Data Analysis of Medical Images: CT, MRI, Phase Contrast X-ray and PET - DTU Orbit
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Data analysis of medical images is an important and growing area, as systems for imaging becomes still more available and complex.

The goal of the thesis is to demonstrate solutions to data analysis problems in a cross disciplinary context. Further, to develop methods for analysis of new imaging modalities and to combine cross disciplinary knowledge from various fields to find new solutions to existing problems.

More specifically the thesis shows segmentation of images, classification and statistics used on a variety of quite different problems. Active Appearance models, Chan-Vese and graph-cut has been used, as well as a variety of statistical tools centred on the General Linear Model.

The point of departure for the thesis is the NanoGuide project, in which gel based x-ray markers for use in radiotherapy has been developed. Two different types of gels has been analysed using segmentation of micro-CT images followed by a statistical analysis of homogeneity, contrast, degradation, and other qualities. By combining knowledge from the different professions in the project, a new application for one of the developed gels - in-vivo dosimetry in radiotherapy - has been studied.

Analysis of differences between groups and of correlations between brain regions and cognitive tests in alzheimers patients is another contribution. Segmentation of fat in abdominal MRI-scans has also been studied and a robust algorithm based on graph-cut is presented.

A relatively new modality phase-contrast x-ray and dark-field has shown promise for diagnosis of a variety of diseases in the lungs. A classification algorithm for differentiation of healthy, emphysematous and fibrotic lung tissue on pixel level is presented.

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