Master Thesis Topic

Simulation study: Impact of neural probe architecture on micromotion attenuation in brain

Introduction

Long-term recording and stimulation with implantable neural probes strongly rely on minimized adverse tissue reactions. A mechanical mismatch between brain tissue and neural probes in addition to brain movements can lead to localized strain around the neural probe tip, resulting in tissue damage and shear stress-induced inflammation. Ideally, an electrode design should account for these challenging conditions and help to minimize those adverse impacts. This work aims to investigate the impact of probe architecture on the adjacent tissue, accounting for the applied pressure under brain movement.

Objectives

Using numerical simulation techniques, to investigate the impact of surface architecture of neural probes in reducing the micro-motion induced injury

Your tasks

- Conducting literature survey on mechanical models of brain-electrode interface
- Selection of suitable simulation parameters and the corresponding boundary conditions
- Introducing finite element models of the given electrode designs and transferring them into the simulation software
- Simulation study to estimate the strain behaviour of different electrode design
- Concluding the design criteria and the impact on the adjacent tissue

Your profile

- You are interested in the field of neurotechnology and active neural implants
- You have a basic knowledge of strain/stress theories /or have background in mechanical engineering
- You can work in a concentrated, focused and structured way
- You are experienced with simulation tools such as COMSOL

- Location: Campus for Intelligent-Brain-Machine-Interface-Technology (IMBIT)
- Earliest starting date: May 2023 (can be discussed)
- Maximum length of the thesis: 6 months

Contact

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