Differential diagnosis of Lewy body dementias using multivariate EEG classifiers

Keith J Yoder[1], Geoffrey Brookshire[1], Spencer Gerrol[1], Colin Quirk[1], John-Paul Taylor[2], Ché Lucero[1]
[1]SPARK Neuro Inc., New York, NY, USA, [2]Newcastle University, Newcastle, UK

Background

- Lewy body dementia (LBD) arises from pathology in α-synuclein and has two manifestations: Parkinson's disease dementia (PDD) and dementia with Lewy bodies (DLB).

- There is currently no non-invasive, fast, reliable method to distinguish between early-stage PDD, DLB, and Alzheimer's disease (AD)

- Combining machine-learning with resting-state EEG (rsEEG) might aid differential diagnosis of dementia
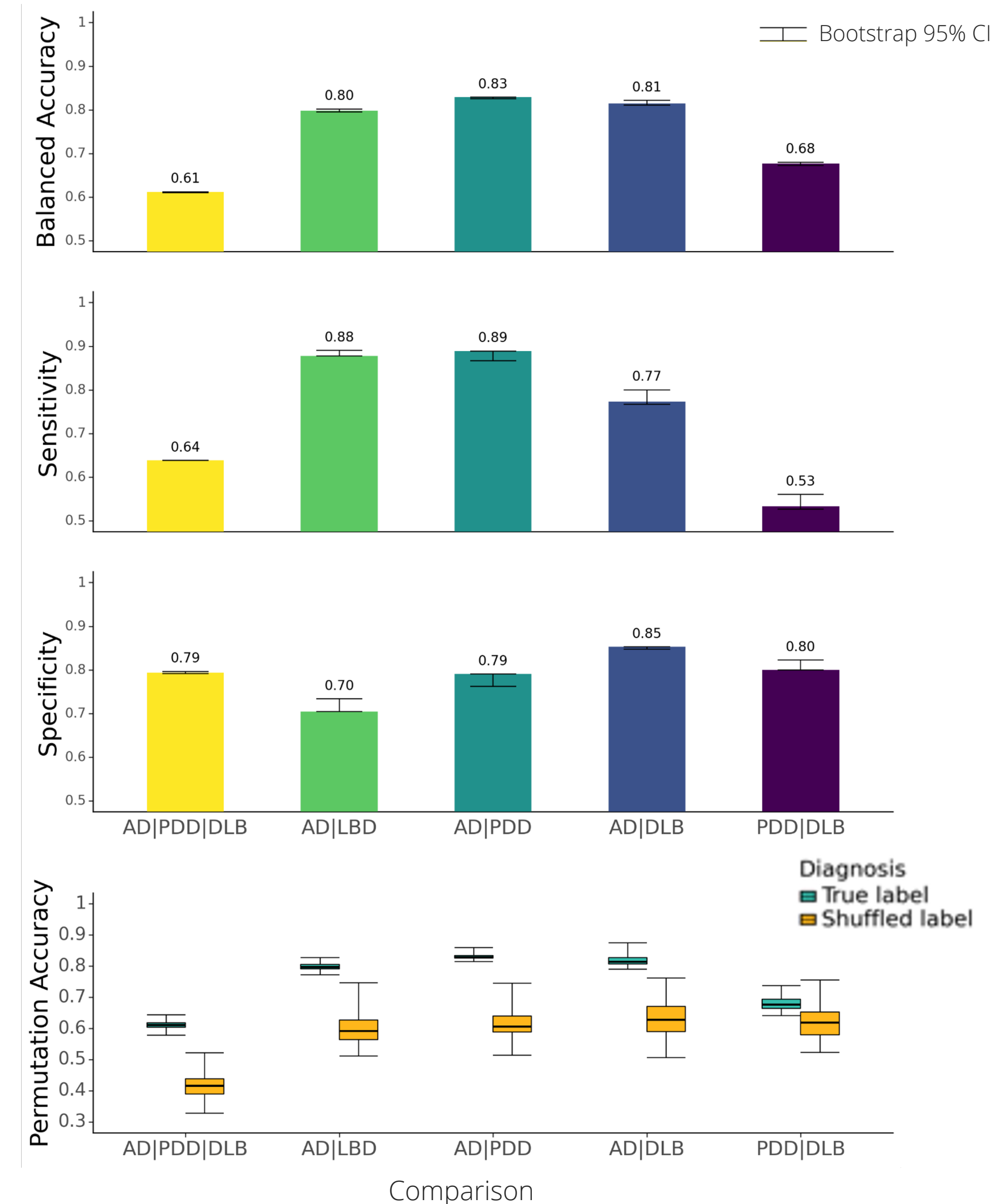
Methods

- Resting-state EEG (N=133, age 59-89)
  - 33 AD, 27 DLB, 45 PDD
- Extract two classes of features
  - FOOOF spectral features[1]
  - Fractal Dimension Distributions[2,3]
- XGBoost classifiers
  - Control vs Dementia
  - AD vs DLB vs PDD
  - AD vs DLB

Detecting Dementia
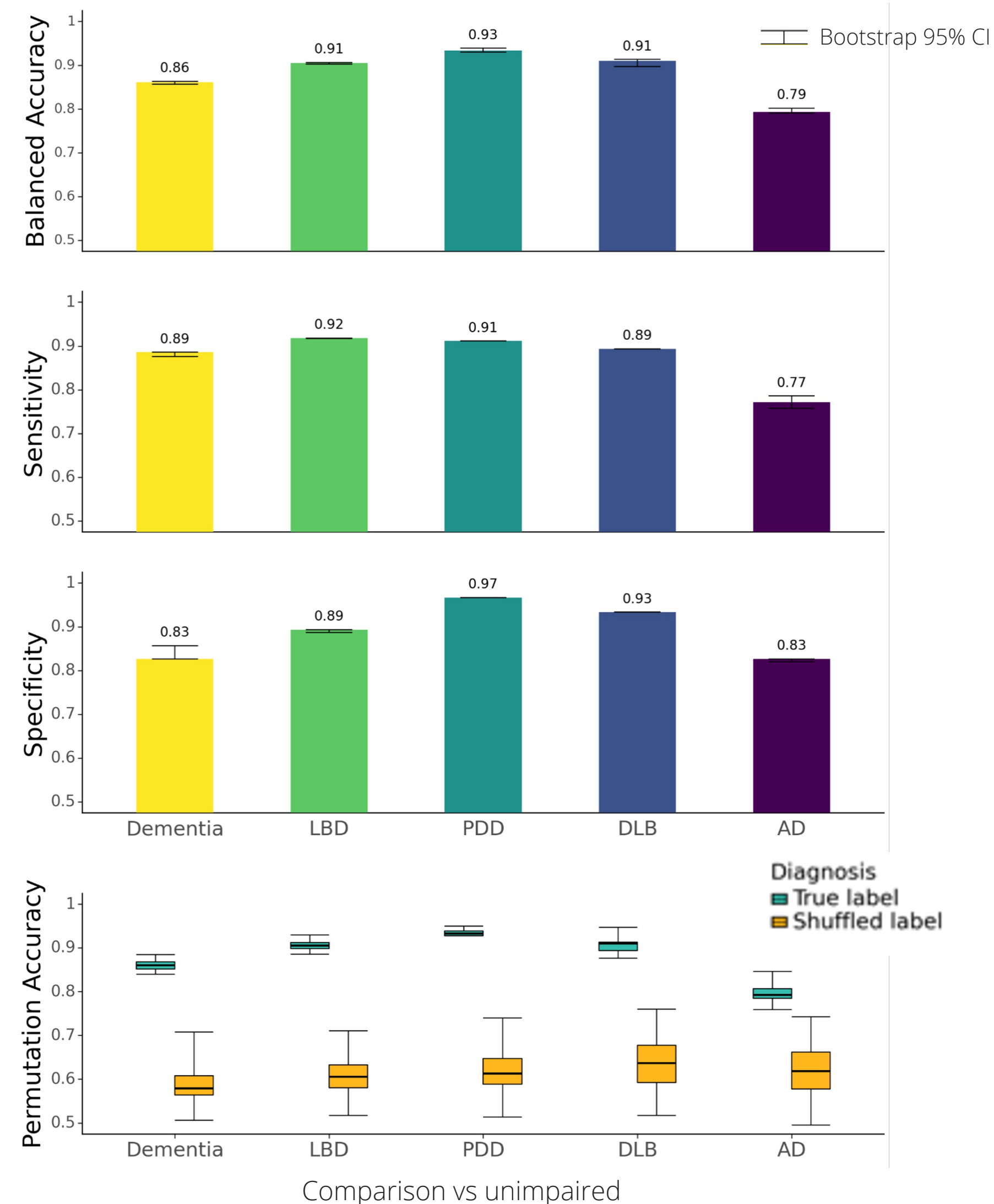
Differentiating between dementias

Conclusions

- Machine-learning can use information extracted from rsEEG to detect dementia caused by AD, PDD, or DLB.

- ML and rsEEG can also distinguish between different causes of dementia.

- This approach has the potential to identify both AD and Lewy body diseases before patients have any cognitive impairment.

References

[1] Donoghue et al. *Nature Neuroscience* 23.12 (2020)
[2] Yoder et al. (*under review*)
[3] Yoder et al. P1-510 "Identifying and differentiating dementias with EEG fractal dimension distributions"