1 Problem Definition

ECG (electrocardiogram) is a non-invasive test in which the electrical activity of the heart is sampled to check its condition and detect any eventual abnormality.

The sampled signal is the heart electrical activity in voltage as a function of time, i.e.: V (t) in units of ms. The sampling is done by connecting electrodes to the patient's body. These electrodes detect the small electrical changes that are a consequence of cardiac muscle depolarization followed by repolarization during each cardiac cycle (heartbeat). It is possible to learn a lot from ECGs about the structure, function, and electrical conduction system of the patient's heart. ECGs can also be used to measure heart rate, heart cell size and location, possible damage to the heart muscle or electrical conduction system and effects of heart medications or of transplanted peacemaker.

This project focuses on the ECG in a particular lifetime of women, during their pregnancy. In this case the sampled signal can be seen as a linear combination of two different signals:

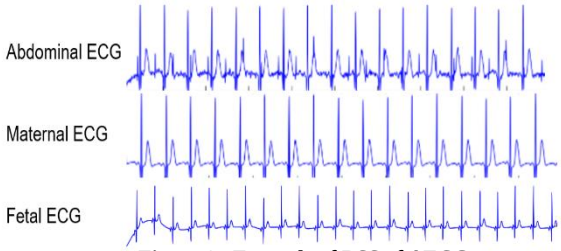

Figure 1 - Example of BSS of AECG

the maternal abdominal ECG (MECG) and the fetal ECG (FECG) with a smaller amplitude and bigger cardiac cycle.

Due to different scale and power of the signals, the FECG peaks are harder to identify from the signal but, at the same time, they play a critical role for checking the health conditions of the soon-to-be-born.

The main goal is to separate the two signals, MECG and FECG, by using an artificial neural network - computational mathematical model inspired by brain and cognitive processes that take place in a natural neural network and used as part of machine learning.

The project diagram is:

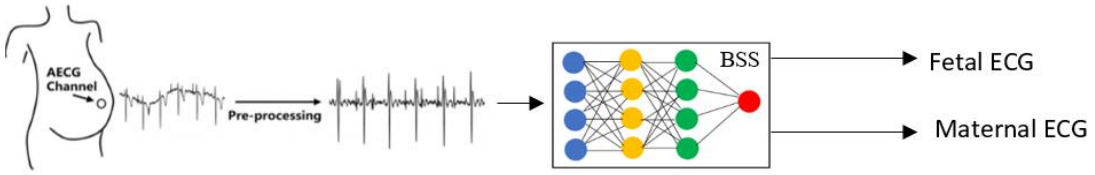

Figure 2 - Block Diagram of the project [1]

The diagram shows an AECG (Abdominal ECG) sample, which passes through preprocessing, given as the input of the neural network that it will eventually train and identify the fetus during testing.