



## Image Segmentation and Object Detection

This student research project is part of a project funded by the Ministry of Economics and Technology that deals with the simulation and experimental validation of eigenstresses in laser-generated composite materials. Laser dispersion is the primary process used in this project, where working surfaces of already manufactured parts are coated by adding tungsten powder into the melt pool. This coating serves as a wear protection layer that helps in extending the part's lifetime. Such coating can lead to high economic savings that correspond to a potential saving of up to 200 billion Euros in Germany in 2016.

In order to accurately simulate the eigenstresses in the generated layer, micrographs (digital images taken through a microscope) of different layers of the composite are collected. These micrographs are then analyzed and converted into an equivalent artificial structure that paves the way to numerical simulations. The artificial structure is generated by an image segmentation process followed by a feature extraction technique that detects specific shapes (here circles, as seen in the figures below).

This project aims to investigate various clustering schemes to generate the segmented image then examine and possibly improve the workflow of circle detection schemes.

### Technical requirements

- Basic Python knowledge
- Interest in digital image processing
- Material including some starting examples will be provided

Python  
MATLAB

