# COMPUTING THE PROBABILITY FOR LOCAL BRAIN CONNECTIVITY

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**Abstract**

Diffusion tensor imaging is a Magnetic Resonance technique that can measure the microscopic diffusion properties of water in the brain and has been used clinically in the early detection of stroke and brain infection. Diffusion tensor data has also been used to identify the direction of white matter fiber bundles in the brain. This analysis relies on the property of nerve axons to restrict diffusion perpendicular to their direction. This can provide information on brain connectivity and is of great research and clinical interest. As its name implies, the most commonly used model to analyze diffusion tensor data relies on a tensor representation of the anisotropic diffusion for each voxel of the brain. Nerve fiber bundles are known to extend over long distances and thus a model that incorporates connectivity across voxels may provide a better fit to the data and will also provide valuable connectivity information. We supplemented the standard diffusion tensor model by introducing the connectivity information through the prior probability. Parameter estimation was performed in simulated data and in a portion of a large data set obtained from a healthy young adult. As expected, incorporating the local connectivity link in the prior changed the parameter estimation and provided us with local connectivity information that is consistent with our knowledge of the local anatomy. In the next phase of this project the local connectivity information will be used to compute the probability of connectivity and the most probable path between any two points in the brain.