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Machine learning in cardiac electrophysiology: localization of accessory pathways in Wolff-Parkinson-White syndrome patients with 12-lead electrocardiographic analysis

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Wolff-Parkinson-White (WPW) syndrome is a rare congenital heart disease characterized by the presence of an accessory pathway (AP) between the atria and the ventricles, causing abnormal conduction of electric signals in the heart and eventually episodes of tachyarrhythmias. The treatment of choice for people with this syndrome is radiofrequency catheter ablation of the AP. The success of this procedure depends on the prior localization of the APs. The AP location influences the direction of conduction and electrocardiogram (ECG) features will vary depending on it. Therefore, the alterations observed in the 12-lead ECG pattern can be used to localize the correct sites of the AP. So far, a non-invasive accurate automated method using artificial neural networks (ANNs) to localize AP sites is not available. Therefore, the primary goals of this thesis are to create a new model for the diagnosis of AP localization in WPW syndrome and to make this model more accurate than the conventional methods and algorithms that already exist. An ANN will learn the characteristics of ECG waves for each AP site using cases of patients with a known AP location. Such method method using an automate ECG classification to accurately identify AP sites non-invasively in WPW syndrome patients will become very useful in clinical practice and can even eventually be adapted to other arrhythmia conditions of the heart.

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