

## EM segmentation pipeline

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### Atlas construction phase:

- Chose one subject from the dataset as the *target* image;
- Using the Slicer3 module to perform *histogram matching* from all other subjects to the target;
- Affine register all subjects to the target using flirt;
- Manually skull strip the target;
- Apply the brain mask to all subjects to obtain brain matter;
- Perform *bias correction* on the brain matters using the binary within ITK Insight Applications.
- Affine register the brain matters of all subjects to that of the target using flirt, and save the transform as .mat;
- Subsequently, using *Diffeomorphic Demons registration* to register all subjects to the target and save the deformation field as .mha;
- Inverse the skull mask to obtain skull matter for all subjects;
- Apply the above obtained affine transformations and Demons deformations to deform their corresponding skull matter;
- Combine the brain matter and skull matter for each subject to obtain co-aligned brain images;
- Average the co-aligned images to generate the atlas;
- Apply *KMS* segmentation on all subjects, followed by manually correction of the segmentations;
- Collect all the segmentation results to generate tissue maps and the ECC masks.

### EM segmentation phase:

- Using the image of each subject as the target and the atlas as the source;
- For each subject, affine register its whole head image to the whole head atlas;
- Use the aligned brain mask from atlas to skull strip the subject image;
- Affine register the brain matter in the atlas to the masked brain matter of the subject, and save the transform as .mat;
- Subsequently, using *Diffeomorphic Demons registration* to register the brain matter in the atlas to that of the subject, and save the deformations as .mha;
- Apply the above obtained affine transformation and demons deformation to the tissue maps and ECC mask;
- Perform EM segmentation using the Slicer2/Slicer3 module.