

“How are you today?” Harnessing speech as a window into life with a chronic disease

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Summary:

This presentation will illustrate the usefulness of complementing wearable sensor studies with speech and patient narratives for better measurement contextualization and deeper insights into the lived experiences of persons with chronic diseases. Moreover, I will showcase a new tool for harnessing speech in health studies and outline a roadmap for its application and continued development within our Endo-train project.

Keywords: Remote Monitoring, Speech, Natural Language Processing, Person-Centered Research, Chronic Diseases.

Background

Sensor-based digital biomarkers hold promise for remote real-time monitoring of chronic diseases. Yet, they may offer only a limited perspective into health, symptoms, patient-led disease management, or lifestyle factors, which are relevant for clinical decision making. [1]

Speech-based descriptions or personal narratives can complement digital biomarkers by enabling such further insights into important aspects of life, but their analysis requires substantial expertise and manual efforts.

Objectives

In this presentation, I will illustrate how recent developments in large language models and natural language processing can increase feasibility and usability of speech-based information in sensor-based health studies and research in general.

Presentation Outline

Based on two study examples, I will showcase how we have leveraged speech data and patient narratives 1) for contextualizing sensor measurements [3], and 2) to characterize life circumstances and longer-term disease histories from a person-perspective [4].

Building on these studies, I will offer insights into the ongoing development of our software tool SpHeRe (acronym for Speech in Health Research). SpHeRe aims to facilitate the collection and analysis of speech and patient-narratives in health studies at scale.

I will conclude with remarks on our plans for applying SpHeRe in our Endotrain SDC17 project, as well as on our development roadmap for closing existing analysis tool gaps.

Conclusion

Integrating speech and personal narratives can meaningfully complement sensor information by providing more depth (e.g. into symptom descriptions) or offering additional context in which to interpret sensor signals (e.g. reasons for signal interruptions).

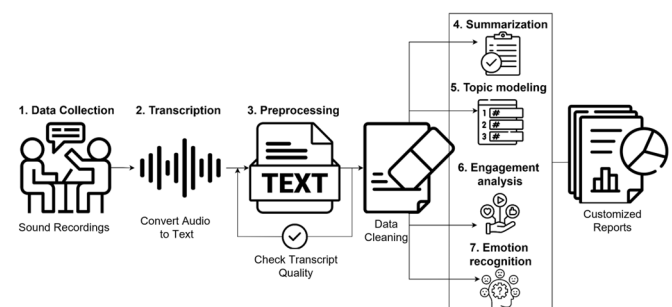


Fig. 1. Speech-to-text transcription and analysis workflow as integrated into our SpHeRe (Speech in Health) research tool.

References

- [1] Azodo I, Williams R, Sheikh A, Cresswell K. Opportunities and Challenges Surrounding the Use of Data From Wearable Sensor Devices in Health Care: Qualitative Interview Study. *J Med Internet Res*;22(10):e19542 (2022); <https://doi.org/10.2196/19542>
- [2] Daniore, P., Nittas, V., Haag, C. et al. From wearable sensor data to digital biomarker development: ten lessons learned and a framework

proposal. npj Digit. Med. 7, 161 (2024);
<https://doi.org/10.1038/s41746-024-01151-3>

- [3] Lu Z, Signer T, Sylvester R, Gonzenbach R, von Wyl V, Haag C, Implementation of Remote Activity Sensing to Support a Rehabilitation Aftercare Program: Observational Mixed Methods Study With Patients and Health Care Professionals. JMIR Mhealth Uhealth;11:e50729 (2023);
<https://doi.org/10.2196/50729>
- [4] Haag C, Steinemann N, Chiavi D, Kamm CP, Sieber C, Manjaly Z-M, et al. Blending citizen science with natural language processing and machine learning: Understanding the experience of living with multiple sclerosis. PLOS Digit Health 2(8): e0000305 (2023);
<https://doi.org/10.1371/journal.pdig.0000305>

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