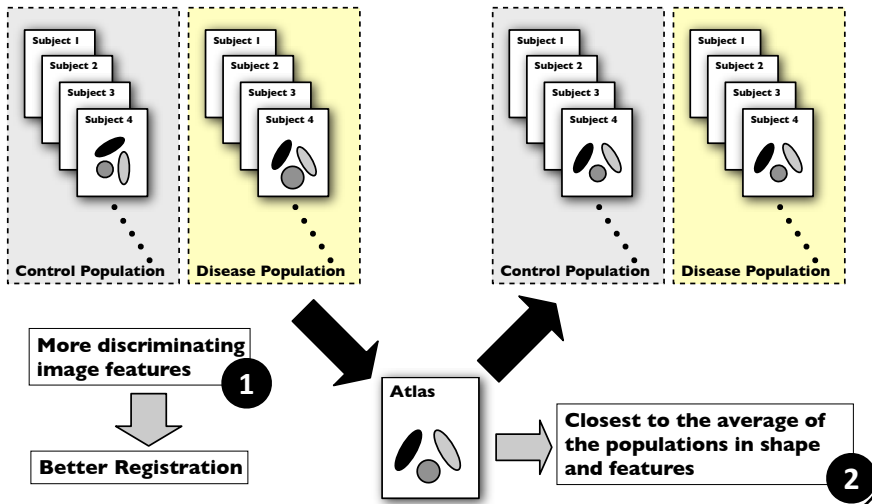# DTI ToolKit: A Spatial Normalization and Atlas Construction Toolkit Optimized for Examining White Matter Morphometry Using DTI Data.

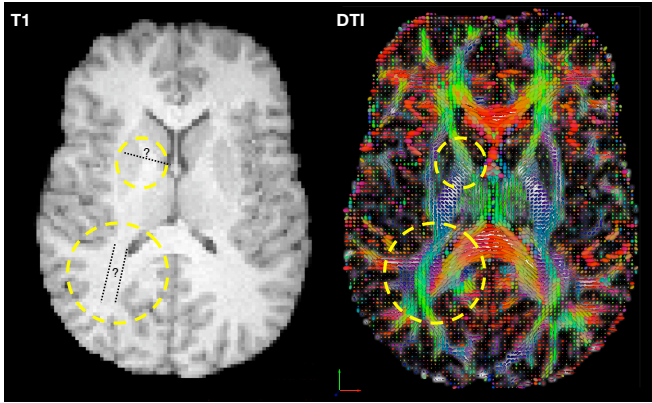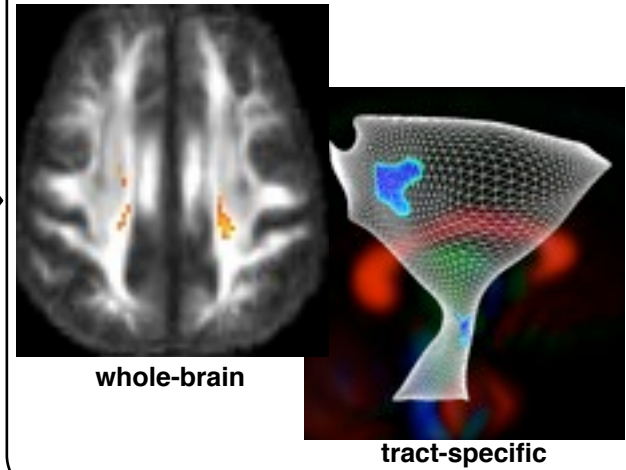*Hui Zhang, Paul A Yushkevich, and James C Gee*

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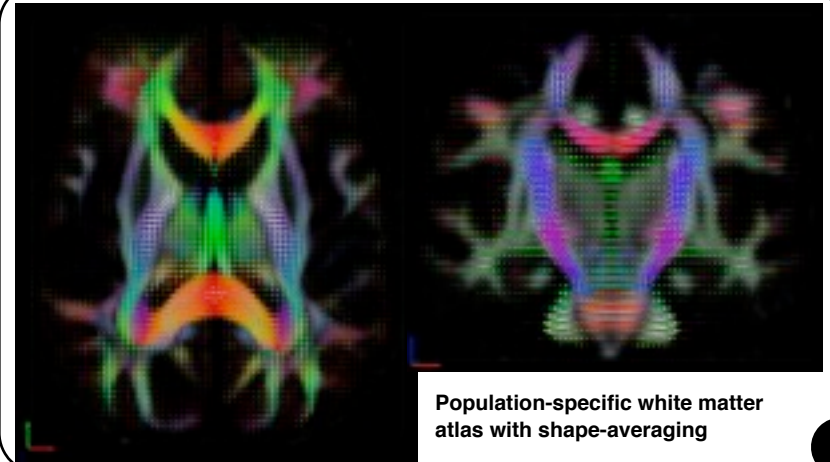## Spatial normalization and atlas construction

Control Population   **Disease Population**

More discriminating image features   ❶

Better Registration

Atlas

Closest to the average of the populations in shape and features   ❷

White matter morphometry

whole-brain

tract-specific

Tensor-based registration leverages rich discriminating features afforded by DTI   ❶

Population-specific white matter atlas with shape-averaging   ❷

Binaries for Linux and Mac OS X Available at http://www.nitrc.org/projects/dtitk

Summary of Key Features:

- Open standard-based file IO support: **NIfTI format** for scalar, vector and tensor image volumes
- Tool chains for manipulating tensor image volumes: resampling, smoothing, warping, registration and visualization
- Pipelines for **White Matter Morphometry**: spatial normalization and atlas construction for population-based studies
- Built-in **cluster-computing** support via **Sun Grid Engine**
- Interoperability with other popular DTI tools: **AFNI, Camino, FSL**
- Interoperability with ITK-SNAP to support multi-modal segmentation

Coming soon:

- Interoperability with **DTI Studio**
- **Tract-specific analysis** [4]

References:

[1] Zhang et al. Deformable registration of diffusion tensor MR images with explicit orientation optimization. *Medical Image Analysis*, 10(5): 764-785, October 2006.

[2] Zhang et al. Unbiased white matter atlas construction using diffusion tensor images. In *MICCAI*, volume 4792 of *LNCS*, pages 211-218, October 2007.

[3] Zhang et al.. High-dimensional spatial normalization of diffusion tensor images improves the detection of white matter differences in amyotrophic lateral sclerosis. *IEEE Transactions on Medical Imaging*, 26(11):1585-1597, November 2007.

[4] Yushkevich et al. Structure-specific statistical mapping of white matter tracts. *NeuroImage*, 41(2):448-461, June 2008.