Speech Detection via Respiratory Inductance Plethysmography, Thoracic Impedance, Accelerometers, and Gyroscopes: A Machine Learning-Informed Comparative Study
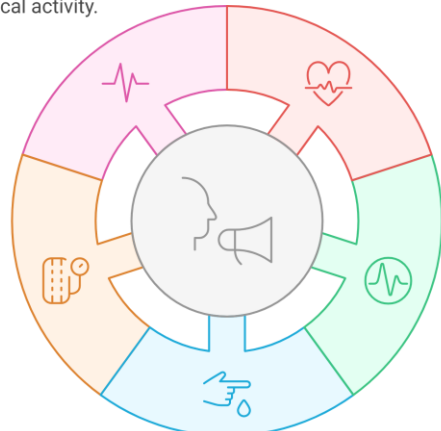

MODEL TRAINING AND VALIDATION
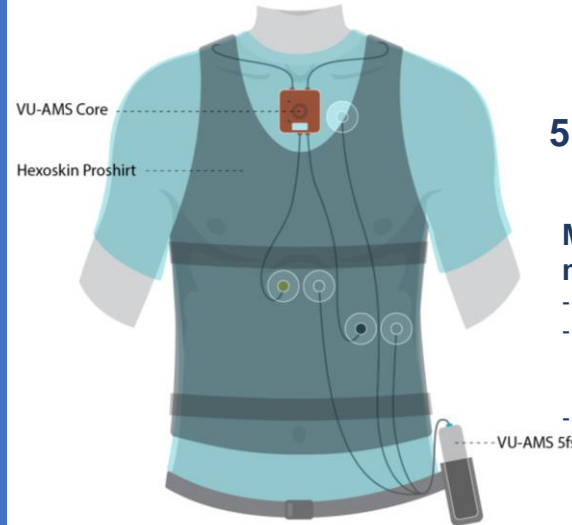
56 participants

Machine learning models for
- **Impedance**
- **Respiratory inductance plethysmography**
- **Accelerometers**

VU-AMS Core
Hexoskin Proshirt
VU-AMS 5fs

Tasks with aloud-silent alterations
- Reading a Neutral Script
- Arithmetic Stressor
- Walking
- Having Conversations

Speech Activity's Impact on Physiology

T-wave Amplitude — Speech patterns influence cardiac electrical activity.

Heart Rate — Speech can elevate heart rate.

Heart Rate Variability — Speech activity significantly confounds a number of HRV metrics.

Skin Conductance Level — Speaking alters SCL.

Blood Pressure — Speaking can increase blood pressure.

RESPIRATION SIGNALS (time-domain)
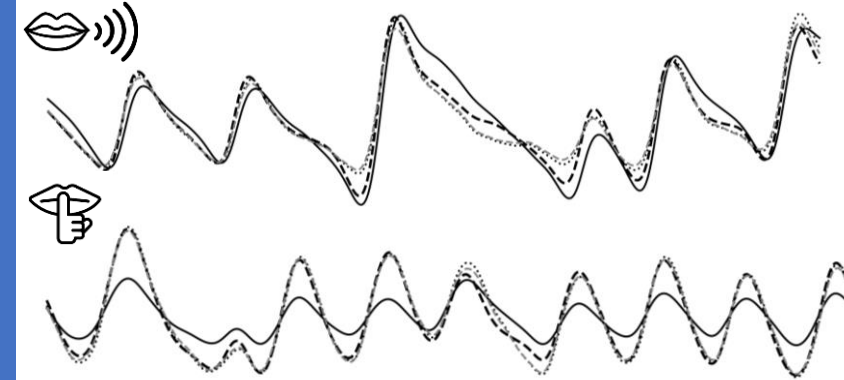
ACCELEROMETER SIGNAL (frequency-domain)
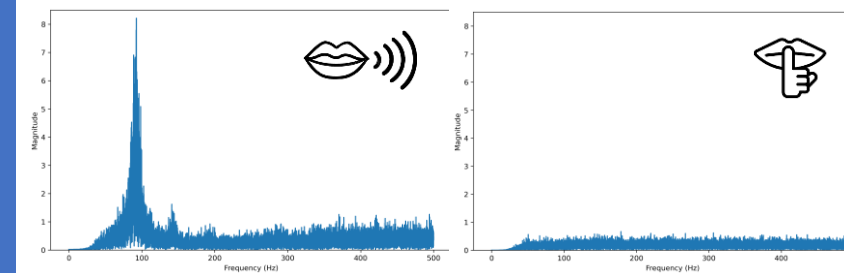
CONCLUSION: Using either respiratory signals or chest-mounted accelerometer signals, speech occurrence in daily life may be reliably detected from wearable devices.

Saygin, M., Schoenmakers, M., Gevonden, M., & de Geus, E. (2025). Speech Detection via Respiratory Inductance Plethysmography, Thoracic Impedance, Accelerometers, and Gyroscopes: A Machine Learning-Informed Comparative Study. *Psychophysiology*. https://doi.org/10.1111/psyp.70021

STRESS IN ACTION

VU