## Q3. Altering the parameters of the testECGGenerator1 model with summarizing its modeling method (ref: https://github.com/alphanumericslab/OSET)

This source code introduces a dynamical model for generating realistic synthetic electrocardiogram (ECG) signals based on three coupled ordinary differential equations (ODE). The parameter that users can specify in this modeling method are: signal length, sampling rate, heart rate, heart location, dipole parameters, initial phase, electrode pair locations, signal-to-noise ratio, and noise color. This data-driven modeling aims to model the electrical activity of the heart with the preservation of key physiological features. It basically generates the motion of a trajectory in a three-dimensional (3-D) state–space. The movement of this trajectory around an attracting limit cycle reflects the quasi-periodicity of the ECG, and every revolution on this circle represents one RR interval or heartbeat. Also, this motion of the trajectory reproduces interbeat variation in the ECG, yielding describing different points on the ECG, such as the P, Q, R, S, and T. Such modelings can produce QT-intervals and R-peak height variation that change linearly with the RR-intervals as has been detected in real ECG data. Besides, the mentioned coupled equation for producing synthetic multi-channel ECG is integrated numerically.

I did two distinct experiments with the following parameters (the parameters which are not mentioned were kept the same as default):

1) snr = 12, beta = 1.4, F = 0.85

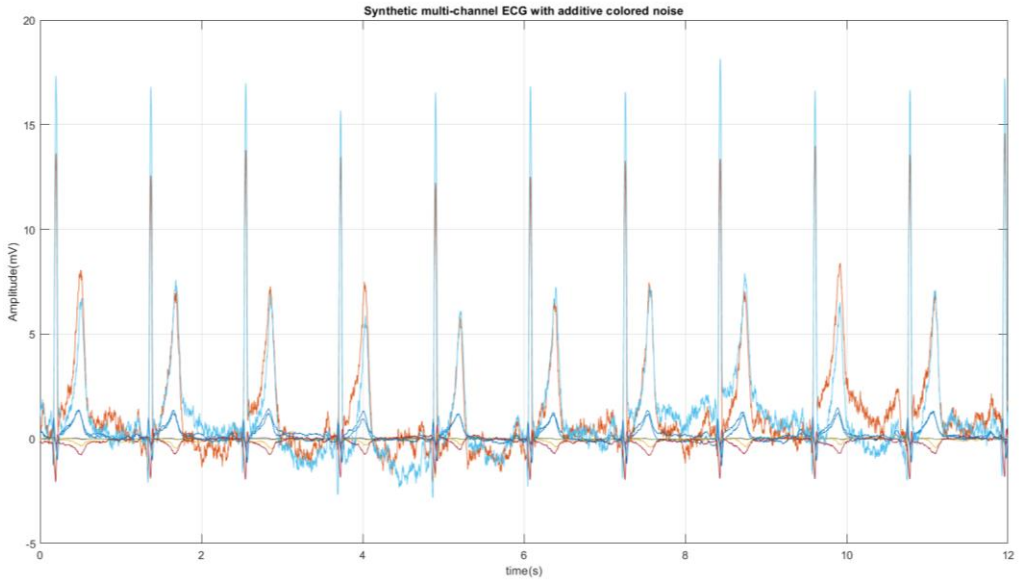


Fig 1. The output of the scripts for the set parameters.

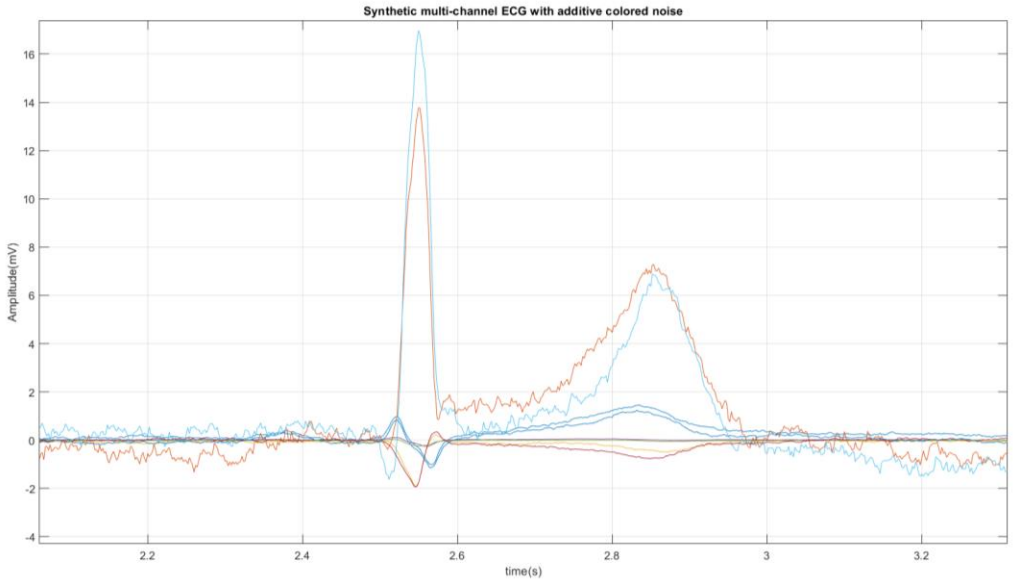


Fig 2. The 3rd beat of ECG signals with the set parameters.

2) N = 60000, fs = 400, snr = 10, beta = 1.6, F = 0.95

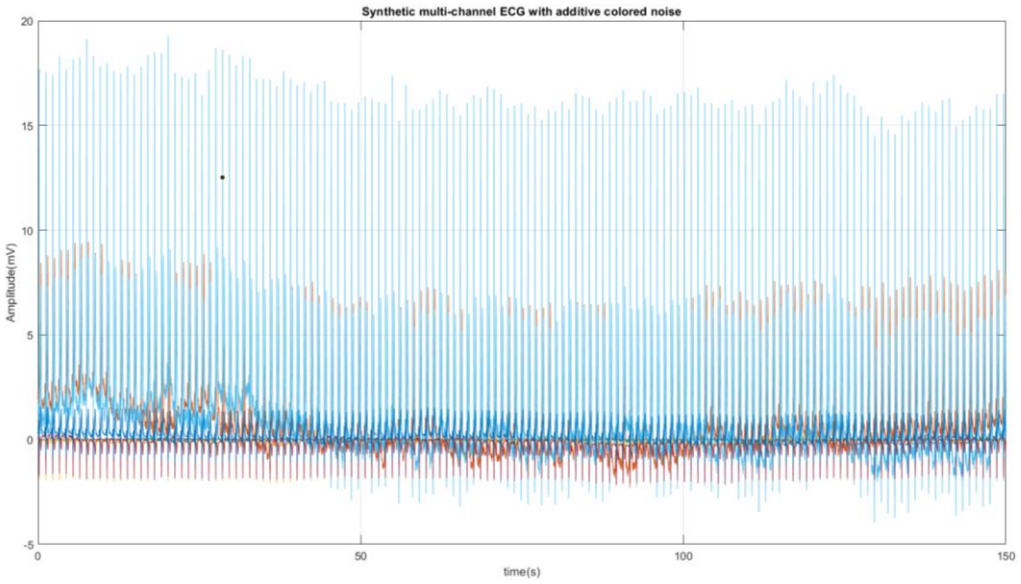


Fig 3. The output of the scripts for the set parameters.

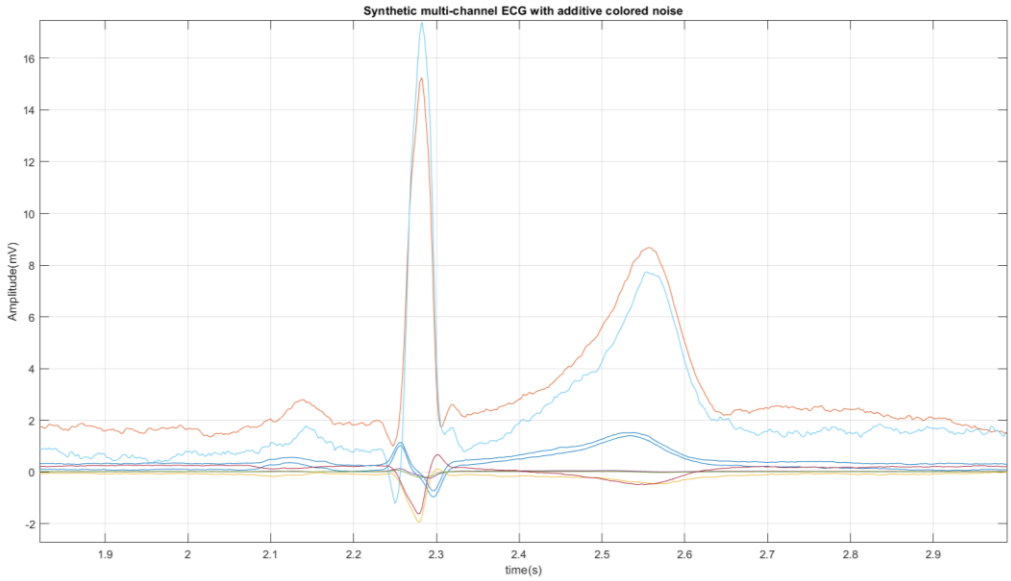


Fig 4. The 3rd beat of ECG signals with the set parameters.