

Universität Stuttgart
Institut für Signalverarbeitung und Systemtheorie
Professor Dr.-Ing. B. Yang



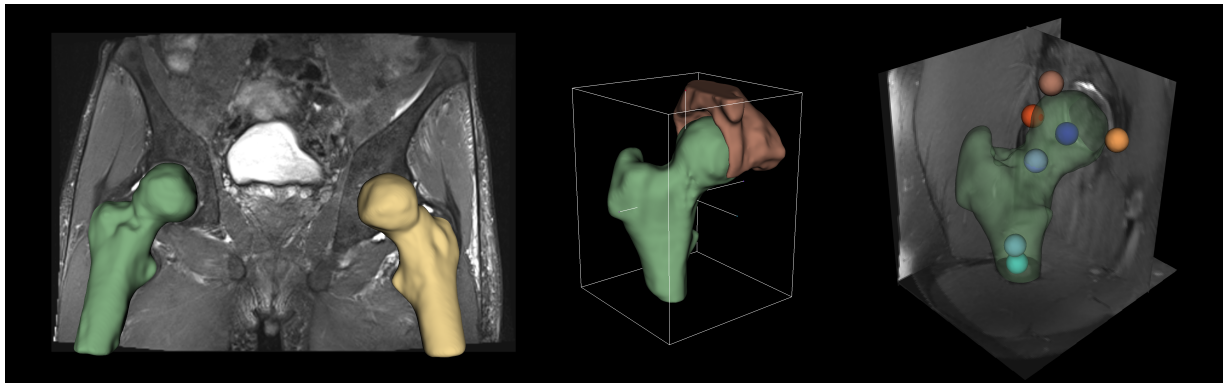
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Master Thesis, Studien-/Forschungsarbeit in Medical Image Processing

Background

Over the last decade clinical imaging capabilities as provided by Magnetic Resonance Imaging (MRI) have increased tremendously and are nowadays an integral part of many diagnoses. With a wide range of potential applications there is an ever increasing demand to process and analyze the respective data in an automated way. As such algorithms providing means to perform semantic segmentation, classification or localization of anatomical structures become a necessity.



Segmentation of femora (Oberschenkelknochen), acetabulum (Hüftgelenkspfanne) and localization of landmarks (colored spheres)

Proposed Topics

Building upon a large body of literature, a wide range of algorithms can be developed, refined and employed to the multiple problems at hand. Many of those arise from the fields of **Computer Vision (CV)** and **Machine Learning (ML)** including **Deep Learning (DL)**. All thesis topics concern problem dependent aspects and appropriately selected algorithms.

- **Classification: Bone and organ segmentation, tissue classification**
- **Regression: Anatomical structure localization**
- **Statistical analysis: Texture and shape analysis of specific regions and structures**
- **Extending and optimizing task dependent analysis pipelines**
- **Framework development: GUI, extending functionalities in Python**

The above points make use of Deep Neural Networks, Random Forests, Constrained Local Models, Statistical Shape Models, Multi Atlas and more. Please contact me for a list of currently available topics.

Prerequisites

- Above all a highly independent and structured way of working is expected
- Expertise in CV, ML and/or DL is beneficial
- Basic knowledge of Python, Matlab, C++ may be mandatory (task dependent)
- Successful participation in courses offered by the ISS or similar acquisitions may be required (task dependent)