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Conference Poster

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Voice Remote Monitoring System for Patients with Heart Failure (VOMOS)

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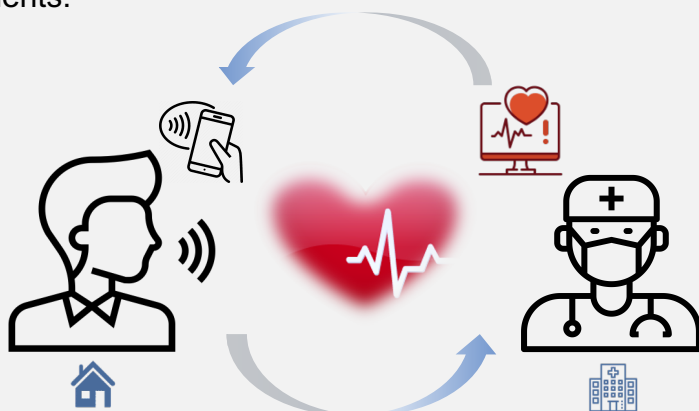
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1 Introduction

Heart Failure (HF) is a major health and economic issue worldwide, and many hospital admissions or readmissions are preventable. Current self-management programs (e.g., weight measurements), however, have not yet reduced hospital admissions due to their low predictive power and high burden. Voice might offer an opportunity to predict health status deterioration for HF patients.

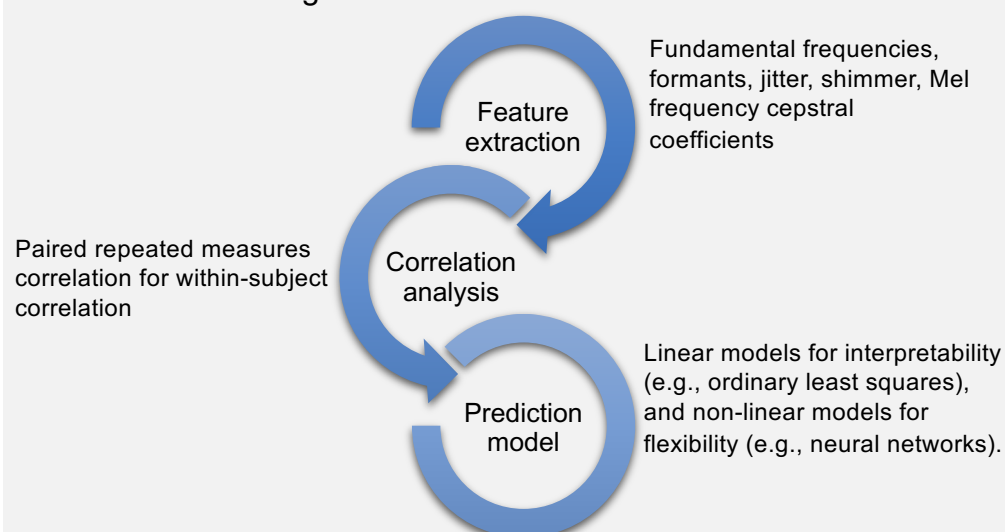
2 Research Objective

To develop and evaluate a digital prognostic vocal biomarker and propose a new monitoring modality for the self-management of HF patients.



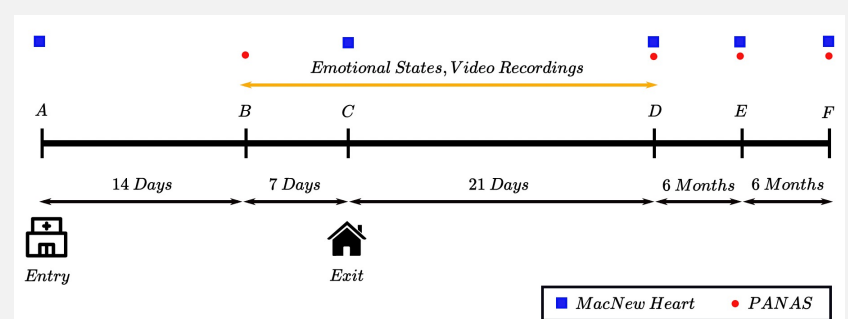
3 Methods

- From collected audio samples, extract voice characteristics with signal processing.
- Investigate the correlation between voice characteristics and health status with t-tests.
- Predict the health status using selected voice features with machine learning methods.

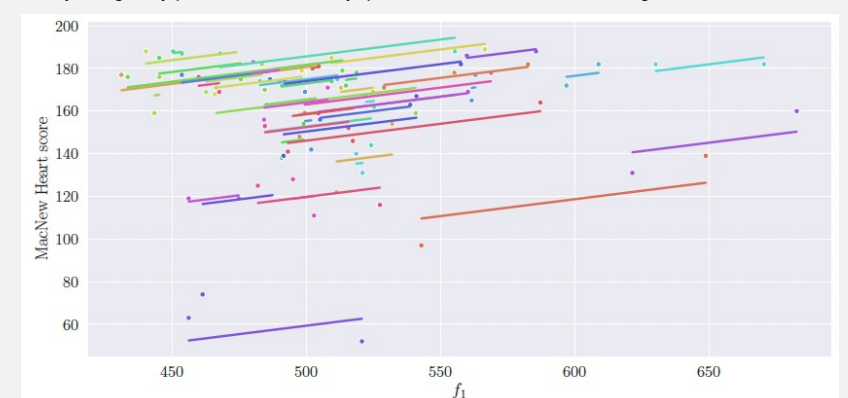


4 Results

Preliminary work shows a significant association between voice features and the health status of patients with cardiac disease.



Timeline of the CAMP study. It involves extensive questionnaire components at multiple discrete points in time and a 28-days-long diary phase with short daily questionnaires and video recordings.



Repeated measures correlation of MNH scores with voice feature formant f_1 between time C and D.

Feature	Group 1		Group 2		Group3	
	ΔX	p	ΔX	p	ΔX	p
f_1	93.674	0.001	-23.618	0.044	2.638	0.737
f_2	241.225	0.067	-33.957	0.059	13.205	0.339
f_3	295.954	0.027	-15.823	0.39	-11.757	0.369

Association between health status changes and audio feature changes. Group1 (n = 2), patients with relevant improvement in MNH score ($\Delta S > 13.5$ points). Group2 (n = 15), patients with relevant deterioration in MNH score ($\Delta S < -13.5$ points). Group 3 (n = 33), patients without relevant change in MNH score ($|\Delta S| < 13.5$ points).

Expected result: voice could work as a more effective prognostic biomarker than the current self-monitoring methods for HF patients.

5 Conclusion

Voice-based digital biomarkers acquired through mobile devices, combined with machine learning methods, might constitute a scalable and cost-efficient monitoring modality for HF patients.

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