TEMPORARY CARDIAC PACING TRAINING TOOL FOR CLINICIANS: ARTIFICIAL INTELLIGENCE APPROACH TO OPTIMIZE THE MANAGEMENT OF POST CARDIAC SURGICAL PATIENTS

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Objectives: Temporary cardiac pacing (TP) is a life-saving procedure used to initiate the myocardial contractions and maintain patients cardiac output following cardiac surgery. This work aims to develop an interactive training tool for the management of post cardiac surgical patient, to improve current TP patient's outcomes.

Methods: Open-source ECG signals were utilized to produce an arrhythmia classification model using Artificial Intelligence (AI) algorithms. The signals were decomposed into 8 levels using discrete wavelet transform. The R-peaks were detected as the maximum points, while the Q and S were detected as the first local minima points on either side of the R-peaks. A set of nine features were extracted and fed into a support vector machine (SVM), that classified the signals in two classes: normal sinus rhythm and arrhythmia.

Results: The SVM model that used a gaussian kernel function with a kernel scale of 0.75, achieved the best total accuracy of 92.2%. The average area under the receiver operating characteristic curve (ROC) was 0.82. Also, the confusion matrix of the model indicates a true positive rate (TPR) of 93.3%, for normal sinus rhythm and 80.5% for arrhythmia classification, respectively.

Conclusion: The presented AI methods provide a good base towards developing a clinical training tool for establishing optimum TP strategies. However, a machine learning approach cannot always represent the data accurately due to the handcrafted feature extraction. Thus, we used a convolutional neural network that can automatically extract the representative features, as well as the prediction of optimal TP parameters.