

# Estimating Heart Rate during Positive Airway Pressure therapy from head movements using a gyroscope



**Please join us for this fascinating talk which will be followed by light refreshments and conversation**

**Abstract** Obstructive Sleep Apnoea (OSA) is a condition where a patient's airway becomes fully or partially blocked, limiting breathing during sleep. A common method for treating OSA is Positive Airway Pressure (PAP) therapy, which applies a positive pressure into the patient's airway to prevent it from becoming blocked. A device was developed to monitor the Heart Rate of patients during PAP therapy. This device consists of a modified PAP mask that has a gyroscope attached. Using the signals from the gyroscope, heartbeats are identified from the small movements of the patient's head caused by the force of blood flowing to the patient's head, a method call Ballistocardiography. However given the low signal-to-noise ratio and the effect of motion artefacts, an accurate instantaneous heart rate could not be consistently identified. Two data fusion methods were implemented to provide a heart rate signal that is able to provide a heart rate estimation with an error of less than 5 beats per minute. This talk will discuss the methods used to achieve this level of accuracy, as well as other potential physiological variables that can be measured from the gyroscope during sleep.

**About Mark Gardner** Mark Gardner is currently in his 3rd year of his PhD in Biomedical Engineering at Flinders University. His PhD is a collaboration project with ResMed and is on developing methods to monitor heart rate during PAP therapy. Mark graduated from UNSW in 2013 with a combined Bachelor of Engineering in Mechatronics and a Masters in Biomedical Engineering. He then completed a 6 month internship in Zurich, Switzerland with Sensirion, developing and testing temperature, humidity and gas sensor solutions. He is currently back in Sydney to present at the IEEE life sciences conference. His research interests include physiological sensors, wearable devices, and heart rate and heart rate variability monitoring.