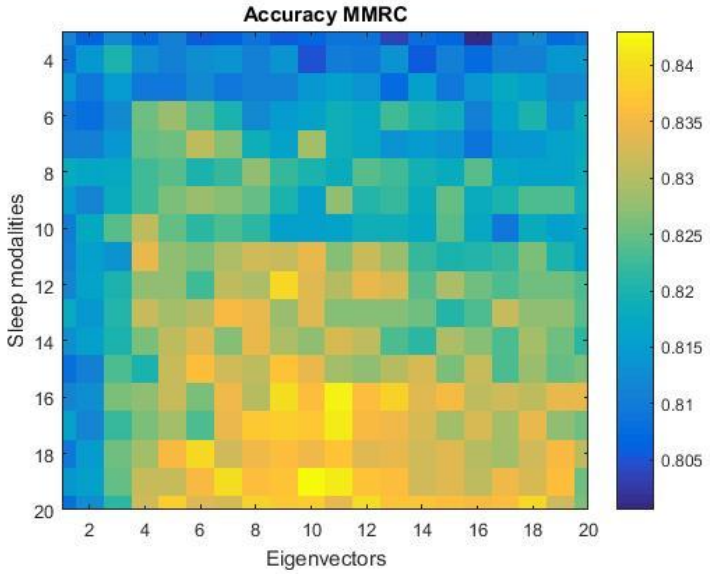

Figure 48 Accuracy matrix for predicting the patients' level of the dyspnoea given each assessed night.

7.6.4 Classification using standard features

The mean accuracy across all ten cross validation trials in classifying each night as healthy or COPD-type is 0.85 ($\mathrm{SD} = 0.06$). For the subject classification the accuracy was 0.92 ($\mathrm{SD} = 0.07$). The average accuracy across all ten cross validation trials in classifying each night as belonging to one of the four disease classes was 0.58 ($SD = 0.02$). For the subject classification the accuracy was 0.72 ($SD = 0.05$). The average accuracy across all ten cross validation trials in classifying each night as belonging to one of the five dyspnoea classes was 0.57 ($SD = 0.02$). For the subject classification the accuracy was 0.76 ($SD = 0.05$).

7.7 Discussion

Early diagnosis of a disease is probably the most valuable asset in order to prevent damages or stall the progression of the disease by effective interventions. Early stages are difficult to assess. More evidence could typically be obtained by longer observations during daily life and obtained with the smallest burden for the patients. For these reasons such observations should ideally be done by unobtrusive means preferably in a familiar environment. Although it is already possible to collect large amounts of data from a single person during a continuous period of his normal life, it is difficult to merge the data into a set of features enabling diagnosis or assistance in diagnosis. We demonstrated the usefulness of our approach by applying it to a real-world COPD patient cohort of more than 1000 patients and a subset of healthy controls showing its validity in assessing sleep in relation to the pathological condition. In particular, we have shown that by fusing multimodal information derived from a device worn exclusively during the night it is possible to differentiate normal subjects from subjects with COPD with an average accuracy of