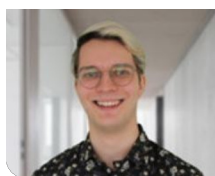


Analysis of Natural Communication Behaviour in the Sonova Real-Life-Laboratory

Students



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Introduction: This project thesis is about the experimental studies conducted in collaboration with Sonova AG. The studies take place in the Real-Life-Laboratory which can simulate realistic ambient noise to test hearing aids. The overall goal is to develop hypotheses about the communicational behaviour in challenging hearing environments and verify them with experiments.

Approach: To achieve this goal, three experiments were conducted. One with changing volume, one with changing frequency spectrum and one with hearing aids. In each experiment, the participants communicated while the room simulated a restaurant background scene. This scene varied to make communication more challenging. Furthermore, the participants' voices and positions were recorded and the Lombard speech was measured to gain further insights. In the end, a small machine learning model was trained to estimate the background noise and the importance of the measured data was assessed.

Conclusion: Our analysis of the first experiment showed the typical effects of Lombard speech. Rising noise level leads to higher speech intensity, pitch, bandwidths and to smaller distances. The second experiment conducted with changing frequencies spectrum concluded that there is no statistical difference between the different measurements of bandpass to bandstop and lowpass to highpass except for the speech intensity, where participants talked quieter during bandstop. The third experiment with hearing aids concluded that the speech level when wearing hearing aids with beamformer was lower while other measurements of the Lombard effect were not affected. The lasso regression model was only able to explain forty percent of the variance in the data and is not complex enough. The most important features were distance, intensity, formant, bandwidth and intensity squared.

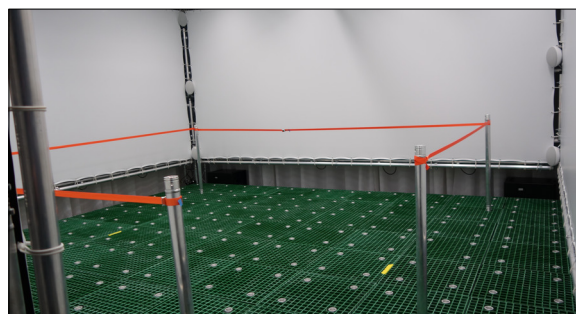
This project work provides data and insights to the Lombard effect without noticeable limitations in vocabulary and movement due to the freedom the Real-Life-Laboratory provides. The experiment data provides multiple insights into human conversational behaviour and provides theories but does not provide any evidence for any theories made. Especially the sample size of all conducted experiments was rather low and should be expanded to make more conclusive statements.

Examiner
Hannes Badertscher

Subject Area
Data Science

Project Partner
Sonova AG, Stäfa,
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Sonova Real-Life-Lab with Barrier
Own presentation



Headset with Optitrack Trackers
Own presentation



Median distances, speech intensities, pitches and bandwidths of the first formants of recordings plotted against time.
Own presentation

