

# Multimodal analysis and modeling of white matter fibers in Multiple Sclerosis based on Diffusion MRI

---

*Claudio STAMILE, supervised by Dominique SAPPEY-MARINIER and Carole FRINDEL, 2013-2016*

Diffusion tensor imaging (DTI) is a sensitive method for detecting alterations in tissue microstructure, by measuring diffusion parameters. DTI also enables to visualize the spatial organization of cerebral white matter (WM) fibers tracts by using tractography algorithms. This project aims to model the WM fibers in order to analyze spatio-temporal changes in patients with Multiple Sclerosis (MS).

To perform this analysis, several processing methods will be developed in order to: 1) Generate diffusivity parameters, 2) reconstruct WM fibers tracts, 3) extract several selected WM fibers bundles to perform both spatial and temporal analysis, along the bundle and on longitudinal acquisitions. The WM fibers analysis will also be combined with others information derived from conventional MRI modalities such as T1, T2, T2 FLAIR weighted images.

In the frame of different international collaborations, other methods such as shape analysis formalism (S-REP, University of North Carolina at Chapel Hill), lesion detection (ICOMETRIX, Leuven – TRANSACT) and classification (SVM, University of Leuven – TRANSACT) will be developed and applied in MS patients to characterize both structural and diffusivity WM fibers alterations.