Biomedical Image Computing and Informatics Seminar

"Shallow and Deep Statistical Models for Analyzing Brain Connectivity "

Vikas Singh, PhD

Professor

Departments of Biostatistics & Computer Science

University of Wisconsin, Madison

Smillow Rubenstein Auditorium & Commons

3400 Civic Center Blvd.

Thursday, March 28, 2019 at 1pm

Pizza lunch at 12:45pm*

Abstract

The analysis of structural brain connectivity obtained via diffusion Magnetic Resonance imaging is an important step in understanding the complex processes that underlie neurodegenerative diseases such as Alzheimer's disease (AD). But in many AD focused studies, especially in early or preclinical AD, the sample sizes are small and detecting the weak disease signal is challenging. This talk will describe two potential solutions, based on our ongoing work, that are yielding promising results. In the first part of the talk, we will discuss how Multi-resolution methods, particularly Wavelets, when defined on non-Euclidean spaces such as brain connectivity graphs, give boost in statistical sensitivity while controlling false discoveries. In the second part of the talk, we will review very recent results on generalizing recurrent neural networks to manifold-valued data – this is suitable for modeling diffusion MR data where one considers the measurement at each voxel (diffusion tensor, EAP or another representation), as a manifold-valued object. It turns out that our generalizations of RNNs can reliably model brain fiber tracts with such manifold-valued data: the formulation directly provides very sensitive frameworks for case-versus -controls analysis in a preclinical AD cohort

Bio

Vikas Singh is a Professor at the University of Wisconsin Madison. His research group is focused on design and analysis of algorithms for problems in computer vision, machine learning and statistical image analysis with a focus on brain imaging, supported by various federal agencies and industry. Singh teaches classes in Computer Vision, Image analysis and Artificial Intelligence. Singh is a recipient of the NSF CAREER award.