

# Planned Experiments

## *Evaluation of Non-rigid Registration and Models*

R. S. Schestowitz  
*Research Student*  
Imaging Science and Biomedical Engineering  
Stopford Building  
University of Manchester  
United Kingdom

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### **Part 1: Validation of Evaluation**

- Comparing Euclidean, shuffles
  - Dataset comprises 104 brains, which have been registered in a group-wise fashion in VXL
  - Perturb the data uniformly and create a collection of perturbed image sets (repeat 10 times for better statistics)
  - The perturbed sets need to have pixel displacements which increase linearly between each given set and its predecessors
  - Apply symmetric shuffle distance with radius of size 1-5 (Euclidean and shuffles)
  - 1000 synthetic images to be generated
  - Derive Generalisability and Specificity with errors for all shuffle radii
  - Derive sensitivity
  - Repeat 5 time for all sets of perturbed images and take the averages
- Use the face data similarly. The Surrey face database contains ~60 instances.

## **Part 2: Comparison with Overlap measure**

- Use the data from IBIM again (need for labels)
  - Compare the results above with overlap
  - Bill has already produced results using different variants of his algorithm
  - Produce a series of graphs which show the correlation between model- and overlap-based evaluation
  - The plots can scale to show a variety of shuffle radii and different types of overlap measures

## **Part 3: Evaluating registration algorithms**

- Pair-wise, group-wise, and others
  - Models built automatically for 104 brains are available already
  - Consider rebuilding these with (what is currently) the improved algorithms
  - Arbitrate the choice of modes so average evaluation for a range of "number of modes", e.g. 5-20
  - Use shuffle distance with radius  $\sim 2.5$ , as before. Base this choice on the experiments in Part 1 so that the choice is justifiable.
- Possibly involve ITK (Imperial College) registration algorithms
  - Needs intensive work on porting formats and writing code
  - Can register the 104 brains using MI, NMI, CR, etc.
  - Evaluate in a way that is consistent with the above evaluations
  - Perform comparisons and draw some conclusions