An update on the project: ***Development of an Automatic Instrument for Schizophrenia(SZ) Diagnosis*** , for the MCIP Innovation Prize 2022.

April 2, 2023

1 Summary

The previous report presented the data acquisition and processing methods along some obtained results. Also highlighted were technical issues noticed during data acquisition and issues with ergonomics of developed software for the clinicians. The previous report also presented the next steps to be taken.

This report will highlight the challenges and next steps stated within the previous eport, then then present the progress made from the time of submission of the last report till the moment of submission of this report, more recent challenges and the next steps to be taken.

2 From February's Report

The last report presented results on some extracted features and stated some challenges the project is facing which include scheduling and mobility issues, subject attitude towards participation in exercise, cue communication and dellivery method, absence of clinician, subject feedback system, fuzzy entropy spatial complexity algoritm problems, non-uniform session times.

Also stated within the last report were the set of steps to be taken next. This steps included establishing the best pre-processing path in terms of features being more discriminable, resolving left over issues with audio cue delivery mechanism, development of hand held annotator for taking feedback from clinician and subject, developing montage analysis algorithm, improvement of data acquisition paradigm and more data acquisition.

In the next section, what has been achieved is discussed.

3 Progress

In order to establish uniform data acquisition paradigm so that processing of data can be made easier, from the already acquired data, the minumum permissible timeframe that can be met from the sessions data of all subjects was adopted for data processing and incroporated into the Generis software as the default. As stated that further data acquisition will take place, since then data has

been acquired from twenty more subjects, distributed almost equally between patients and controls.

To ensure ease of interpretation of arithmetic cues and instructions, the default time for cue delivery in the arithmetic phase of data acquisition (DAQ) has been increased by 60s and audio recordings of the cues and instructions has ben incroporated into the Generis software for all major Nigerian languages.

A handheld annotator is currently under design to take subject and clinician feedback on comfort, artifact activity and arithmetic task completion.

In trying to establish a best data processing path, certain areas of possible improvements were noted and acted on. One of such is the processing of the auditory phase signals from which the mismatch negativity (MMN) waveform is computed. Previously,the three tone classes, one standard and two deviant were plotted directly. The MMN waveform is meant to be computed as the difference between the deviants and the standard tone. This has been corrected and the results shown under section 6. Also to further smoothen the MMN waveform, a five point moving average was used and a minimum-maximum scaler was used on each waveform to make visualization easier.

Formerly, in computing the fuzzy entropy, the library used had a minimum space complexity rquirement. Electrode of cortical regions of high spatial proximity were combined to overcome this. This might lead to some information loss. This has been improved by augmenting electrode of each region with channels of gaussina noise od zero mean and a unit standard deviation. The new results are shown under section 6. Also a self developed fuzzy entropy algorithm not having this limitation, has been developed after extensive literature review on fuzzy entropy. The code is given in section 5

4 Next Steps

Over the period of four weeks, I will be doing the following

5 Appendix

6 Figures

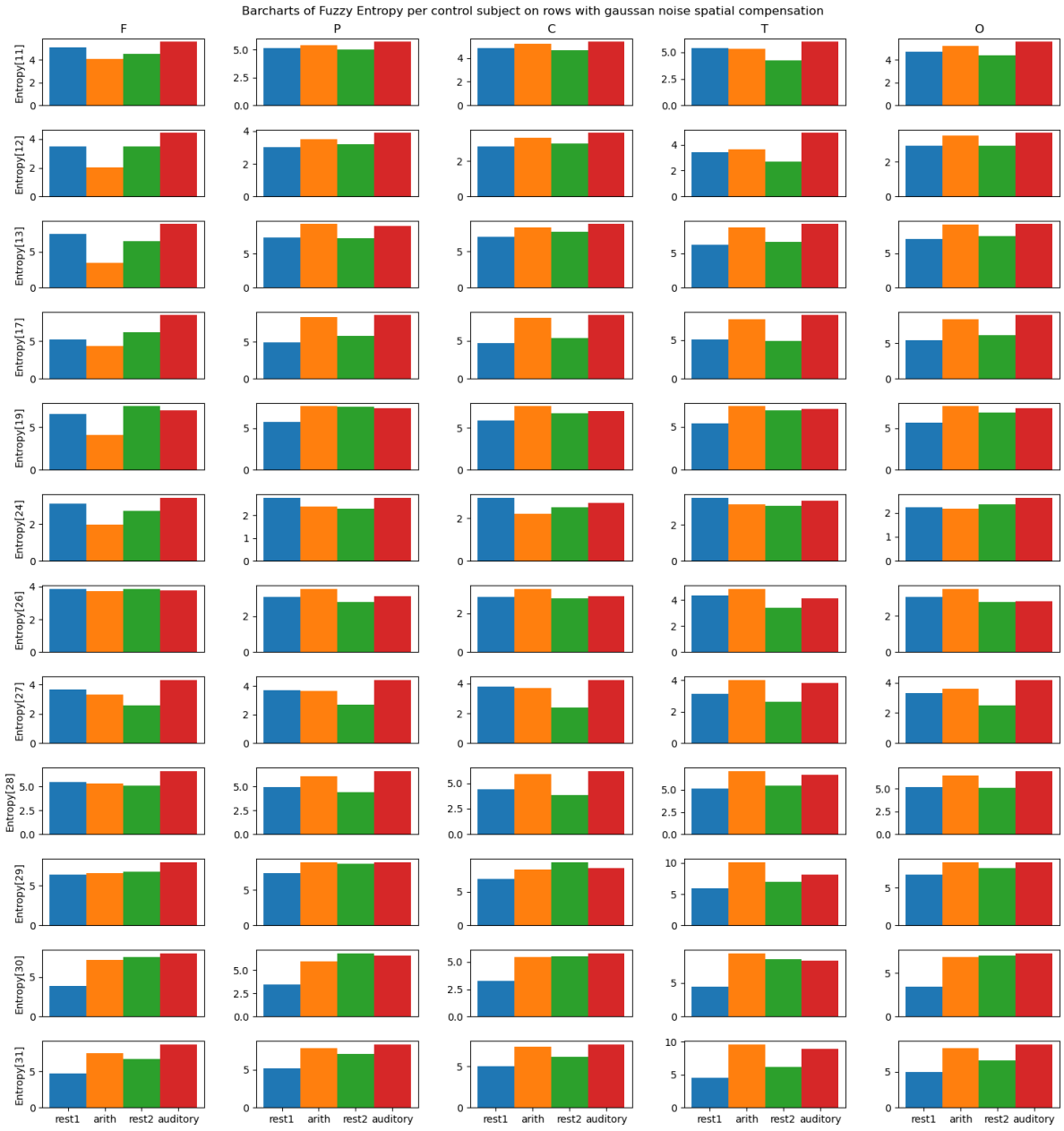

Figure 1: Fuzzy Entropy from controls

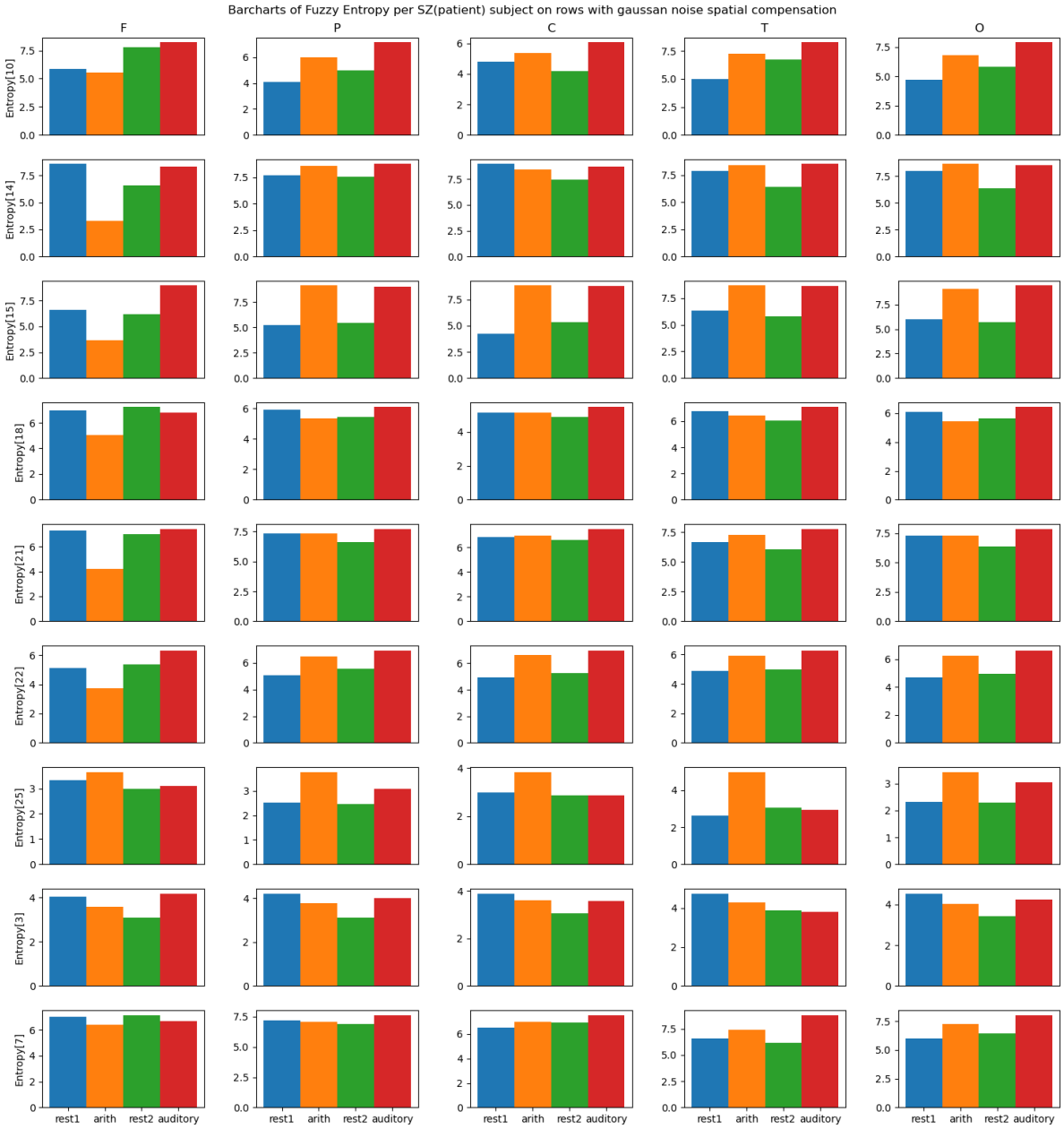

Figure 2: Fuzzy Entropy from patients

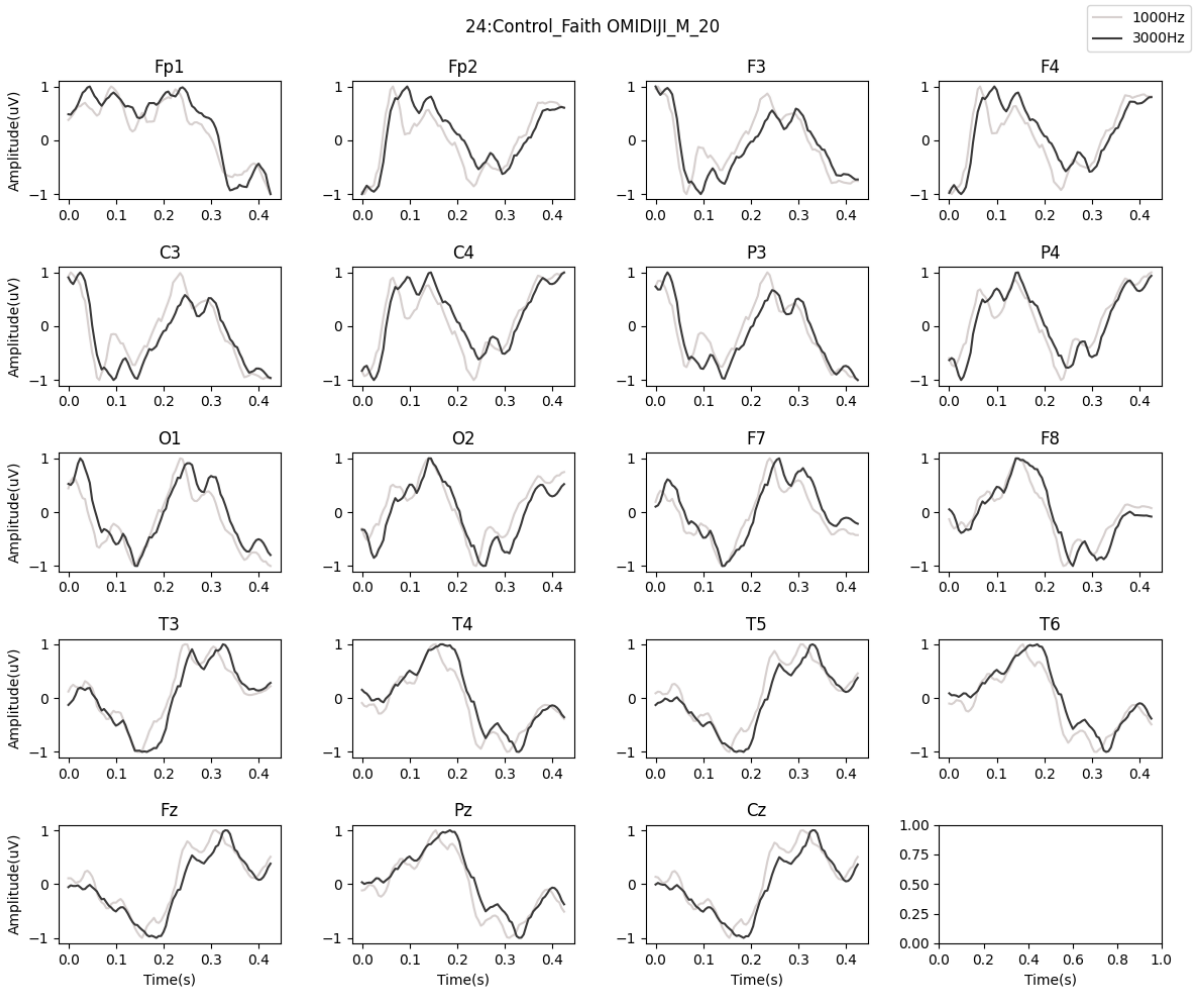

Figure 3: A control subject MMN plots

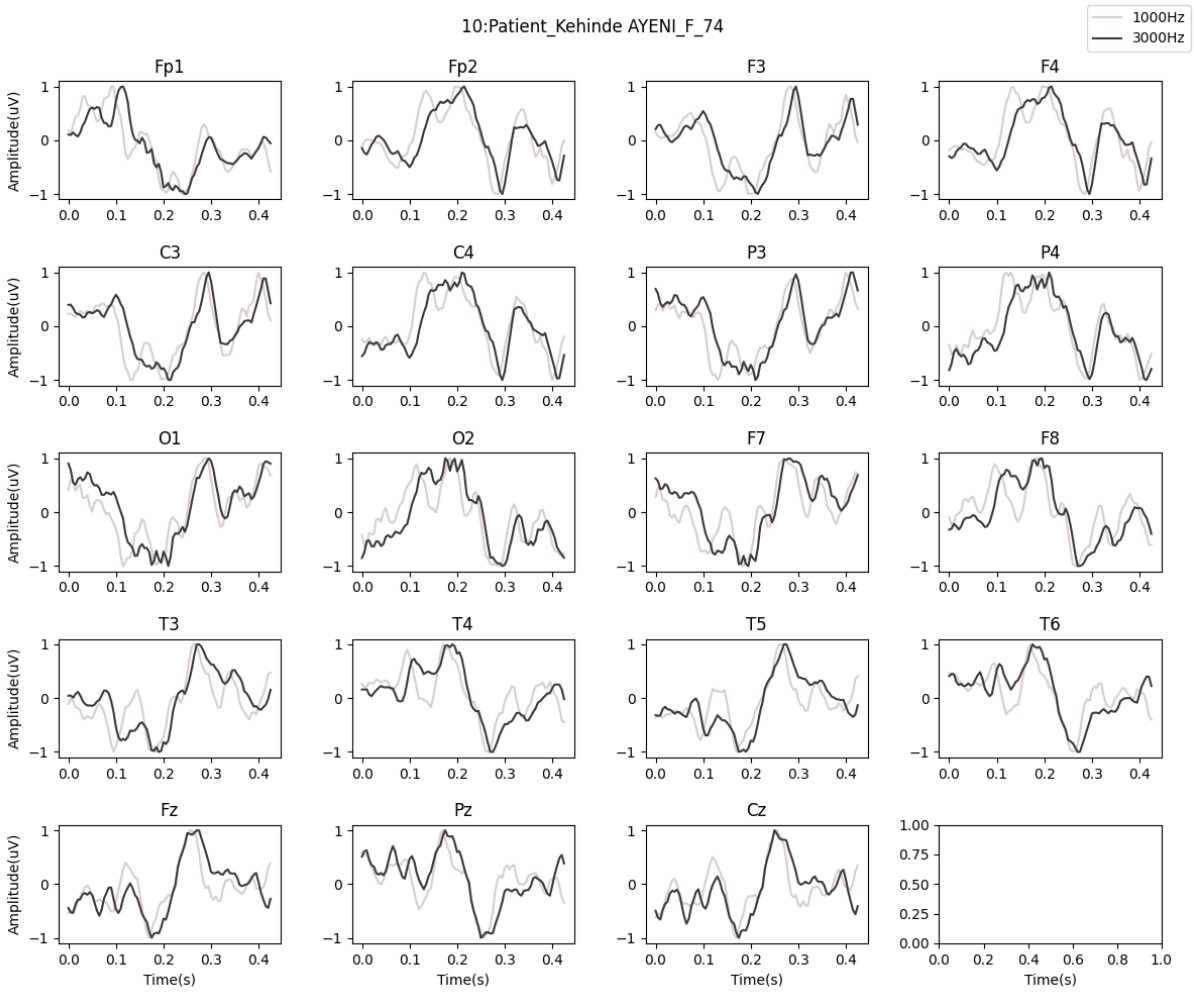

Figure 4: A schizophrenia (SZ) subject MMN plots