

## Registration and Analysis of White Matter Group Differences with a Multi-Fiber Model

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## Highlight

Registration and analysis of multi-fascicle models improves our understanding of white matter abnormalities.

## Motivation







 $\mu_R = \langle R, T \rangle T$  Generalization of the mean

 $\lambda_1$  for a landmark in two subjects

 $R \rightarrow aR + bT$  Generalized invariance

 $m(R,S) = \sum_{x \in \Omega} \max_{\pi} \sum_{i=1}^{N} f_i g_{\pi(i)} \left\langle \log \mathbf{D}_i^R, \log \mathbf{D}_{\pi(i)}^S \right\rangle$ Pairing function of the tensors

## Results

Multi-fascicle registration is more accurate than single-tensor registration.

13 controls

32 patients with tuberous sclerosis complex (TSC)

CUSP-45 sequence (Scherrer et al, ISBI 2011)

Atlas construction (Guimond *et al.* CVIU, 2000)

Tract-based statistics in the arcuate fasciculus



based on 100 inter-subject registrations of healthy controls







Multi-Fascicle: two significant clusters of size 18 and 7

DTI: one significant cluster of size 10

Multi-fascicle models reveal more microstructural differences than DTI.