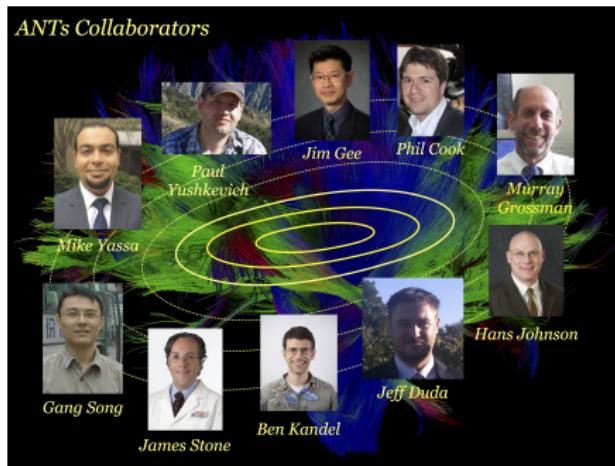


ASHS revisited — can we do better?

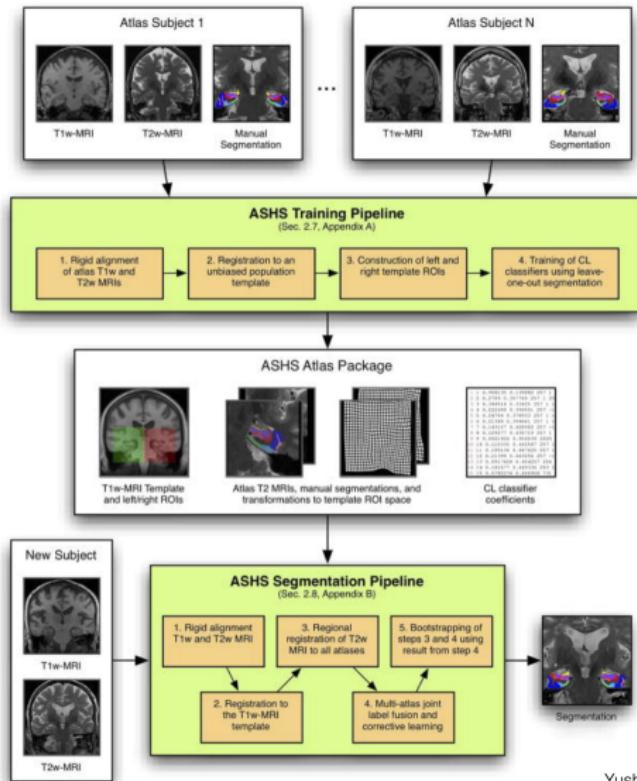
Nick Tustison and Mike Yassa

UCI



Motivation

Main components of ASHS



Training steps

1. atlas registration
2. joint label fusion
3. AdaBoost training

Segmentation steps

1. atlas registration
2. joint label fusion
3. corrective learning
4. repeat 1*, 2, 3
5. heuristics

Yushkevich et al., Human Brain Mapping, 36:258-287, 2015.

Joint Label Fusion

Modifications

- Registration
 - antsRegistration
 - B-spline SyN (“-t BSplineSyN[...]”)
 - generic label interpolation (“-n GenericLabel[Linear]”)
- jointfusion → antsJointFusion
 - non-negative least squares option (vs. SVD)
 - joint intensity fusion
 - multi-threaded
 - memory issues

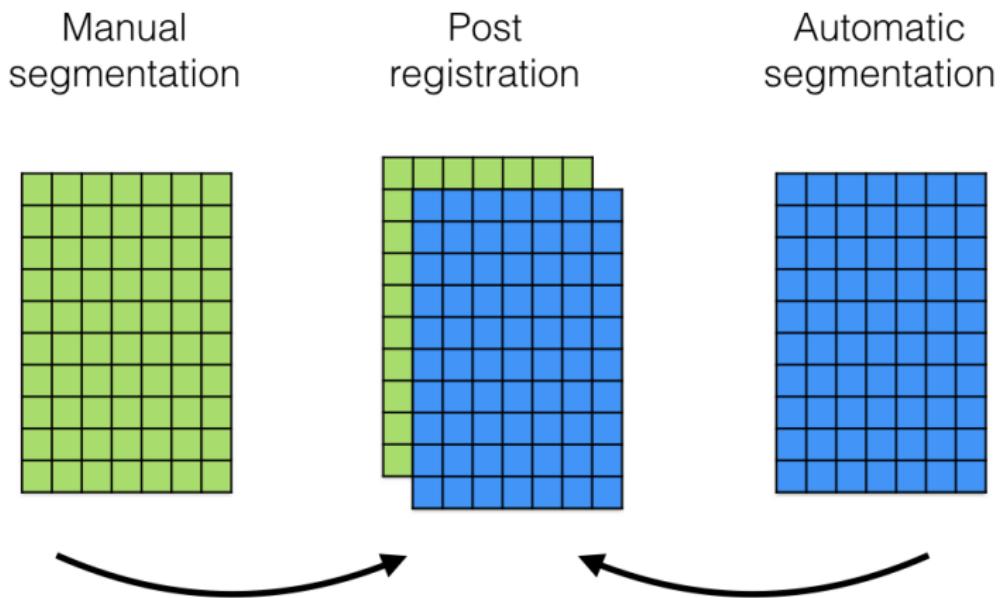
Corrective learning

Modifications

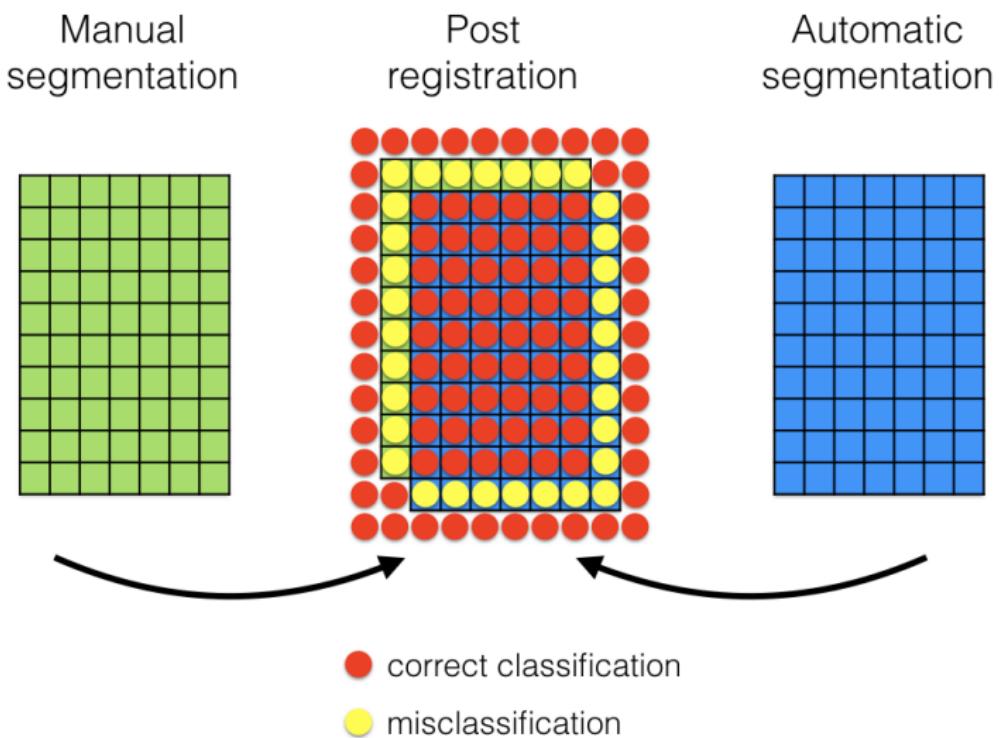
- ANTsR implementation
 - open-source
 - easy to change machine learning techniques
- machine learning technique
 - AdaBoost (original ASHS)
 - random forests
 - extreme gradient boosting
- prior knowledge
 - two classes (original ASHS)
 - four classes

Machine learning technique

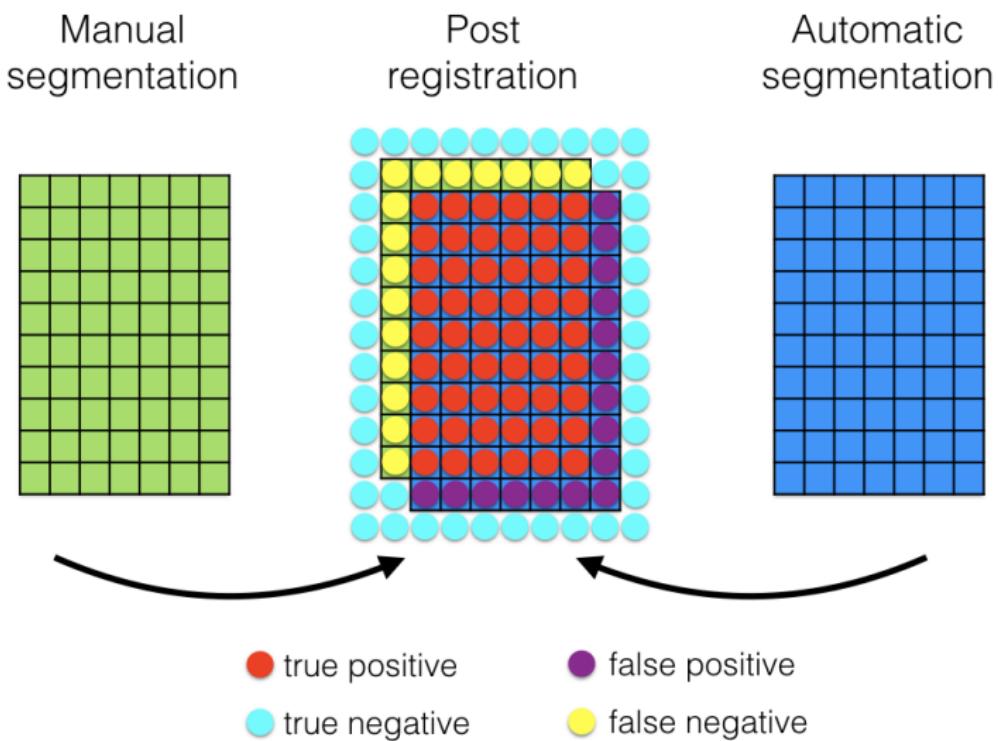
Incorporate additional prior knowledge



Two-class AdaBoost



Four-class Random Forest or Extreme Gradient Boosting



Results: Penn Data

Results: UCI Data