

**To students at the Technical Faculty  
(Medical Engineering)**

**Starting date:** May or June

**Hals-Nasen-Ohren-Klinik  
Kopf- und Halschirurgie**  
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## **Bachelor thesis: Kinematic Modelling of Human Vocal Fold Vibration Observed in a Hemi-Larynx Experiment**

Verbal communication is one of the most important achievements of human beings. A pivotal component of speech is the voice generated by the vibrating vocal folds located in the voice box, also known as the larynx. Since differences in patterns of vocal fold vibration influence voice quality in diverse ways, it is crucial to understand and model kinematics of the complex phenomenon of vocal fold vibration.

The kinematics of the vocal folds are represented by the 3D movement of discrete points distributed across the vocal folds' surfaces. These points are captured in a hemi-larynx experiment, in which a human larynx is taken out of a cadaver, and split into two halves. The vocal fold that is normally driven by the airflow provided by the lungs is driven here by an artificial flow source.

Parameter driven **computer models of the vocal fold kinematics** are currently under development. The **aim of this work** is to use and then improve a state-of-the-art computer model of vocal fold kinematics for the purpose of **optimizing this model on data observed in hemi-larynx experiments**. First, the 3D kinematic hemi-larynx data is imported, and compared with the model output. Second, the kinematic parameters of vocal fold vibration are estimated/optimized by minimizing the average Euclidean distances of the surface points. Third, ways of improving the structure of the model are explored with the aim of providing more adequate representations of the natural data.

This topic is supervised in collaboration with the Medical University of Vienna and the Palacky University Olomouc.

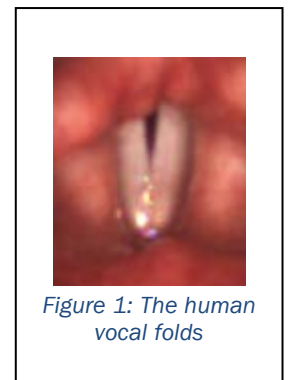


Figure 1: The human vocal folds

### **We search for a dedicated and motivated student with**

- Knowledge in MATLAB / PYTHON
- Knowledge in Optimization

### **Tasks:**

- Visualization of vocal fold vibration data obtained from a hemi-larynx experiment
- Optimization of an existing kinematic model towards the hemi-larynx data

### **Contact persons:**

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