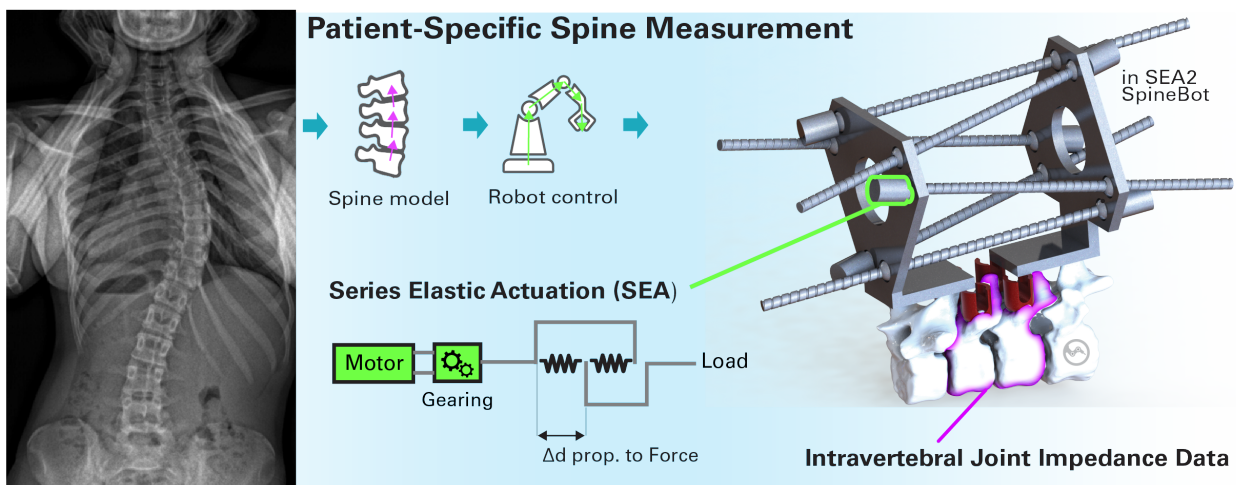


## Thesis: Series Elastic Actuation Component for Surgical Robot

**Context:** The "in SEA2 SpineBot" Project aims the development of a robotic impedance measurement device capable of assessing the biomechanical properties of the spine under the consideration of patient-specific anatomy. This highly interdisciplinary project targets the first robotic in vivo data acquisition of patients with idiopathic adolescent scoliosis (AIS). It is a collaboration with the Children's Hospital of Basel (UKBB) and the Computational Bioengineering Group at ARTOG University of Bern.

Based on a previous design, the envisioned 6 DoF parallel robot implements Series Elastic Actuation (SEA) to achieve accurate force control and inherent device compliance. Ensuring the functionality and reliability of such a SEA component offers challenges in sensor development and signal electronics and is paramount to the project's overall success.



**Task description:** Your task will be to iterate and refine a linear SEA design, develop an advanced prototype, and validate its functionality and clinical usability in a series of mechanical experiments. In addition, the thesis aims to incorporate the sensor into the robot architecture and control.

### Workpackages:

- Literature review on state-of-the-art Series Elastic Actuation robotics and force sensing in the context of medical devices.
- Development and building of an advanced prototype under the consideration of mechanical engineering, FEM, and fabrication principles.
- Test-driven concept development with a continuous evaluation methodology for task and user requirements.
- Performance evaluation of the sensor component
- Implementation of SEA in industrial Beckhoff/Ethercat hardware.

### Info:

Student: Nicola Wyss  
Start: 09.10.2023  
Duration: 6 months

### Supervision:

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