Brain Image Analysis Seminars

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Advances in Diffusion MRI from the Human Connectome Project

March 14, 2018 4:00pm Wiley Conference Center, Waisman Center

Abstract: I will give an overview of the developments carried out for diffusion MRI at 3 Tesla and 7 Tesla, in the Human Connectome Project (HCP). Next, I will describe some recent work which stemmed from data or technological advances achieved under the HCP. In particular, I will discuss cortical depth dependent analysis of fiber orientations using high resolution 7T diffusion MRI. I will conclude with on-going work on Friedreich's ataxia, an autosomal recessive genetic disease, which has leveraged image acquisition acceleration techniques developed and improved under the HCP.

Brain Microstructure and Networks Mapping using Diffusion MRI

March 15, 2018 9:30am, Medical Science Center 4765

Abstract: First, I will show how sparsity can be introduced into a recent multi resolution algorithm (RubiX) to estimate white matter fiber orientations from compressed (under-sampled) diffusion MRI (dMRI) data. A sparse Bayesian algorithm combines data acquired at different spatial resolutions via a dictionary representation and priors which leverage the dependence between fiber orientations. Second, I will describe an optimization procedure for biophysical models, which relate quantities such as axonal radius and density to the dMRI data by predicting signal in the intra- and extra-axonal compartments, using variable projection and stochastic global search. Finally, I will present a new method to jointly model diffusion and functional MRI data, which enables the discovery of function-specific brain circuits and helps recover structural connections that are under-estimated by diffusion MRI.

Short Bio: Dr. Lenglet is an Assistant Professor at the Center for Magnetic Resonance Research (Department of Radiology) and a Scholar of the Institute for Translational Neuroscience (ITN). He was a 2014-2016 McKnight Land-Grant Professor. He earned a Ph.D. in Biomedical Imaging and Neuroscience from INRIA Sophia Antipolis - Méditerranée (Sophia Antipolis, France, 2006). He then joined the Imaging and Visualization Department at Siemens Corporate Research in Princeton, New Jersey as a Research Scientist. In 2008, he moved to the University of Minnesota as a Research Associate in the Department of Electrical and Computer Engineering. In 2010, he became a faculty member of the Center for Magnetic Resonance Research. Dr. Lenglet's group develops computational tools to harness the power of high-field Magnetic Resonance Imaging (MRI) for neuroscience and clinical applications. His research aims at better understanding the structural and functional alterations of brain connections in neurodegenerative disorders.