Multivariate Symbolic Aggregate Approximation for ECG Analysis

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Outline

Introduction

ECG Basics

– recorded electrical impulses of the heart

– leads, voltages, what datasets have what leads

– time series

$$\mathbf{T} = \{x_1, x_2, ..., x_n\}$$

– widely available, used as tool to diagnose heart diseases

– heart diseases are very deadly, so evaluating an ECG correctly matters

– concept of a discord in time series

ECG Basics

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the leads are I, II, II, V1-V6, aVf,...
don't forget to mention that ECGs are time series

include graph here

Automated ECG Analysis

– automated ECG analysis has become very important recently

– methods are FFT, DFT, DWT, ANN, CNN, kNN, filters, other methods

– general advantages and disadvantages

– general challenges and process

SAX and MSAX

– Symbolic Aggregate Approximation (who when)

– time series analysis, symbolic representation, mindist

– why is symbolic representation useful?

– Multivariate Symbolic Aggregate Approximation (who when)

– differences and advantages to SAX

– THESIS: using MSAX vs SAX on ECGs should increase the accuracy of discord detection

– which datasets will be used?

SAX

how sax is being normalized as a formula
what does this mean?

piecewise aggregate approximation, what does it do, plus formula
dimensionality reduction

PAA – graph example

insert graph that shows paa here

how is the discretization done?
thresholds
rationale
table

insert graph that shows sectioned thing here

bounded distance to the original graph

MSAX

how this works and differs from SAX

basically the same, we simply put them behind each other

Sectioning – graph example

graph with two leads, each with a different capitalization

MSAX for ECG Analysis

M. Konarski

Introduction

SAX

MSAX

HOTSAX

Results

Outlook

Q & A

References

Mindist for MSAX

how does this relate to SAX and does it work in the same way?

HOTSAX

why is this useful?
what makes it difficult?
brute force is a joke

what is this and how does it work?

what is this and how does it work?

Results

using SAX with HOTSAX resulted in:
using MSAX with HOTSAX resulted in:

Outlook

this still needs to be done

– perform cross validation

– try to use it with kNN

– try a different dataset (with more leads?)

Q & A

References

MSAX for ECG
Analysis

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