DEPARTMENT OF COMPUTER SCIENCE

TECH 314, 713-313-1290, TEXAS SOUTHERN UNIVERSITY ·3100 CLEBURNE AVENUE ·HOUSTON TX 77004
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RESEARCH SEMINAR

A Study of Structural Connectivity within the Reading Network of Young Struggling Readers

Anna Romanowska-Pawliczek, PhD
The University of Texas Health Science Center, Houston

16:00 – 16:50, Wednesday, September 27, 2017
TECH - 335

Abstract

The magnetic resonance imaging (MRI) is a technique that facilitates examination of the human body. In my presentation, I will introduce examples of advanced MRI techniques, such as diffusion tensor imaging (DTI), applied to a brain-related research project. By employing MRI and DTI, along with specialized computational workflows, developed for this project, we attempted to decipher the neuronal connectivity of sophisticated brain networks. The goal of the project was to examine properties of brain regions associated with reading in typical and struggling readers. The triangle model of reading hypothesizes a neural network of left hemisphere basal temporal, temporoparietal, and inferior frontal regions. Word reading is mediated through both a dorsal route for phonologically mediated word reading and a ventral route for more rapid, automatic orthographic processing. A key component of the ventral route is the "word form" area, which includes the left fusiform gyrus that stores orthographic representations and allows for immediate sight recognition of words. How these components are connected in the white matter is unclear, especially in children with dyslexia. There is ample evidence for reduced connectivity of pathways mediating language and reading, but these studies have not specifically targeted the reading network. In order to examine the strength of connections between these regions, the probabilistic tractography methods were used. Structural connectivity strength was evaluated in relation to different performance measures of reading skill.

Biosketch

Dr. Anna Romanowska-Pawliczek is an imaging scientist. She holds a PhD in Biomedical Engineering, MSc in Computer Science and MSc in Biology. She has successfully worked with images obtained by confocal fluorescent microscopy, electron microscopy, magnetic resonance and diffusion tensor imaging. Dr. Romanowska-Pawliczek has participated in numerous image processing projects, such as 3D reconstruction of hippocampal glial cells, analysis of calcium channels structure, image-based classification of cast alloys microstructure, evaluation of autologous stem cell therapy for traumatic brain injury patients, and structural connectivity within the reading network of young struggling readers. Her expertise consists of design and implementation of image processing algorithms and workflows.