Department of
Biomedical Engineering

Master of Science – Biomedical Engineering
Thesis Proposal

Strict shape preserving VAE sampling of human vertebrae

Minimal-invasive surgeries at the University Children's Hospital of Basel rely heavily on pre-operative planning and computer-assisted surgical navigation. One of the research interests of our group is the planning of spine deformity corrections. The field of spine deformity correction currently lacks robust planning tools to visualize how the spine will look post-operatively. One possible approach is to use VAE's to interpolate from the deformed state to a "healthier" state. It must be noted, however, that usually, the deformity cannot be corrected fully to a typical human spine shape due to the common vertebral deformities in the scoliotic spine. Careful pre-operative planning with good visualisation is thus required.
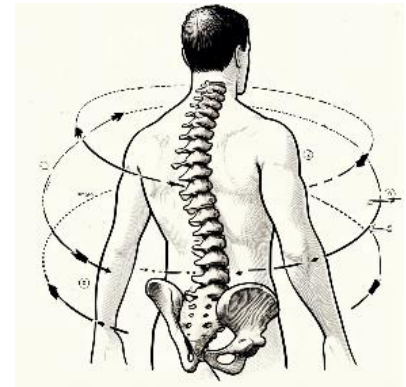
This project holds significant potential to guide the correction of vertebrae deformities towards a shape that more closely resembles a healthy spine using a VAE. Additionally, it aims to explore the possibility of extracting the Cobb angles from the VAE latent space directly. Such findings could revolutionize spine deformity correction planning, leading to more accurate and effective surgical interventions.

Nature of the Thesis
Theory: 30%
Programming: 60%
Documentation: 10%

Specific Requirements
Experience with Python,
Pytorch and understanding of CT and MRI imaging would be helpful

Group Leader / Supervisor
Prof. Dr. Philippe Cattin, University of Basel, Center for medical Image Analysis and Navigation CIAN

Collaborators
Maria Licci, Maria.Licci@ukbb.ch, Prof. Dr. C. Hasler

Contact
Volodimir Buchakchiyskiy, volodymyr.buchakchiiskyi@unibas.ch