

data generating model:

$$Y = Cb + E\alpha + G\beta + W\eta + \varepsilon$$

C: clinical factor

$$C = (C_1, \dots, C_{q_1}), b = (b_1, \dots, b_{q_1})^T, q_1=10, b \text{ is generated from unif}(1, 2.2)$$

E: environmental factor

$$E = (E_1, \dots, E_{q_2}), \alpha = (\alpha_1, \dots, \alpha_{q_2})^T, q_2=4, \alpha \text{ is generated from unif}(1.2, 2.5)$$

G: genes

$$G = (G_1, \dots, G_P), \beta = (\beta_1, \dots, \beta_P)^T, P=100, \text{the nonzero } (\beta_1, \dots, \beta_8) \text{ is generated from unif}(1, 2.5) \text{ and other } \beta \text{ is } 0.$$

#nonzero: 8

W: GxE interactions

$$W = (G_1 \times E_1, \dots, G_1 \times E_{q_2}, \dots, G_P \times E_1, \dots, G_P \times E_{q_2}), \eta = (\eta_1, \dots, \eta_{PXq_2})^T$$

the nonzero $(\eta_1, \dots, \eta_3), \eta_8, (\eta_9, \dots, \eta_{11}), \eta_{16}, (\eta_{17}, \dots, \eta_{19}), \eta_{24}$ are generated from unif(1, 2.5) and other η is 0.

#nonzero: 12

Estimate the coefficients of β and η with marginal model:

$$Y = Cb + E\alpha + X\beta + W'\eta' + \varepsilon$$

$$X = G_j, W' = (X \times E_1, \dots, X \times E_{q_2}), \eta' = (\eta'_1, \dots, \eta'_{q_2})^T$$

Simulation Results (95% confidence interval)

n=200, p=50

Bayesian Lasso

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	6.333333	0.266667	5.266667	2.166667
sd	0.9589266	0.5208305	1.436791	1.839853

Bayesian Lasso Spike and Slab

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	4.066667	0	2.766667	0.1333333
sd	1.362891	0	1.430778	0.3457459

LAD Bayesian Lasso

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	7.3	1.1	8.533333	3.633333
sd	0.7497126	1.241523	1.357821	2.484203

LAD Bayesian Lasso spike and slab

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	5.4	0.06666667	5.4	0.4666667
sd	1.404426	0.2537081	1.588754	0.6288102

n=200, p=50 (posterior median)

Bayesian Lasso

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	8	42	12	188
sd	0	0	0	0

Bayesian Lasso Spike and Slab

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	6.8	0.7333333	5.6	0.7666667
sd	0.8866831	0.9071871	1.67332	1.222866

LAD Bayesian Lasso

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean				
sd				

LAD Bayesian Lasso spike and slab

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean				
sd				