Using Machine Learning Classification Approaches for Prediction of Obstructive Sleep Apnea from Mean Diffusivity MRI Images

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Introduction
- Obstructive sleep apnea (OSA) affects 10% of adults [1], and can increase risk of disease [2]
- Early diagnosis and treatment can lower the risk of diseases and brain damage [3]
- Current diagnosis methods are long and costly [4]
- Mean diffusivity (MD) is a promising alternative [5]

Methods
- MD images from 96 control, and 59 OSA patients
- 20-80% Test train split, 4-fold cross validation (val)
- Augmentations (deformation, noise, and affine)

The network with the best AUC was applied to the test data
- LDA had .64 AUC, and 63% accuracy, only predicted controls
- Logistic had .89 AUC and 75% accuracy on validation, .65 AUC and 63% accuracy on test, only predicted controls
- CNN had a best AUC of .84 with 83% accuracy on the val, AUC of .56 and accuracy of 63% on test, and predicted OSA and control

Models used:
1. Linear discriminant analysis (LDA)
2. Logistic regression network
3. Convolutional Neural network (CNN) based on Alzheimer’s detection [5]

Conclusion
- We show the ability for different classification approaches to be used in OSA screening
- Generalization remains a big problem with small datasets, but only CNNs didn’t predict only control
- Transfer learning approaches and increasing samples will improve results
- The need for cheaper and faster diagnosis of OSA remains, and our study shows that CNN models have promise to screen OSA from MRI