My research concerns segmentation of volumes that have been acquired through x-ray computed tomography. These volumes can be scans from various materials used in the energy sector, for example fibre composites or fuel cells.

I am working with a supervised segmentation method that is based on a so-called dictionary of image patches and corresponding label patches (Dahl & Larsen, 2011). This dictionary aims to represent in a compact manner all the information contained in a set of training images that have been created through manual annotation. When an image has to be segmented, instead of looking up the whole set of training images, the dictionary is searched.

I have performed segmentations of solid oxide fuel cells and glass fibres uding 3D methods (Emerson, Jespersen, Larsen, & Dahl, 2015), but at the moment I am mainly performing the segmentations in 2D.

Currently I am working on the characterisation of uni-directional glass and carbon fibre reinforced polymers. I have been able to segment the individual fibres from scans with low quality and high fibre volume fraction. This involved segmentation of the centre points of each fibre and a subsequent tracking procedure so as to connect the points that belong to the same fibre, see Figure 1. This opens up for different possibilities regarding the study of fibre architecture, such as determining the fibre orientation distribution, which affects the compression strength of the material.

Future work will focus on modeling the fibres statistically, so as to for example detect cracks. The aim is also to analyse these materials at a coarser scale where individual fibres cannot be distinguished, but instead complete fibre bundles can be characterised.

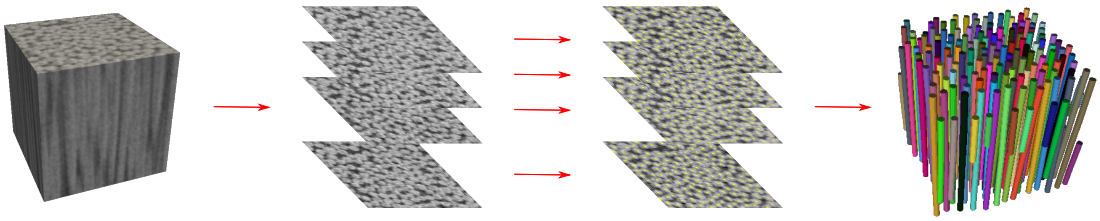

Figure 1: Description of the whole process for individual fibre segmentation. First the volume is sliced. Then each sliced is processed so as to obtain the centre points in every slice. Finally, the centre points need to be tracked through the volume, i.e. the centres corresponding to the same fibre need to be connected.

## Bibliography

Dahl, A. L., & Larsen, R. (2011). Learning dictionaries of discriminative image patches. *22nd British Machine Vision Conference.*

Emerson, M. J., Jespersen, K. M., Larsen, R., & Dahl, A. B. (2015). Dictionary based segmentation in volumes. *19th Scandinavian Conference on Image Analysis* (pp. 504-515). Springer.