Title: Understanding Lower Back Pain through Geometric Statistical Analysis of computed toomography (CT) Images

In developed countries about 80% of the total population suffers from acute and 5–10% from permanent lower back pain (LBP). An early diagnosis is crucial to reduce patient suffering and lower the economic burden on the society. In a representative study for the western world, the cost of LBP in Switzerland was estimated at 2.6 billion Euros in 2005. Nevertheless, surprisingly little is known about geometrical abnormalities resulting in LBP. This is in part due to the subtle distinction between healthy geometrical variability and pathological abnormal deformities of the spine.

In this project, our goal is to understand how lumbar spine morphology is related to LBP by identifying pain specific deformations. We focus our statistical analysis on 400 CT images of healthy and LBP patients and study the geometrical variability within and between the two groups. On the technical side, we work on new synergies between medicine, geometry, statistics and computing that are needed to perform such statistical tasks. This project brings together image analysis researchers, medical doctors and statisticians and fosters an exchange of ideas between these fields.