<u>Master Thesis</u>
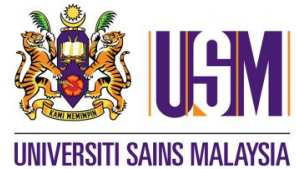
To Students at the Technical Faculty
(Medical Engineering/Medizintechnik,
Computer Science/Informatik)

FAU
Friedrich-Alexander-Universität
Erlangen-Nürnberg

USM
UNIVERSITI SAINS MALAYSIA

<u>Title</u>: Machine Learning-based App for Objective Feedback of Voice Therapy

Background: Resonant voice therapy (RVT) is an effective treatment for voice disorders, which trains patients to use the "resonant voice". At the fundamental level of RVT, patients learn to produce resonant /m/ or /n/ sounds, which can be accomplished by altering the vocal tract configurations. This basic level is built upon to increase the complexity of tasks until generalization into daily communication is achieved.

Given Data: The dataset includes acoustic signals and computed formants (F1, F2, F3, F4) for the sounds /m/ and /n/ in both resonant voice (RV) and typical voice (TV). The data was collected from 75 subjects who each produced the sounds 12 times i.e., 3 trials for RV and 3 trials for TV, each set for /m/ and /n/ sounds, resulting in a total of 900 samples.

Research Questions: Is it possible to separate RV from TV? Which signal features (e.g. formants) are significant for this task? How can the distance or similarity between RV and TV be quantified?

Methods: For classification, the entire signal or the formants will be considered. Also, additional acoustic features and signal representations (e.g. frequency domain) will be investigated. Different classification algorithms will be analysed to find the best method for classification using the acoustic signal (e.g. by CNN, CRNN) or acoustic features (e.g. by SVM, Decision Trees).

Goal: Develop a suitable classification scheme and implement it in a usable voice therapy app. The purpose of the app is to give feedback if the patient is producing RV or how close they are to RV.

The work will be supervised by **Prof. Dr.-Ing. Michael Döllinger (Member of Department Informatik & AIBE).** The thesis is in **cooperation with Dr. Khairy Anuar Mohd Khairuddin**, Speech Pathology Programme, School of Health Sciences, Universiti Sains Malaysia.

<u>We search for a dedicated and motivated student</u> with
- experience in machine learning methods
- experience in Python (implement and test classification methods)
- experience in app programming (e.g. using Java)

<u>Tasks:</u>
- development of a classification scheme (RVT vs. normal) using the acoustic signals
- implementation of classifier in a usable app

<u>Contact persons:</u>

Prof. Dr.-Ing. Michael Döllinger (michael.doellinger@uk-erlangen.de / Tel. 09131-85 33814)