Sparse Learning and Structure Identification for Ultra-High-Dimensional Image-on-Scalar Regression

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Joint Work with Lily Wang and Huixia Judy Wang

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Motivating Example: Alzheimer’s Disease Study

Memory loss

Courtesy of http://www.mayoclinic.org

Normal AD

Alzheimer's disease

Family History

Sex

Mild Cognitive Impairment

Age

Courtesey of Wikimedia Commons

Normal AD

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Method Illustration

Covariates:
Age, Sex, Diagnosis

SNP1 ... SNPp

Statistical Modeling

Image Smoothing: Basis Approximation

G x E Study: Adaptive Group LASSO

Estimation & Inference

Diagnosis

Sex

Age
ADNI Data: Estimated Coefficient Maps

Triangulation

Intercept

MCI

AD

Age

APOE₂

MCI × rs1445493

rs1541312

APOE₁ × rs1541312

rs2131771

MCI × rs2131771

Sex × rs2131771