Big Brain Benchmarks

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Website for this work including leaderboards: www.bigbrainbenchmarks.org.

Python package for download data and running all algorithms:

Direct link to download data:

3 Inference Tasks

3.1 Testing

3.1.1 Data

We use the data from [1] for testing, which is the 1000 Functional Connectome Project Data.

3.1.2 Algorithms

- t-test:
- rank-sum test:
- wilcoxon:
- Lq-test:

3.1.3 Performance Metrics

False positive and false negative rates as well as computational time.

3.2 Classification

3.2.1 Data

ABIDE [2], autistic or not.

3.2.2 Algorithms

- Linear Discriminant Analysis (LDA) ∘ embedding:
- Quadratic Discriminant Analysis (QDA) ∘ embedding:
- Support Vector Machine (SVM):
- Random Forest (RF):
- k-Nearest Neighbor:

For embeddings, we consider:

- PCA:
- Random Projections:
- Iterative Denoising Trees:

3.2.3 Performance Metrics

- Area Under Curve (AUC): Though see [3]
- Npairs:

3.3 Regression

3.3.1 Data

ABIDE [2] age.

3.3.2 Algorithms

- Ridge Regression (RR):
- Linear with Total Variation Penalty (LTV): for spatial and temporal smoothing
- Support Vector Regression (SVR):
- k-Nearest Neighbor Regression:

3.3.3 Performance Metrics

3.4 Time-Series Prediction

3.4.1 Data

3.4.2 Algorithms

- Vector Auto-Regression (VAR):
- Kalman Filter-Smoother (KFS):
- Support Vector Regression (SVR):

3.4.3 Performance Metrics

- Integrated L2 error for t time steps ahead:

3.5 Clustering

Cameron wanted some unsupervised something in here.

3.5.1 Data

NKI Test-Retest Data. We clustering time-series of each individual to parcellate the brain.

3.5.2 Algorithms

- k-means:
- Spectral Clustering:
- METIS:

3.5.3 Performance Metrics

Something like reliability, e.g.:

1. run each clustering algorithm separately on each scan
2. compute cluster similarity metric to compare each scan ($2 \times n$), where n is the number of subjects
3. rank each scan according to its ordering relative to the other scan for that individual
4. cluster performance is the sum of ranks for each algorithm

4 Results

4.1 Testing

4.2 Classification

4.3 Regression

4.4 Time-Series Prediction

4.5 Clustering

5 Discussion

References

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