Master’s Thesis (German or English)

Electrical impedance tomography-assisted modeling of the lung during nerve-stimulated and mechanical ventilation

Background:
Patients with lung diseases like Covid-19 are treated with mechanical ventilation. While the treatment can save lives, the patients do not use their diaphragm, which gradually atrophies, causing patients to stop being able to breathe without a mechanical ventilator. However, the diaphragm can be kept active artificially via electrical stimulation of the phrenic nerve. The electrical impedance tomography (EIT) images on the right show that the stimulation leads to the ventilation of different areas of the lungs compared to mechanical ventilation. These were obtained during animal trials, where the air pressure, air flow and EIT were measured.

Aim of the Thesis:
The regional differences of the lung ventilation shall be modelled and parametrized via EIT metrics, i.e., regional compliance and resistance will be derived from the EIT ventilation signal. The constructed model will be validated after splitting the data into a training set and a test set.

Content of the Thesis:
- Literature research
- Extraction of EIT metrics from the measurement data
- Modelling of the regional lung ventilation
- Model validation and interpretation of findings
- Documentation

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