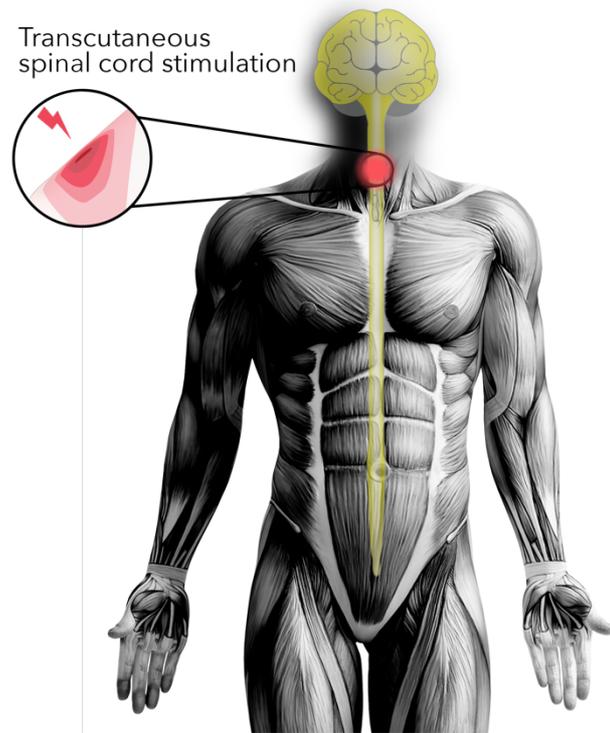


# Master Thesis: A computational model of transcutaneous Spinal Cord Stimulation

## Background

Spinal Cord Stimulation (SCS) is an effective clinical treatment for neuropathic pain and has recently demonstrated to target a wide variety of neurological functions. However, the mechanisms of action between the applied electric fields and the underlying neural circuits remain largely enigmatic, limiting both the clinical efficacy as well as the pace of translational research of SCS. Computational modeling of SCS has recently emerged as a powerful tool for investigating both theoretical mechanisms and techniques to



optimize the clinical application of the technology. Much of the field has focused on invasive SCS, which had a great impact on surgical targeting and stimulation parameter selection. However, recently transcutaneous SCS - a non-invasive, surface-electrode based neurostimulation therapy - received increasing attention as a cost-, time-, and risk-limited alternative to invasive SCS.

## Aim

The successful student is asked to develop a patient-specific 3D Finite Element Method (FEM) model of the spinal cord and its surrounding and evaluate the effects of stimulation parameter selection on the electric field generated by transcutaneous SCS. The student is asked to couple the results of the FEM analysis with compartmental cable models of the axon, assess the outcomes of stimulation parameter selection of various neural substrates and optimise stimulation parameters accordingly.

## Data

Project type	Master thesis
ECTS	30
Language	English/German
Period	Summer term 2022

Presence time	Virtual and/or at the Chair of Digital Health
Useful knowledge	Finite Element Method, Compartmental Cable Models, Programming, Neuroscience
Work distribution	50 % modeling and 50 % programming
StudOn link	N/A
Registration	E-mail to Dr. Andreas Rowald

## Literature

Literature recommendations are provided during the meetings. The candidate is further encouraged to research relevant publications on this topic.

## Examination

Final presentation and final report/thesis

## Contact



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