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INVESTIGATING THE FEASIBILITY OF USING NON-INVASIVE EEG SIGNALS TO DEVELOP A SPEECH NEUROPROTHESIS

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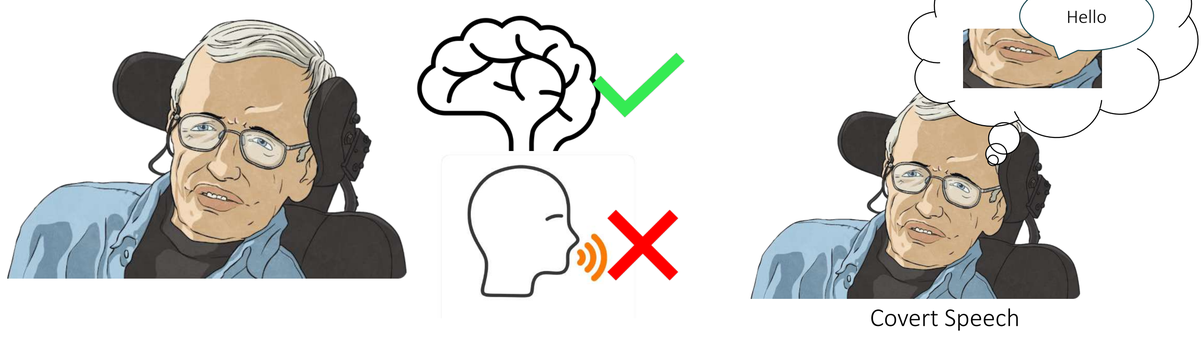
Introduction

In some diseases, cognitive abilities remain intact, but individuals are unable to speak (e.g., locked-in syndrome).



Covert Speech

A solution to restore communication: Brain-Computer Interfaces (BCIs)

Deep Restore

Aprendizaje profundo para la restauración del habla a partir de bioseñales de movimientos faciales

High performance Speech Neuroprothesis (BCIs) with Invasive brain recordings

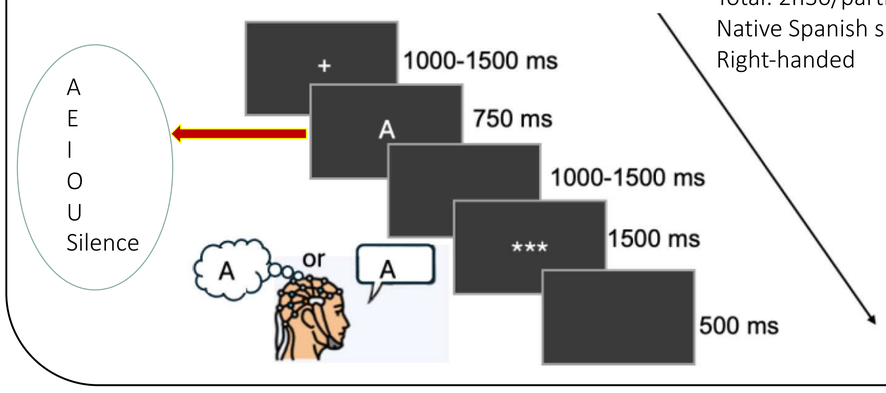
Can we achieve the same with non-invasive EEG recordings?

Method

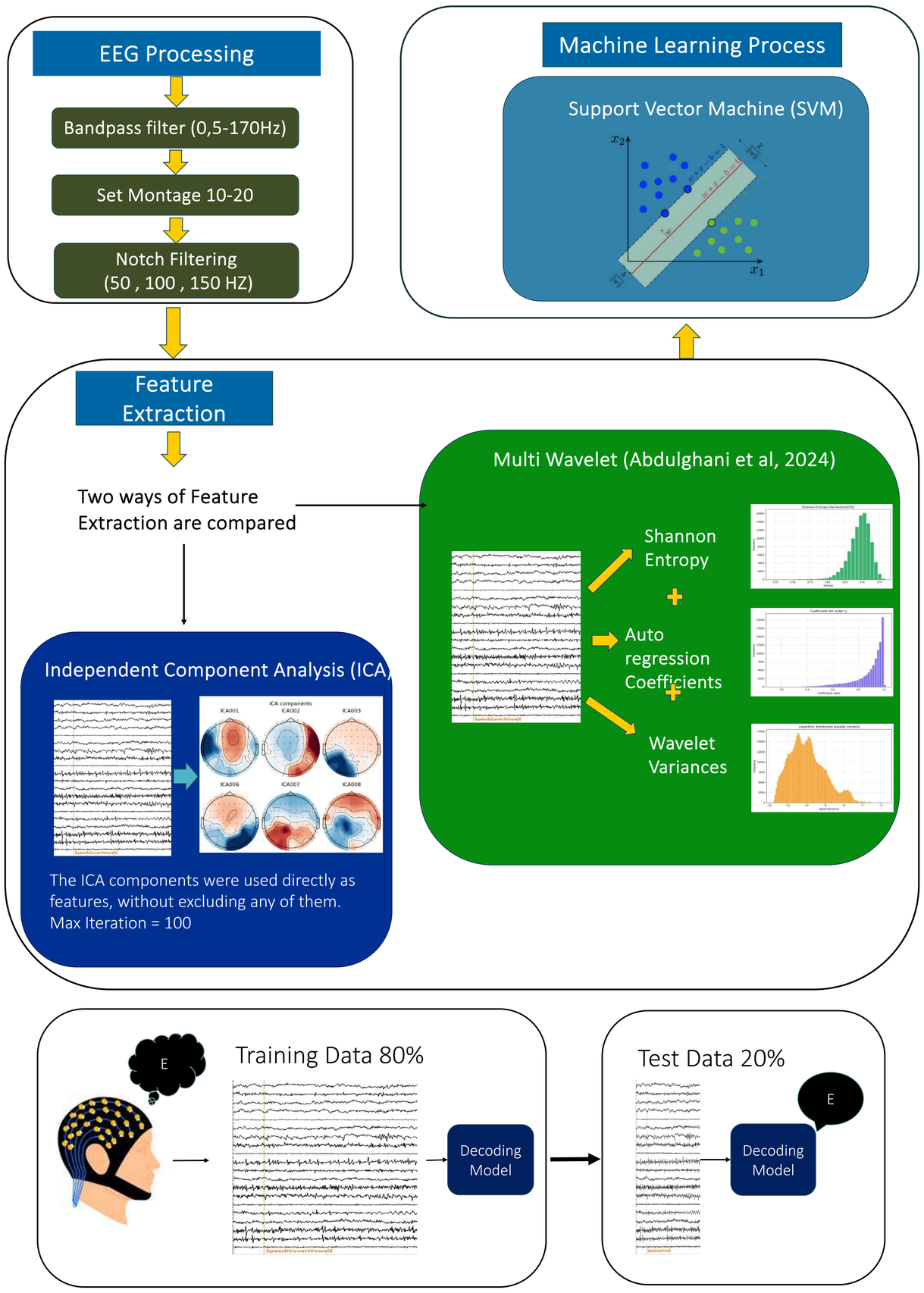
Experimental Task

EEG actiCAP 64 channels
Voice recording

N = 6 (healthy)
Two sessions per participant
Total: 2h30/participant of recordings
Native Spanish speakers
Right-handed

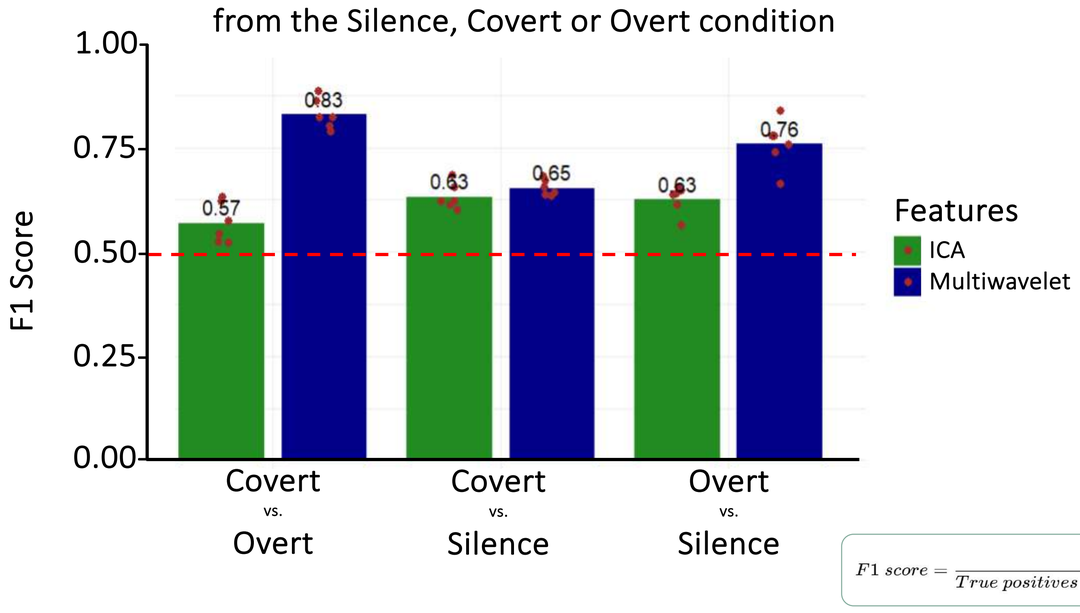


Data Processing



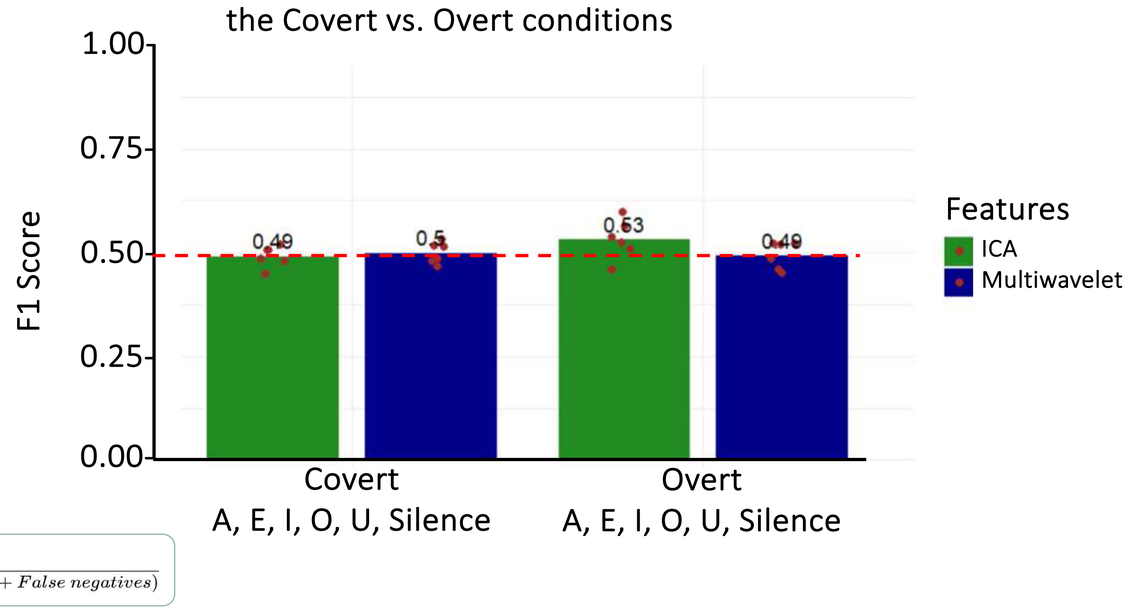
Results

F1 Score for the classification of the trials as from the Silence, Covert or Overt condition



$$F1\ score = \frac{True\ positives}{True\ positives + 0.5(False\ positives + False\ negatives)}$$

F1 Score for the classification of the vowels in the Covert vs. Overt conditions



Conclusions

- Identification of linguistic content (Overt vs. Silence vs. Covert classification).
- Feature extraction methods: Multi-Wavelet > ICA.
- Unable to decode specific vowels.
- For future research, we will compare performance using Deep Learning models for the classification process.

References

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