

# **Voxel-Based Group Tests of Diffusion Tensor Brain Images**

Armin Schwartzman  
Department of Biostatistics  
Harvard University, USA

Diffusion Tensor Imaging (DTI) data differ fundamentally from most brain imaging data in that values at each voxel are not scalars but 3-by-3 positive definite matrices, also called diffusion tensors (DTs). Typically, analyses of DTI data are based on scalar summaries of the DT, which do not capture all the information available in the data, especially directional information. In this talk I present several tools I have developed over the last few years for testing voxel-based differences between two groups of independent DTIs, first in terms of their principal diffusion direction, and then in terms of DT's full set of eigenvalues and full frame of eigenvectors. The test statistics in the latter case are likelihood ratio test statistics derived from a Gaussian model for symmetric matrices. The null distribution is approximated for an arbitrary covariance structure between the DTs entries. The methods are illustrated on a DTI comparison study of boys and girls.