Voice AI Labs, a first-of-its-kind national infrastructure to boost vocal biomarker research and implementation

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Voice is a mirror of our health, and vocal biomarkers (VBs) hold promises for remote health monitoring, disease screening, and as objective digital endpoints in clinical research (1, 2). Despite growing interest, the development, validation, and implementation of robust VBs remain in their early stages and require large-scale longitudinal data collection.

The Deep Digital Phenotyping (DDP) lab at the LIH has developed expertise in voice-based research, including methodologies for voice acquisition and preprocessing, as well as the identification of candidate VBs such as a VB to predict type 2 diabetes status, or a VB of fatigue (3, 4).

To accelerate VB research, the DDP lab established the Voice AI Labs, a national research infrastructure comprising soundproof recording booths deployed across hospitals in Luxembourg. The infrastructure will facilitate the standardised collection of high-quality voice recordings, enabling dedicated cohort studies on voice and establishing voice as a pivotal parameter in clinical trials at the LRC and hospitals.

SONAR (Vocal Biomarkers for Health Monitoring: An Open Longitudinal Hybrid Cohort Study) is the first study conducted within the Voice AI Labs infrastructure. SONAR aims to characterise longitudinal intra-individual variability in voice and develop vocal biomarkers of symptoms common to chronic diseases. We aim to include at least 4000 adults, regardless of their health status, speaking one of the study languages (German, French, English, Portuguese). Participants will be followed longitudinally through both on-site visits in the booths and remote monitoring, via a dedicated companion app to track key health parameters and voice.

Voice AI Labs is set to position Luxembourg at the forefront of vocal biomarker research, enabling future clinical trials including voice at the LRC, and fast-tracking access to new digital technologies for patients in Luxembourg.

Voice AI Labs is funded by the LIH and is conducted in partnership with the Centre Hospitalier de Luxembourg, the Centre Hospitalier Emile Mayrisch and the Centre François Baclesse, the Centre Hospitalier du Nord, the Centre Hospitalier Neuropsychiatrique, and the Hopitaux Robert Schuman.

References

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2) Fagherazzi G, Bensoussan Y. The Imperative of Voice Data Collection in Clinical Trials. Digit Biomark. 2024;8(1):207-209.

3) Elbéji A, et al. A voice-based algorithm can predict type 2 diabetes status in USA adults: Findings from the Colive Voice study. PLOS Digit Health. 2024;3(12):e0000679.

4) Elbéji A, et al. Vocal biomarker predicts fatigue in people with COVID-19: results from the prospective Predi-COVID cohort study. BMJ Open. 2022;12(11):e062463.

Biosketch

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CURRENT AND PAST POSITIONS

Since 2019: Scientific coordinator in the Deep Digital Phenotyping (DDP) Research Unit at the Luxembourg Institute of Health (LIH): development of new multi-institutional projects and collaboration opportunities with national and international stakeholders, implementation and coordination of large cohort studies in the digital research field.

2014-2019: Clinical Research Coordinator at CIEC, LIH: set-up and coordination of projects in different therapeutic fields, with particular focus on infectious diseases (regulatory, scientific, operational aspects), support to researchers for project set-up.

2001-2013: Research engineer at the retrovirology lab, CRP-Santé (former LIH).

EDUCATION

PhD in Health and Life Sciences: "Development of a voice-based digital health solution to monitor Long COVID Symptoms in real-life", Université de Lorraine, Nancy (2021-2024).

DIU FARC-TEC (Formation d'Assistant de Recherche Clinique), Faculté de médecine, Strasbourg (2013-2014).

Biochemistry Engineer Diploma (Master II level), National Institute of Applied Sciences (INSA), Lyon (1994-1999).

AWARDS AND HONORS

Prix de Sciences de l'Académie Nationale de Metz, 2025.

OTHER RELEVANT PROFESSIONAL ACTIVITIES AND ACCOMPLISHMENTS

Coordination of the Predi-COVID cohort study and of several axes of the CoVaLux initiative on Long-Covid and Covid-19 vaccination in Luxembourg.

Teaching activities at University of Luxembourg (PROMs, PREMs, Digital Health) since 2024.