

# Bayesian Tensor Regression

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# Motivation

- Functional MRI (fMRI) data is received as a three- or four-dimensional array, referred to as a *tensor*
- Regression methods that utilize this data are helpful in pinpointing part of the brain associated with certain neurological disorders
- Common analysis methods include
  - ▶ Critical Regions
  - ▶ Vectorized LASSO
- Rewriting a tensor coefficient using the Tucker decomposition offers improved fit and a reduced parameter space

$$\mathbf{B} = \sum_{r_1=1}^{R_1} \cdots \sum_{r_D=1}^{R_D} \mathbf{g}_{r_1, \dots, r_D} \beta_1^{(r_1)} \circ \cdots \circ \beta_D^{(r_D)}$$

# Regression with Appropriate Regularization

- Sparse tensor coefficients benefit from models with shrinkage
- Multiway-Dirichlet Generalized Double Pareto Prior

