

## **Multimodal Neuroimaging Predictors for Cognitive Performance Using Structured Sparse Learning**

Jingwen Yan, Shannon L. Risacher, Sungeun Kim, Jacqueline C. Simon, Taiyong Li, Jing Wan, Hua Wang, Heng Huang, Andrew J. Saykin, Li Shen, for the Alzheimer's Disease Neuroimaging Initiative

Center for Neuroimaging, Department of Radiology and Imaging Sciences, Center for Computational Biology and Bioinformatics, Indiana University School of Medicine, IN, USA

Regression models have been widely studied to investigate whether multimodal neuroimaging measures can be used as effective biomarkers for predicting cognitive outcomes in the study of Alzheimer's Disease (AD). Most existing models overlook the interrelated structures either within neuroimaging measures or between cognitive outcomes, and thus may have limited power to yield optimal solutions. To address this issue, we propose to incorporate an L21 norm and/or a group L21 norm (G21 norm) in the regression models. Using ADNI-1 and ADNI-GO/2 data, we apply these models to examining the ability of structural MRI and AV-45 PET scans for predicting cognitive measures including ADAS and RAVLT scores. We focus our analyses on the participants with mild cognitive impairment (MCI), a prodromal stage of AD, in order to identify useful patterns for early detection. Compared with traditional linear and ridge regression methods, these new models not only demonstrate superior and more stable predictive performances, but also identify a small set of imaging markers that are biologically meaningful.