

Automated Mechanical Analysis of the Human Spine

Task

Main goal of the project is to establish a simulation workflow that allows to perform clinical studies. The workflow combines an existing automated segmentation of CT-scans and construction of load surfaces with our in-house simulation tool Adhoc++ to perform clinical studies based on the MBS generated loads.

- Literature
- Analyse existing data and get familiar with the required tools (python scripts for segmentation and endplate generation, load data from MBS)
- Introduction to Adhoc++ (in-house FE tool at the chair based on C++)
- Transformation of MBS loads as boundary conditions for the FE model
- Combine single tools into an automated simulation workflow
- Perform studies based on clinical CT-scans of human spines

[1] Elhaddad, Mohamed, et al. "Multi-level hp-finite cell method for embedded interface problems with application in bio-mechanics." *INT J NUMER METH BIO* 34.4 (2018): e2951.

[2] Oztoprak, O. (2020). *Enforcement of Boundary Conditions in FCM with Applications to Biomechanics*. Technische Universität München. https://publications.cms.bgu.tum.de/theses/2020_oztoprak_masters_thesis.pdf.

Project Characteristics

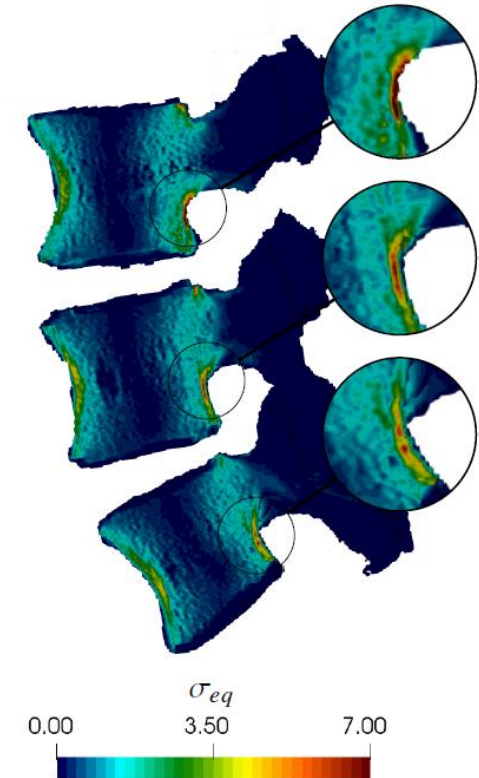
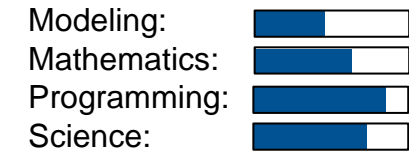


Figure 1: Von Mises stresses in L3-L5 vertebrae. [2]