

# RR estimation MAE

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## I. OBJECTIVE

- 1) To update the RR estimation Mean Absolute Error (MAE) of MIMIC-II

## II. ALGORITHM USED

In Progress Report 28, the overview and initial trial to calculate the MAE for all 5 datasets have been carried out. The results were not good. In this report, several other algorithms have been received from Dr. Marco Pimentel. These algorithms were not in the RR toolbox. Since there are many algorithms for similar functions, each algorithms have been tried in order to get the best MAE, i.e. as close as possible to the reference respiratory rate.

MIMIC-II dataset have been chosen for the pilot study. In previous weeks, 32s window with 32s window step have been used. In this report, the RR has been calculated from PPG signal at 32s window each and 4-s window shift. Although, it take longer time to process, better results compared to the previously done method are expected. SQI is calculated in each 32s window. Only the data of SQI (F1) 0.9 will be used. If the data shows lower than 0.9, that window will not be taken. The SQI algorithm used, which is developed by Dr. Pimentel is *sqippg*. Instead of template matching which was used in previous reports, *sqippg* is using two different peak detectors *portabledetector* and *delineator* which must agree to each other within a default of 10s window. For PPG data 0.9 SQI, *getmodulation* will process the signals and extract iiv, iav and ifv modulation. Next, *arspecfusion* fuse the three modulations and calculate the RR.

Next is the RR from reference respiratory signal. Each 32s window of the reference respiratory signal has firstly been filtered to remove the frequencies above the respiratory frequencies. There are two algorithms used to extract RR from the reference signals; *arspec*, the auto regressive model and *ref\_cto*, a time domain method. Another algorithm; *ffitham*; RR extraction using standard FFT with a Hamming window has also been evaluated but finally *arspec* and *ref\_cto* have been chosen based on the evaluation results. If the RR extracted has a difference of 2 breath/min, the mean will be taken as the RR of the reference signal. The errors of RR from PPG and from reference signal, at each 32s window are calculated and used for MAE calculation.

As shown in Fig.1 and 2, the 25th and 75th percentile has reduced to 1.2 to 3.1 breath/min from 6.1 to 16.6 breath/min which reported in the Progress Report 28. These algorithms and methods will be applied to other datasets and will be reported soon. The other improvement that will be made is to run simultaneously to cut the processing time from SQI to RR extractions.

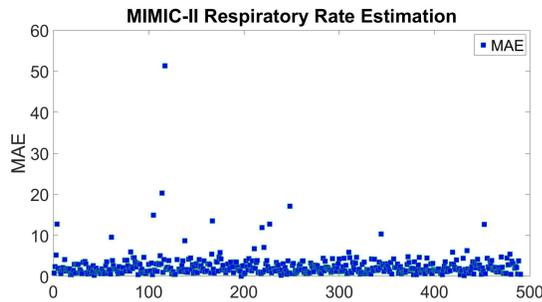


Fig. 1. MIMIC-II

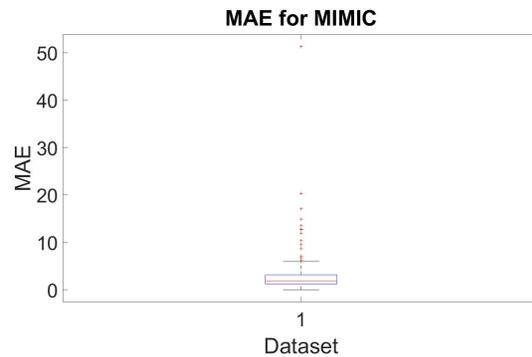


Fig. 2. MIMIC-II MAE boxplot

## III. STAR2 PROJECT

The project was delayed due to new MDS could not work on the server for some reason. Dr. David Springer has arranged the team to work with Sana mastermind with the hope it will get sorted soon, thus stuff can be uploaded to OpenMRS from Sana. However, next week, I will set up a procedure in Sana and upload it to the testdemo OpenMRS.