



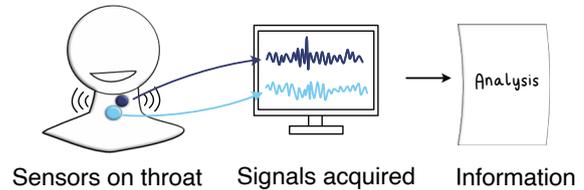
CONTEXT

Videofluoroscopy (VFS) is considered as the **reference examination** to assess dysphagia. However it can't be done systematically due to its lack of accessibility, invasiveness and cost.

High Resolution Cervical Auscultation (HRCA) is a promising alternative when VFS is not feasible^[1-4].

This preliminary study introduces a new automatic method for **segmentation and identification of PharyngoLaryngeal (PL) events** in HRCA signals recorded with the Swallis DSA™.

High Resolution Cervical Auscultation



DATA AND MATERIALS

Scenario and subjects

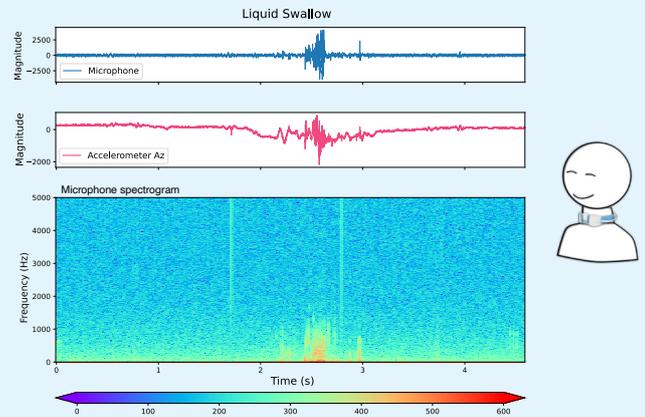
Six healthy participants (2 females, 4 males) from 24 to 62 y.o. (mean age 34) were asked to swallow different boluses (saliva, water, gelled water, biscuit) in a controlled position. Coughs, hummings and phonations were asked and also appeared spontaneously during the recording.

	Swallows	Expectorations	Phonations	Others
Controlled	125	15	6	0
Spontaneous	118	4	163	27

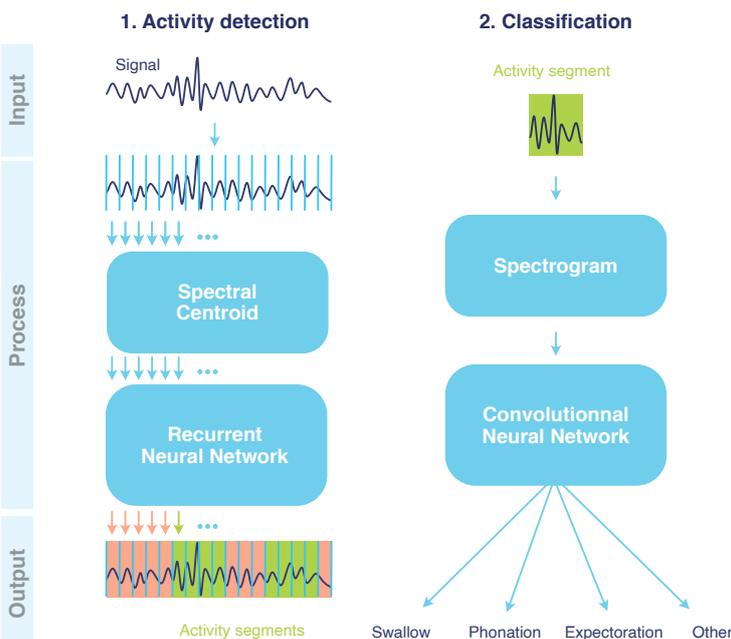
Device

The Swallis DSA™, which includes a three-axis accelerometer and a microphone, was used to record vibroacoustic signals on the subject's throat.

Representation of a liquid swallow signal on the anterior-posterior axis of the accelerometer and on the microphone



METHOD



RESULTS AND DISCUSSION

As this study was on a subset of our corpus, we used a **leave-one-out** approach to train and evaluate our system.

Detected activity segments

Swallows	Phonations	Expectorations	Others
249	155	16	369

This preliminary study gives promising results with **86.3 %** of good classification rate overall.

Most of the remaining errors are linked to the natural movements and noises of the subject between the controlled events. Some swallows (saliva, biscuit and multiple water ones) will require special processing to better detect their specific patterns and intensity.

For which medical use?

- Structuration of recordings to ease clinician's analysis
- Statistics on PL events, swallowing frequency

Perspectives

- Validation of algorithms on the whole data collection
- Characterisation of PL events signals for healthy subjects

REFERENCES

[1] Dudik JM, Coyle JL, Sejdic E. Dysphagia screening: contributions of cervical auscultation signals and modern signal-processing techniques. *IEEE Trans Hum Mach Syst.* 2015;45:465-77. <https://doi.org/10.1109/THMS.2015.2408615>.
 [2] Donohue C, Khalifa Y, Perera S, Sejdic E, Coyle JL. A preliminary investigation of whether HRCA signals can differentiate between swallows from healthy people and swallows from people with neurodegenerative diseases. *Dysphagia.* 2020. <https://doi.org/10.1007/s00455-020-10177-0>.

[3] Kurosu A, Coyle JL, Dudik JM, Sejdic E. Detection of swallow kinematic events from acoustic high-resolution cervical auscultation signals in patients with stroke. *Arch Phys Med Rehabil.* 2019;100:501-8. <https://doi.org/10.1016/j.apmr.2018.05.038>.
 [4] C. Donohue, Y. Khalifa, S. Mao, S. Perera, E. Sejdic, et J. L. Coyle, « Establishing Reference Values for Temporal Kinematic Swallow Events Across the Lifespan in Healthy Community Dwelling Adults Using High-Resolution Cervical Auscultation », *Dysphagia*, mai 2021, doi: 10.1007/s00455-021-10317-0.