Predicting Apneas in Preterm Infants from Physiological Time Series Data

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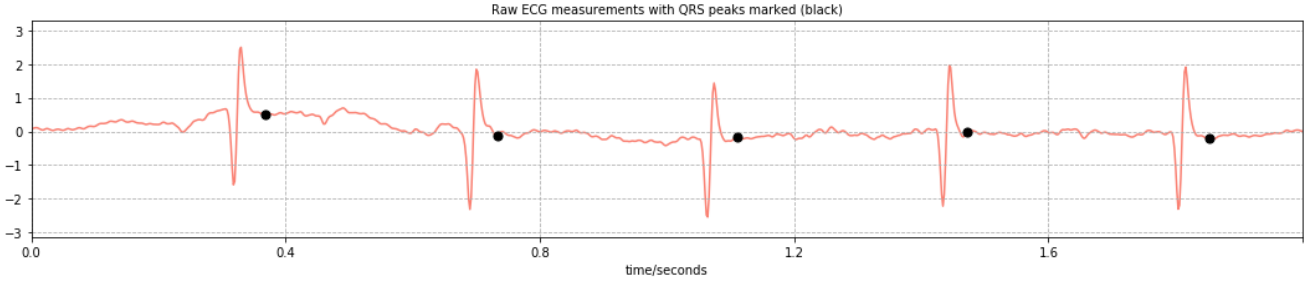
In the United States, one out of eight infants are classified as a preterm birth, in which they are born less than 37 weeks after conception. Episodes of apnea are more common in premature infants as opposed to full-term infants, and are also associated with hypoxia (lack of oxygen reaching tissues) and bradycardia (slowing of heart rate, heart rate slower than 100 BPM). Apnea of prematurity, which is one of the most common diagnoses in neonatal intensive care units (NICU), has detrimental long term effects as it increases the risk of organ damage, especially to the developing brain. Automated algorithms that accurately predict the onset of apneas in preterm infants before they occur would help prevent these effects. In this project, we use simultaneous ECG and respiration signals recorded for 20-70 hours from ten preterm infants taken from the Preterm Infant Cardiorespiratory Signals database (PICSDB) on PhysioNet (Gee *et al*.). We utilized the Python waveform-database (WFDB) package, a library of tools used to read, write, and process WFDB signals from PhysioNet. To analyze the ECG data, we used a modified Pan-Tompkins algorithm to find peaks of the QRS complex. The QRS complex is a series of voltage deflections that occurs in the ECG signal every time there is a heartbeat. By finding the time between peaks, we were able to calculate an infant's heart rate and designate when that infant was experiencing bradycardia. Our next step is to use machine learning algorithms to explore the relationship between bradycardia and the respiratory signal.



A. Gee *et al*., "Predicting Bradycardia in Preterm Infants Using Point Process Analysis of Heart Rate", *IEEE Transactions on Biomedical Engineering*, vol. 64, no.9, 2017