Classification between Alzheimer's disease and frontotemporal dementia using a single neuroimaging feature

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INTRODUCTION

Alzheimer Disease (AD) and Frontotemporal Dementia (FTD) are common forms of early-onset dementia with different, but partly overlapping, symptoms and brain signatures. Thus, different atrophy patterns have been described by magnetic resonance imaging (MRI) studies. In this context, there is a need to establish accurate diagnosis and to obtain good markers that could be further used for patients' prognosis. We combined supervised and unsupervised machine learning (ML) to classify AD and FTD patients and healthy controls (CTR).

METHODS

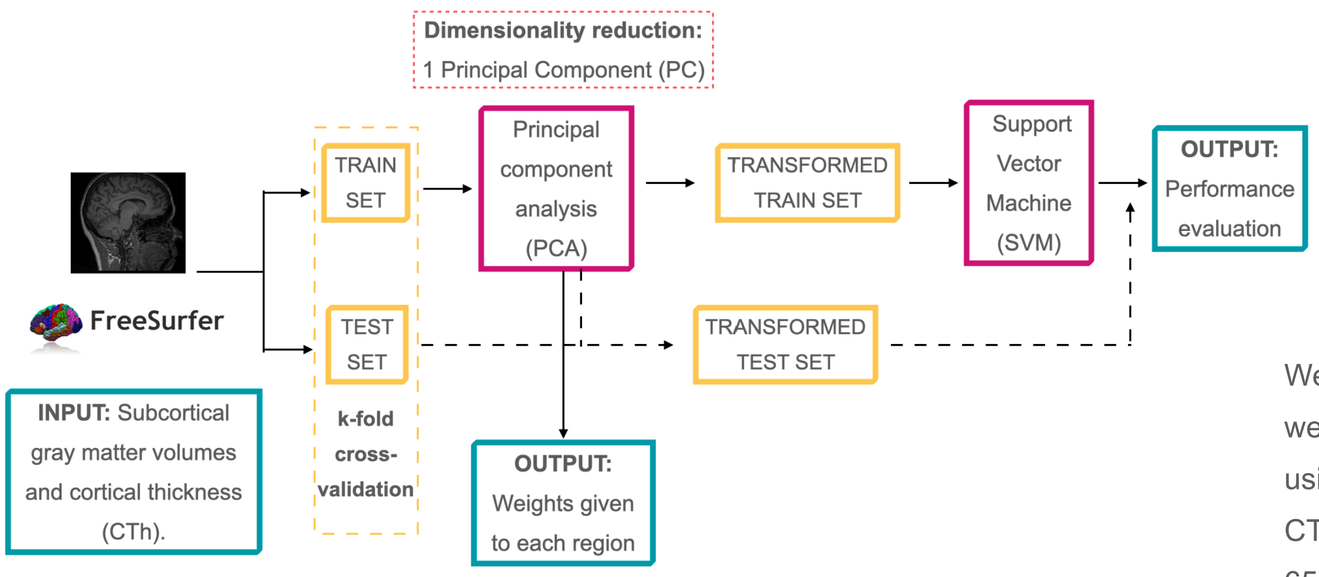

Table 1. Sample summary. There were no differences in age between groups

	CTR N=44	AD N=53	FTD N=64
Age (SD)	57.8 (5.4) years	59.4 (4.4) years	64.4 (8.8) years

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RESULTS

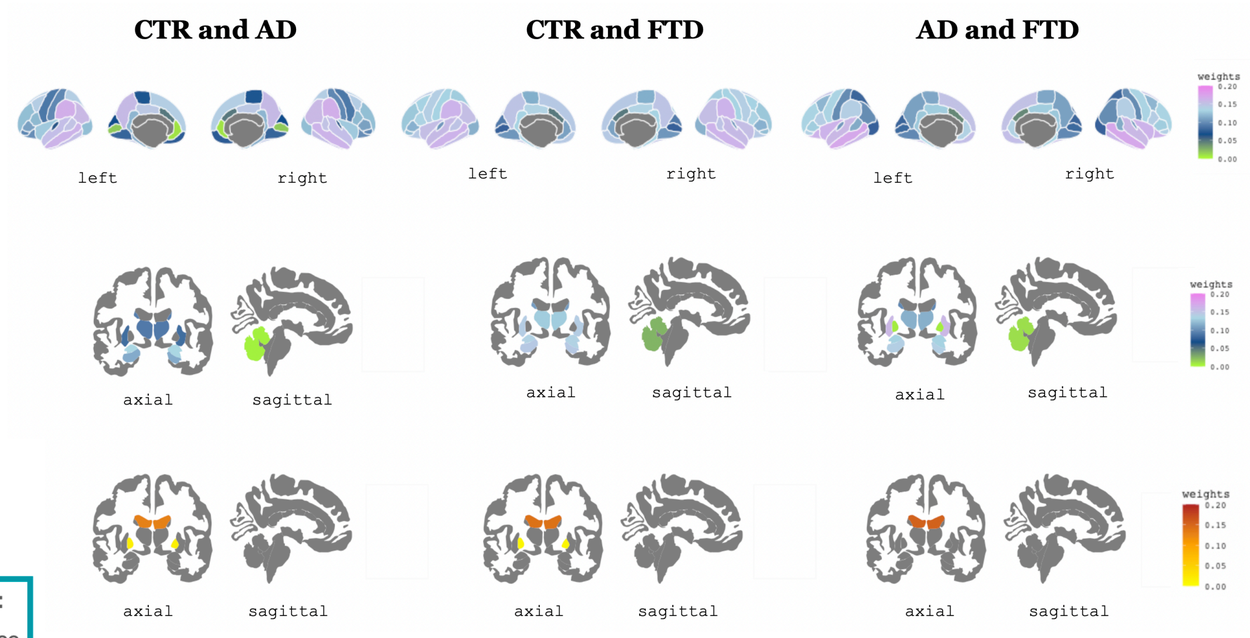

Figure 1. Subcortical and cortical patterns of the first PC's weights associated with AD and FTD. For simplicity, we considered effects to be symmetric. Cool color scale represent negatives weights and warm scales represents positive wights within the component.

We used the first PC obtained from the PCA to create disease-specific patterns with the weights of the quantified brain regions (**Figure 1**). Then, we performed a SVM algorithm using this PC as a single feature. Our algorithm had an accuracy of 85.3 ± 13.6 % in the CTR vs AD classification, 84.2 ± 15.8 % for CTR vs FTD, 67.7 ± 18.5 % for AD vs FTD and 65.8 ± 14.0 % when discriminating the 3 groups. Including age in the algorithm led to similar results.

CONCLUSIONS

By using a single feature that combines information from CTh and subcortical volumes, our algorithm is capable to classify CTR, AD and FTD with fairly good accuracy. We suggest that this approach can be used to reduce the amount of data used in ML algorithms while providing interpretable atrophy patterns. Furthermore, the algorithm helps to differentiate the two pathologies that can be confused for their diagnosis.