data generating model:

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

C: clinical factor
$C = (C_1, \dots, C_{q1})$, $b = (b_1, \dots, b_{q1})^T$, q1=3, b is generated from unif (1, 2.2)

E: environmental factor
$E = (E_1, \dots, E_{q2})$, $\alpha = (\alpha_1, \dots, \alpha_{q2})^T$, q1=4, α 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 β is 0.
#nonzero: 8

W: GxE interactions
$W = (G_1 \times E_1, \dots, G_1 \times E_{q2}, \dots, G_p \times E_1, \dots, G_p \times E_{q2},)$, $\eta = (\eta_1, \dots, \eta_{PXq2})^T$
the nonzero η_1, η_{10}, η_{19}, η_{32}, η_{57}, η_{70}, η_{96}, η_{97}, η_{138}, η_{144}, η_{157}, η_{170} are generated from unif(1.8, 2.5) and other η is 0.
#nonzero: 12

Estimate the coefficients of β and η with marginal model:

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

$X = G_j$, $W' = (X \times E_1, \dots, X \times E_{q2})$, $\eta' = (\eta'_1, \dots, \eta'_{q2})^T$

Simulation Results

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

Bayesian Lasso

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	8	192	12	788
sd	0	0	0	0

Bayesian Lasso Spike and Slab

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	8	3.67	6.37	13.6
sd	0	2.09	1.73	5.89

LAD Bayesian Lasso

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	8	192	12	788
sd	0	0	0	0

LAD Bayesian Lasso spike and slab

	TP(main)	FP(main)	TP(interaction)	FP(interaction)
mean	8	27.53	9.83	103.2
sd	0	7.27	1.48	19.1