**CLASSIFICATION MODEL TO DETECT PRIMARY HEADACHE USING QUANTIFIED SELF DATA FROM WRIST-WORN WEARABLE DEVICES***Anne Hoelgaard, Andreas Lauridsen, Jacob Ponsaing\*, Erik Smedegaard\*\****Group 18gr7403**

**Introduction:** Primary headache is a health problem that affects more than 50% of people annually. Migraine costs in Denmark alone are estimated to be 1.21 billion Danish kroner [1]. Headaches have individuals causes, but common denominators are dehydration, sleep habits and activity level [2]. Over the last years, migraine hospitalisation has increased [1]. State of the art within treatment is medication, which leaves out patients who aren’t going to the doctor. Quantified Self (QS) is using personal data to improve quality of life. The aim of this study is to develop and evaluate using a classification model with QS to detect primary headache.

**Methods and Material:** Three subjects ages 24 and 25 were included in the study. Heart rate, steps, sleep time was used from the Fitbit devices. The subjects were instructed to wear the device at all times, record fluid consumptions and headache details. With the fluid intake, a model to simulate the fluid volume in the body was developed. Because the timeframe of headache precursors is not known, delay features between 5 and 300 minutes were created. The imbalance in data was adjusted for by using a random forest and a RUSBoost tree ensemble classifier. The model is developed at an intrapersonal level. Feature selection is performed with principal component analysis (PCA). The classification was evaluated by five-fold cross validation and hold-out with one day per week removed for final testing.

**Results:** The results show that a model with RUSBoost or random forest as classifiers gives a balanced accuracy mean at 49.2% (±10.6) for detecting primary headache. The mean sensitivity and specificity were 9.8% (±14.4) and 49.2% (±16.7).

**Discussion:** The results clearly present an overfitting issue. This might have been because the unbalanced distribution of headache and non-headache, even when using RUSBoost, random forest and PCA. Additionally, low correlation between recorded data and indicators of headache. As expected, amount of sleep and the fluidmodel had a high predictor importance, however heart rate and number of steps didn't show any significant importance, in accord with the literature [2]. This study shows minimal potential for detecting headache from QS obtained data.

**References**[1] Statens institut for folkesundhed, Sundhedsstyrelsen. Sygdomsbyrden i Danmark. 2015; 225-236.  
[2] Aminoff MJ, Greenberg DA, Simon RP. Clinical Neurology. McGraw-Hill Education. 2015; 134-159.