

# RR estimation MAE

Nazrul Anuar Nayan

## I. OBJECTIVE

- 1) To update the RR estimation Mean Absolute Error (MAE) of 3 datasets.

## II. ALGORITHM USED

In Progress Report 29, *arspecfusion* algorithm, which was developed by Dr. Marco Pimentel was used to estimate respiratory rate (RR) from the modulated PPG signals of  $>0.9$  SQIs. Two algorithms; *arspec* and *ref\_cto* were used to extract RR from reference respiratory signals. 480 patients of MIMIC-II dataset show MAE of 25<sup>th</sup> and 75<sup>th</sup> percentile as 1.2 to 3.1 breath/min. These results have been reported in Progress Report 29, but further analysis has been done to check its validity. This week, it is confirmed that these results are incorrect, where I have incorrectly inserted an additional condition for the acceptable errors (RR estimation – RR ref).

In this report, I am using *arspecfusion* for RR estimation from modulated PPG signals and *calcrefrr* for RR from reference respiratory signals. SQI is calculated for each 32s window. The processing window size for RR estimation and RR reference is 32s with 4s shift. Prior to processing the datasets, synthetic data (Z:\netshares\bspprojects9\OURR\Synthetic) have been used for verification. Figure 1 shows the MAE for all 192 data of Synthetic dataset. The histogram of the MAE is shown in Fig.2. From this result, firstly we could say that the algorithms work fine on Synthetic dataset which contain clean PPG signals. The reference respiratory signal were generated purposely to test the *calcrefrr* algorithm as Synthetic dataset only has ‘breath timing’ as the reference. Using the same procedures, the algorithms are applied to MIMIC-II, CapnoBase and Dialysis 3 datasets. The results are as shown in Table I and boxplot in Fig.3. These results need to be improved. Further study on this will be carried out soon.

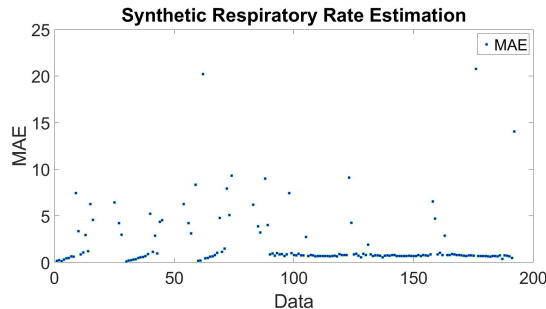


Fig. 1. Synthetic data MAE

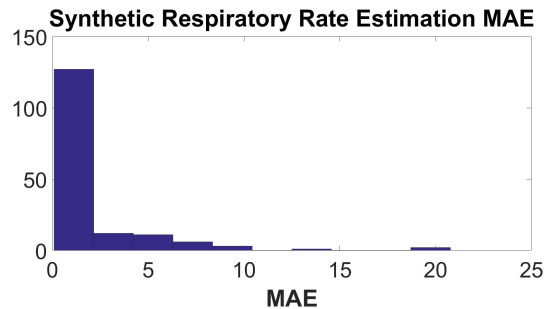


Fig. 2. Synthetic data MAE

TABLE I  
RR ESTIMATION MAE DETAILS

Dataset	25th Percentile	Median	75th Percentile
Synthetic	0.68	0.76	1.06
MIMIC-II	3.50	6.13	8.58
CapnoBase	0.61	2.40	4.40
Dialysis 3	6.70	7.19	7.72

## III. STAR2 PROJECT

I am focusing on the procedure developments and upload to demo server, ‘demo.sana.csail.mit.edu’ server, while waiting for the OpenMRS server to be ready. Procedure are set of questions for the medical assistance at the site to answer, containing information about the patients. The answers will be uploaded to the server. The procedure in Sana Mobile app is developed using Android Studio. The default procedure is ‘demonstation.xml’. The new procedure, newproc.xml is created by adding it at sana.mobile-master/app/src/main/res/raw. Then enable only ‘newproc.xml’ in app/src/main/java/org/sana/android/util/SanaUtil.java. I encountered several issues such as the sana app is not reaching ‘demo.sana.csail.mit.edu’. After changing the emulator from Nexus 5 API 23 x86 to Nexus 5 API 19. The newly developed procedure successfully uploaded to the demo server. Next to ensure it works not only on the emulator but also the device, Android Studio is connected to Samsung Galaxy Tab 2 10.1 P5100. The procedure is now can be seen using this tablet after the setting is done. The answers are also successfully uploaded to the demo server. I am now waiting for the next task which will be requested by the team.

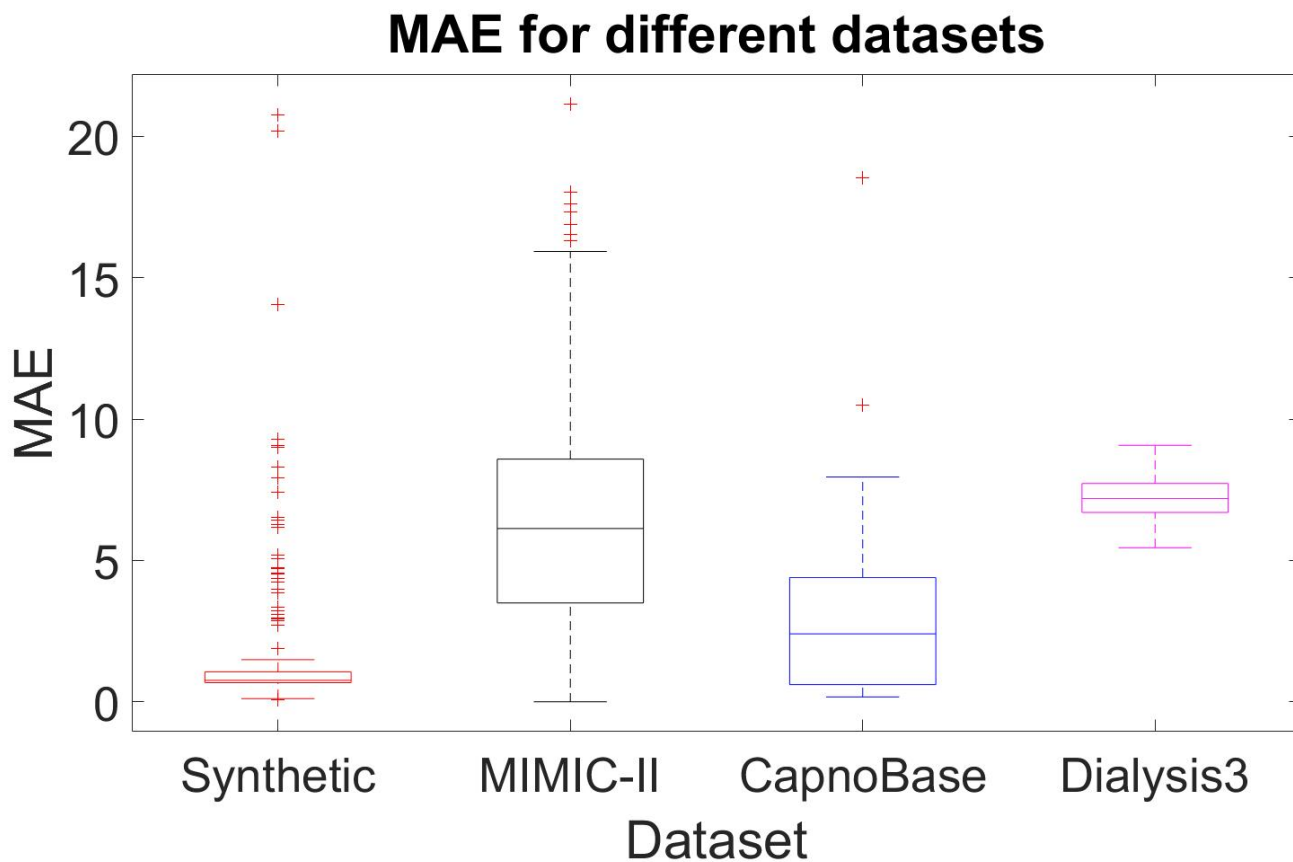


Fig. 3. Boxplot