# Open Vocabulary Silent Speech Recognition

Neural Networks on Raw Data and decision trees and random forest on spectral density estimations

Goals and objectives of work:

1. Check the conceptual possibility of OVSSR.
2. Collect dataset of phonemes recordings for silent-speech recognition.
3. Spread it in community, so everyone could try their ideas simply.

Dataset collection

1. Male english teacher.
2. 30 repeats for every of 44 phonemes of English language.
3. 10+2 EMG sensors placed as follows:
4. 1000 hz discretization freq.
5. 500 hz low pass filter.
6. 2050 ms for each sample.
7. No sound or blowing, while recording sample.
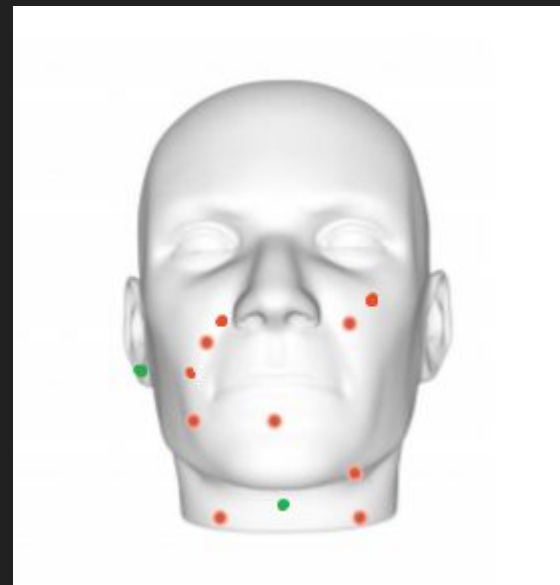
Tested methods:

Raw data:

1. CNNs
2. RNNs

Spectral Density Estimations(whole sample record):

1. Decision Tree Classifier
2. Random Forest

Obtained results:

1. Random forest 500 trees and 30 max. features beaten 72% accuracy score on 10-fold cross-validation.
2. Obtained classification quality is competitive with usual phoneme recognition[2].

Conclusion:

Possible outcomes:

1. OVSSR is possible within the same conditions as usual speech recognition.
    a. Short-term phoneme recognition
    b. Statistical models applied over results of "a".

2. OVSSR is possible with personal tuning.

References:

1. [AlterEgo: A Personalized Wearable Silent Speech Interface](), Kapur et al., April 2018
2. [A PHONEME-BASED PRE-TRAINING APPROACH FOR DEEP NEURAL NETWORK WITH APPLICATION TO SPEECH ENHANCEMENT](), Shlomo E. Chazan, Sharon Gannot and Jacob Goldberger, 2016
3. [Sub-Word Unit based Non-Audible Speech Recognition using Surface Electromyography](), Matthias Walliczek, Florian Kraft, Szu-Chen Jou, Tanja Schultz, Alex Waibel, 2006