

# Electrocardiography-Based Assessment of Cardiac Contractility

Mously D Diaw<sup>1,2</sup>, Idriss Ngomseu Tchoupe<sup>2</sup>, Stéphane Papelier<sup>1</sup>, Alexandre Durand-Salmon<sup>1</sup>, Jacques Felblinger<sup>2,3</sup>, Julien Oster<sup>2,3</sup>

<sup>1</sup>Cardibase, Banook Group, Nancy, France

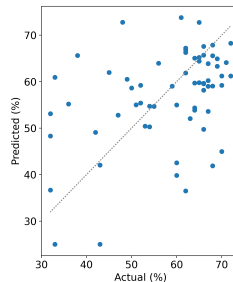
<sup>2</sup>IADI, U1254, Inserm, Université de Lorraine, Nancy, France

<sup>3</sup>CIC-IT 1433, Université de Lorraine, Inserm, CHRU de Nancy, Nancy, France

Heart failure is a major health concern that often follows left ventricular systolic dysfunction (LVSD) whose early identification could allow better disease management. Echocardiography is the primary diagnostic tool of LVSD, defined as reduced left ventricular ejection fraction (LVEF). Given the cost and practical limitations of echocardiography, our study investigates whether electrocardiography (ECG) could be used to estimate LVEF, making it a viable pre-screening test of LVSD.

ECG parameters including intervals and global electric heterogeneity (GEH) parameters were extracted for each of the 128 patients in PhysioNet's SHAREE database with matched ECG and LVEF. Since the orthogonal XYZ leads from which GEH parameters are typically derived were not available in SHAREE, we formed pseudo-orthogonal leads from the only 3 leads available:  $X \approx V5$ ,  $Y \approx III$  and  $Z \approx -V3$ . We divided the 128 subjects in half and trained different machine learning models on the first split to estimate LVEF based on the extracted ECG parameters.

The best performing ECG-based LVEF estimator, a ridge regression model, yielded a mean absolute error of 9.5%, 95% CI [8.1%, 11.3%] on the evaluation set. Our study thus suggests that the ECG could be a practical tool to gain insight on cardiac contractility, specially amongst asymptomatic individuals.



Actual versus predicted LVEF.