

الآية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿ اِقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ * خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ * اِقْرَأْ
وَرَبُّكَ الْأَكْرَمُ * الَّذِي عَلَّمَ بِالْقَلَمِ * عَلَّمَ الْإِنْسَانَ مَا لَمْ يَعْلَمْ ﴾

Dedication

To my lovely family and wonderful mother's for her love and support, to my husband Hindi Abd AL Hafez for raising me in a way to believe that I can achieve anything in life with hard work, and dedication to my twins (Judy and Jana), and to everybody who helps me in this work .

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Abstract

Electrocardiogram (ECG) is one of the most important techniques that used for diagnosing cardiac arrhythmias. Automatic detection and classification of ECG signals is paramount since scrutinizing each and every beat is a tedious job specially when we need to record the heart's electrical activity versus time, this tediousness leads to increase the human error factor in the cardiologist decisions. In this research, have been used an accurate method of classification and differentiation of Normal and abnormal heartbeats.

1500 ECG signals were collected from MIT-BIH Arrhythmia database in Physionet bank in Physionet website. 1000 of these signals are said to be abnormal and the rest 500 signals are normal sinus rhythm ECG. These signals were processed to remove baseline wander and high frequency noise using band path filter.

The Matlab program was also developed to extract the main feature of the ECG signals during a set period of time. 10 features were extracted and divided into 2 groups : ECG features and statistical features, All the features were presented in an excel file and used in the development of the ANN. the signal has been segmented into smaller samples then detecting the R peak knowing that it is the easiest feature to detect because it's the highest peak. The rest of the features were collected easily once R peak is known. Artificial Neural Network was used in the classification step. The normal signal was given the number 1 while the abnormal sample was 0 in the construction of ANN. All these data were used in the training of ANN and the results was collected and discussed. The system successfully classified and differentiate between the normal and abnormal with accuracy 99.7%, and between atrial premature beat (APB) and paced beat (PB) with accuracy 95.1%.

الخلاصة

قياس كهربية القلب أو ما يعرف بتخطيط القلب يعد من أهم التقنيات التي تستخدم لتشخيص اضطراب ضربات القلب. فمن المهم وجود أنظمة ذكية قادرة على قراءة وتمييز إشارات رسم القلب وذلك لأن عملية تشخيص وقراءة رسم القلب عملية مملة ومرهقة خصوصا عندما يتطلب الأمر إجراء ومتابعة رسم القلب للمرضى عدة مرات خلال اليوم الواحد، هذا قد يقود إلى زيادة عامل الخطأ الشخصي مما يؤدي إلى اتخاذ قرارات خاطئة في التشخيص .

في هذا البحث تم استخدام طريقة دقيقة للتمييز والتفريق بين إشارات القلب الطبيعية وغير الطبيعية, وبين زيادة ضربات القلب ونقصان ضربات القلب.

تم تجميع 1500 إشارات رسم قلب كهربائية من موقع فيزيوننت الالكتروني , 1000 من هذه الإشارات تعتبر غير طبيعیه وباقي 500 إشارة هي عبارة عن إشارات ذات نمط طبيعي. وعولجت هذه الإشارات لإزالة التشويش والذبذبات ذات التردد العالي باستخدام تقنية مرشح ممر الموجة.

تم تطوير برنامج ماتلاب ليقوم باستخراج المميزات الأساسية لإشارة رسم القلب خلال فترة زمنية محددة, وتم استخراج 10 مميزات وقسمت إلى مجموعتان هما : مميزات قياس كهربية القلب ومميزات إحصائية. وقد تم تجميع كل هذه المميزات في ملف اكسل ليتم استخدامه في إنشاء الشبكة العصبية . وتم تقسيم الإشارة إلى عينات اصغر ومن ثم البحث عن القمة R مع العلم أنها أسهل مميزة يتم اكتشافها لأنها اعلي قمة, باقي المميزات تم تجميعها بسهولة بمجرد معرفة موقع القمة R .

واستخدمت الشبكة العصبية الاصطناعية في مرحلة التصنيف, وتم إعطاء الإشارات الطبيعية الرقم 1 والإشارات غير الطبيعية الرقم 0 في تصميم الشبكة العصبية . كل هذه المعلومات تم استخدامها لتدريب الشبكة وتم تحصيل النتائج ومناقشتها. وبلغت دقة هذا النظام 99.7% بين الإشارات الطبيعية وغير الطبيعية, و 95.1% بين زيادة ضربات القلب ونقصان ضربات القلب .

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List of Acronyms

Acronyms	Stand For
ECG	Electro Cardio Gram
ANNs	Artificial neural networks
N	Normal
PB	Paced beat
APB	Atrial premature beat
EMG	Electromyography
SNR	Signal to noise ratio
SA	Sino atrial
LBBB	Left bundle branch block
RBBB	right bundle branch block
APC	Atrial premature contractions
PVC	Premature ventricular contractions
T2FCM	Type-2 fuzzy c-means clustering
AAMI	Advancement of medical instrumentation

MLP	Multilayer perceptron
DOM	Difference operation method
RBF	Radial basis function
DWT	Discrete wave transform
MATLAB	Matrix laboratory
SVM	Support victor machine
KICA	Kernel independent component analysis
OA0	One against one
PCA	Principal component analysis
SFFS	Sequential forward floating search
KNN	k-nearest neighbor