Main Collaborators and Coauthors

- Stefan Klein
- Bob Duin
- Alexander Hammers
- Fedde van der Lijn
- Marleen de Bruijne
- Tom van den Heijer
- Aad van der Lugt
- Monique Breteler
- Wiro Niessen
Standard Approach

• Features
  • Hippocampus volume
  • CSF volume
  • Cortex thickness
  • ...
Standard Approach

- Features
  - Hippocampus volume
  - CSF volume
  - Cortex thickness
  - ...

- Morphological changes
Dissimilarity Approach

- Many brain structures related to dementia
- Whole-brain pairwise comparisons
- Similar anatomy implies small distance
Registration-based Dissimilarity
Registration-based Dissimilarity
Symm std log det J
Data & Classifier

• 3D MR brain data of Rotterdam Scan Study
  • 490 subjects: all healthy when scanned
  • 5 years later: 29 subjects developed clinical symptoms of dementia
  • Selected 29 age and gender matched controls that remained healthy

• NMC in dissimilarity space
Results

Error rate: 0.19

Dissimilarity matrix $D$

Decision of classifier: 

healthy  |  demented

healthy  |  demented

Leave one out estimate
Discussion

- Slight improvement over right hippocampus volume: error rate of 0.22
- Combining of classification results
- Overall error rates higher in some similar studies: prognostic vs. diagnostic
More Discussion

- Symm std log det J? Symm?
- kNN gave similar performance
- Various other simple classifiers [1NN, Fisher, regularized LDA, QDA, etc.] gave clearly worse results
- How to exploit knowledge that we are dealing with dissimilarity features?
Reference

• Klein, Loog, et al., *Early Diagnosis of Dementia Based on Intersubject Whole-Brain Dissimilarities*, International Symposium on Biomedical Imaging, 2010