

**Project #13: Yijun Liu and May Wang: *Neuroimaging and Biomedical Informatics Integration for Risky Factors Analysis and Treatment of Developmental Disorders***

Currently there are proposals using transcranial magnetic stimulation (TMS) to treat autism or autism spectrum disorder (ASD). TMS needs to target specific cerebral areas or subcortical structures to be stimulated. Identifying such anatomical spots through diffusion tensor imaging (DTI)-based tractography as well functional MRI (fMRI)-based network analysis is critical to TMS intervention. Meanwhile, neuroimaging studies using both fMRI and DTI may help define biological markers of ASD or risky factors related to the development of such conditions. In this project, we will examine variations in the whole brain volumes, cortical thickness, fiber number, fiber length, fractional anisotropic, apparent diffusion coefficient and other characteristic MRI signal changes specific to ASD, and to further explore a model of phenotype imaging (based on multiple modal MRI indicators) and clinical phenotype (symptom characteristics) of ASD. The relationship between these MRI signal changes and both clinical characteristics and genetic profiles of ASD will be assessed. Finally, a prediction model of early diagnosis will be established using combined neuroimaging and biomedical informatics approaches, so as to provide reliable, objective basis for early diagnosis and treatment of ASD. The neuroimaging aspects of this project will be based on Prof. Liu's research results and experience. Prof. Wang brings to the team her extensive experience in developing professional-level bioinformatics systems, as shown by two tools, caCORRECT (chip artifact CORRECTION) and omniBiomarker, which have been certified by National Cancer Institute (NCI/NIH) cancer Biomedical Informatics Grid (caBIG) as silver-level compatible and being deployed from NCI website (<https://cabig.nci.nih.gov/tools/caCorrect/> and <https://cabig.nci.nih.gov/tools/Omnibiomarker>). She will be responsible to set up bioinformatics infrastructure (both IT infrastructure and informatics methodology) to facilitate long-term R&D of this important medical problem.