Prediction of Malignant Ventricular Arrhythmia across Multiple Public Databases

Wei Wei Heng*, Eileen Su Lee Ming, Ahmad Nizar B Jamaluddin, Che Fai Yeong

Universiti Teknologi Malaysia
Johor, Malaysia

Prediction of malignant ventricular arrhythmia (mVA) is essential for timely management of the patients to prevent sudden cardiac death. Based on literature review, there were mainly three research clusters on mVA prediction using ECG: prediction using CUDB, SDDB or private databases. The comparability and generalization issue arose due to the different usage of arrhythmic datasets for analysis. Very few studies attempted short term prediction of mVA using multiple databases and low prediction performance was achieved. Our study aims to improve the prediction performance involving multiple databases and to promote the algorithm comparability by performing more comprehensive comparability study and including a more complete set of data available from the public databases.

In our study, eight statistical box count features derived from phase space reconstruction on ECG were classified using maximum thresholding method, followed by performance benchmarking against the first two clusters of existing research and performance evaluation on the combined set of databases.

Box count coefficient of mean absolute deviation achieved over 90% of accuracy and over 4-minutes prediction time for all the three set of performance evaluations, which were CUDB versus PTBDB, SDDB versus NSRDB, as well as CUDB and SDDB versus PTBDB and NSRDB. It outperforms the existing work by the lower computational efforts while attaining similar performance accuracy, sensitivity and specificity.

This research has gone some way towards closing the algorithm comparability gap between different research clusters by proposing benchmarking against the two existing research clusters of mVA prediction and reporting of final performance on multiple databases. Future work might explore more prediction features on these two research clusters and inspect the performance difference. This systematic evaluation is envisaged to facilitate the translation of effective prediction algorithms from scientific research to practical implementation