# Masters Thesis: Force Sensing with Series Elastic Actuation Component for Surgical Robot

Context: The "in SEA2 SpineBot" Project aims to develop a robotic impedance measurement device capable of assessing the biomechanical properties of the adolescent spine with patient-specific anatomy. This highly interdisciplinary project will be the first of its kind to acquire in vivo data from patients with idiopathic adolescent scoliosis (AIS) during their correction surgery. It is a collaboration with the Children's Hospital of Basel (UKBB) and the Computational Bioengineering Group at ARTOG University of Bern.
Ensuring the functionality and reliability of the series elastic actuation (SEA) component of this device is a challenge in sensor development and signal electronics and is paramount to the project's overall success.
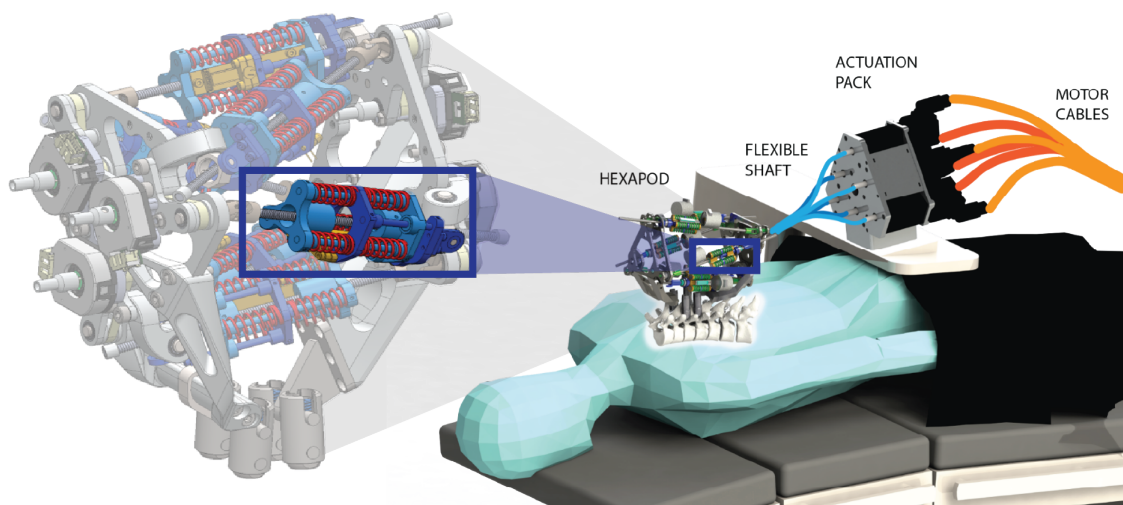
Task description: Your task will be to build and test version 3 of a linear SEA, validating its functionality and clinical usability in a series of mechanical experiments. You will also develop a force read-out system that can be used in the control of the SpineBot.

Workpackages:

- Literature review on state-of-the-art Series Elastic Actuation robotics and force sensing in the context of medical devices.
- Building and mechanical validation of a prototype.
- Implementation of SEA-based force sensing and estimation using an industrial Beckhoff/Ethercat hardware.
- Evaluating the reliability of the SEA.

Info:
Student: TBD
Start: March 2025
Duration: 6 months

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