

## **Powder Spread Process Monitoring in Polymer Laser Sintering and Its Influences on Part Properties**

Helge Klippstein<sup>1</sup>, Florian Heiny<sup>1</sup>, Nagaraju Pashikanti<sup>1</sup>, Monika Gessler<sup>2</sup>, Hans-Joachim Schmid<sup>1</sup>

<sup>1</sup> Direct Manufacturing Research Center, Paderborn University, Germany

<sup>2</sup> EOS GmbH, Krailling / Munich, Germany

### **Abstract**

Confidence in additive manufacturing technologies is directly related to the predictability of part properties, which is influenced by several factors. To gain confidence, online process monitoring with dedicated and reliable feedback is desirable for every process. In this project, a powder bed monitoring system was developed as a retrofit solution for the EOS P3 laser sintering machines. A high-resolution camera records each layer, which is analyzed by a Region Based Convolutional Neural Network (Mask R-CNN). Over 2500 images were annotated and classified to train the network in detecting defects in the powder bed at a very high level. Each defect is checked for intersection with exposure areas. To distinguish between acceptable imperfections and critical defects that lead to part rejection, the impact of these imperfections on part properties is investigated.

The full paper may be found in a special issue of the TMS publication *JOM*, March 2022.