# Classificaion fMRI trajectories

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# Classification using the High-dimensional Classifiers

- After B-spline basis expansion for each functional covariate, we consider the high-dimensional classifiers for the stacked basis coefficients matrix.

- Following 6 classifiers are considered:
  - `sparseLDA`: `sparseLDA` package
  - `Dlda`: Diagonal Linear Discriminant Analysis; `HiDimDA` package
  - `Mlda`: Maximum-uncertainty Linear Discriminant Analysis
  - `Slda`: Shrunken Linear Discriminant Analysis
  - `RFlda`: Factor-model Linear Discriminant Analysis
  - `hdda`: `HDclassif` package

# Results using the High-dimensional Classifiers

| | sparseLDA | Dlda | Mlda | Slda | RFlda | hdda |
|---|---|---|---|---|---|---|
| Accuracy | 0.531 | 0.495 | 0.499 | 0.497 | 0.490 | 0.581 |
| Sensitivity | 0.242 | 0.242 | 0.242 | 0.242 | 0.242 | 0.242 |
| Specificity | 0.714 | 0.714 | 0.714 | 0.714 | 0.714 | 0.714 |

## 문제점

- 각 covariate간 grouped하여 sparse하게 하는 것이 적절하나 이를 무시한 결과임

# High-dimensional functional LDA

- Xue, K., Yang, J., & Yao, F. (2023). Optimal linear discriminant analysis for high-dimensional functional data. *Journal of the American Statistical Association*, 1-10.
- 해당 논문에서 `matlab` 코드를 제공하나, 일부 함수들이 포함되어 있지 않아 코드 실행 불가능

| | fMRI | EEG | EEG (5-fold CV) | EEG (Original paper) |
|---|---|---|---|---|
| Accuracy | 0.514 | 0.683 | 0.740 | 0.787 |
| Sensitivity | 0.207 | 0.246 | 0.368 | - |
| Specificity | 0.739 | 0.943 | 0.957 | - |