industry

- Need to generate the ground truth – how is each defect represented in the data?
- Need to train the model to recognize features

Semi-supervised deep-learning for data clustering in order to generate labels

Developing a tool that can recognize defects based on the labels

- Need to have an intelligent tool that can detect defect based on the learnt labels
- Tool that is capable of processing pictures

Classification based on object detection model