

ST495/590 Assignment 7 - Solutions

- (1) *Perform thorough convergence diagnostics.*

See the R code.

- (2) *Comparison of 3 priors.*

To check which β_j ($j = 1, \dots, p$) is significant, we can check the 95% posterior credible interval for each β_j , and those intervals not covering 0 are considered as significant ones. From the table, we can see that the set of the significant positions for the uninformative prior is the largest, which contains the set using hierarchical prior as a subset; while the set of the significant positions using hierarchical prior contains the set using Bayesian LASSO as a subset.

The reason is that, compared to the uninformative normal prior, by using the hierarchical normal prior, the prior variance of β_j decreases, thus leading to smaller posterior estimates of β_j , or more shrinkage and less significance. Similarly, since the double exponential prior has more shrinkage around zero than the normal prior, the Bayesian LASSO prior would lead to more shrinkage compared to the hierarchical prior, thus less significance.

Prior	Significant β_j
Uninformative	1, 2, 5, 6, 10, 13, 14, 22, 24, 34, 37, 42, 45, 50
Hierarchical normal	1, 2, 5, 6, 10, 13, 14, 22, 24, 34, 42, 45, 50
Bayesian LASSO	1, 2, 5, 6, 10, 14, 22, 34, 42, 45, 50