USING SPEECH TO FOLLOW-UP SLEEP DISORDERS

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Sleep disorders and speech

Sleep disorders affect 1/3 of world's population and impact their daily and professional quality of life.
It is also a major public health problem (20% of car accidents were caused by sleepiness).

Subjective sleepiness evaluation

Objective sleepiness evaluation

Regular and frequent appointments needed to follow-up patients' symptoms evolution

→ Difficult to set up

Clinicians use the *Ecological Momentary Assessment* method to follow-up patients symptoms evolution in ecological conditions

Speech is a useful modality because its collection is non invasive and passive

Previous results: read speech

Multiple Sleep Latency Test corpus (MSLTc)

- Recorded at the Bordeaux sleep clinic (France)
- 135 patients (675 recordings)
- Subjective and objective sleepiness
- Patients' characteristics and comorbidities

Speech biomarkers extracted

- Acoustic features [1]
- Location and duration of pauses in read speech [2]
- Errors in Automatic Speech Recognition [3]

Results (UAR)

Subjective sleepiness

KSS: 67,8% | **ESS: 75,4%**

Objective sleepiness

MSLT: 84,6%

Pathological sleepiness can be automatically detected using speech biomarkers specific to read speech

But we need more ecological data collection
→ spontaneous speech

Objectives of my thesis: spontaneous speech

Medispeech corpus

Similar to the MSLTc but:

- Recordings with a smartphone
- 2 new tasks:
  - Semi-spontaneous speech
    "Describe the rules of a game of your choice"
  - Spontaneous speech
    "Is it difficult for you to get out of bed?"

New speech biomarkers

- Phonetical and phonological analysis of speech [4]
- Validation of the previous biomarkers on spontaneous speech

Perspectives

- Biomarkers of sleepiness in spontaneous speech
- Integrate speech analysis in clinical practice using mobile devices
- Other symptoms (fatigue, depression, anxiety…)

[1] V. P. Martin *et al*, "Sleepiness detection on read speech using simple features", IEEE,2019
[2] V. P. Martin *et al*, "Does sleepiness influence reading pauses in hypersomniac patients?", Speech Prosody, 2022
[3] V. P. Martin *et al*, "Automatic Speech Recognition systems errors for accident-prone sleepiness detection through voice", IEEE, 2021
[4] C.Beaumard *et al*, "Automatic detection of schwa in French hypersomniac patients ", PFIA, 2023