Accepted Manuscript

Multiclass classification of myocardial infarction with convolutional and recurrent neural networks for portable ECG devices

Hin Wai Lui, King Lau Chow

PII: S2352-9148(18)30133-3

DOI: 10.1016/j.imu.2018.08.002

Reference: IMU 129

To appear in: *Informatics in Medicine Unlocked*

Received Date: 25 June 2018

Revised Date: 9 August 2018

Accepted Date: 12 August 2018

Please cite this article as: Lui HW, Chow KL, Multiclass classification of myocardial infarction with convolutional and recurrent neural networks for portable ECG devices, *Informatics in Medicine Unlocked* (2018), doi: 10.1016/j.imu.2018.08.002.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Multiclass classification of myocardial infarction with convolutional and recurrent neural networks for portable ECG devices

Hin Wai LUI[a], King Lau CHOW[a]*

[a]Interdisciplinary Programs Office, Hong Kong University of Science and Technology, Hong Kong

Abstract

Myocardial infarction (MI) is a medical emergency for which the early detection of symptoms is desirable. The prevalence of portable electrocardiogram (ECG) devices makes frequent screening for MI possible. In this study, we develop an MI classifier that combines both convolutional and recurrent neural networks, and is suitable for wearable ECG devices with only a single lead recording. It performs multiclass classification to discriminate the ECG records of MI from those of healthy individuals and patients with existing chronic heart conditions, as well as ECG records contaminated with noise. The method was tested on a database with MI ECG records and compared with a pure convolutional neural network and classifier with hand-crafted features. It was found that the addition of a recurrent layer improved the classification sensitivity by 28.0% compared to the convolutional neural network alone. Overall, it achieved 92.4% sensitivity, 97.7% specificity, a 97.2% positive predictive value, and a 94.6% F1 score.

Keywords: Myocardial infarction, Electrocardiogram, Deep learning, Convolutional neural network, Recurrent neural network, Classification

1. Introduction

Myocardial infarction (MI), more commonly known as a heart attack, is a medical emergency requiring immediate attention [1]. During an MI episode, blood flow to the heart tissues is disrupted owing to full or partial blockage of the coronary arteries. Without a full supply of oxygen and nutrients (ischemia), the heart tissues

Download English Version:

https://daneshyari.com/en/article/11028076

Download Persian Version:

https://daneshyari.com/article/11028076

Daneshyari.com