

data generating model:

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

C: clinical factor

$C = (C_1, \dots, C_{q_1})$ ,  $b = (b_1, \dots, b_{q_1})^T$ ,  $q_1=3$ ,  $b$  is generated from unif (1, 2.2)

E: environmental factor

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

E have 2 continuous variables and 2 discrete variables.

G: genes

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

#nonzero: 8

W: GxE interactions

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

the nonzero  $\eta_1, \eta_{10}, \eta_{19}, \eta_{32}, \eta_{57}, \eta_{70}, \eta_{96}, \eta_{97}, \eta_{138}, \eta_{144}, \eta_{157}, \eta_{170}$  are generated from unif(1.8, 2.5) and other  $\eta$  is 0.

#nonzero: 12

Estimate the coefficients of  $\beta$  and  $\eta$  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

n=300, p=200, error distribution: N(0,1)

### Bayesian Lasso

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	8	12	7	41.53
sd	0	2.86	1.64	9.77

### Bayesian Lasso Spike and Slab

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	8	3	6.47	13.9
sd	0	1.46	1.83	5.46

### LAD Bayesian Lasso

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	8	8.1	5.9	17.97
sd	0	4.05	1.65	6.9

### LAD Bayesian Lasso spike and slab

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	8	37.37	10.67	181.27
sd	0	8.52	1.09	38.04