Bayesian Statistics — Assignment 2
On the Bayesian Lasso

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July 4, 2024

1 LASSO regression and the Laplace prior

The[1]

- Introduce notation for linear regression;

- Explain the Lasso regularization;

- Explain why the L1 norm produces shrinkage;

- Show how the LASSO estimator is the MAP estimator when using the Laplace prior;

- Explain the conditional structure of the Laplace prior;

- Comment on possible advantages of having a full probability distribution for the parameters;

- Talk about possible disadvantages of using the Laplace prior, allude to excessive shrinkage in the experiments;

2 The Gibbs sampler

The[2]

- Explain the sampling hierarchy suggested by Park and Casella.

- Modify the hierarchy to facilitate MAP estimation;

- Discuss how one should include information about the measurement noise parameter?

- Discuss why marginalize μ in the computation and when that is and is not desirable;

- Show how to recover inferences about μ in the marginalized case.

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[1]Corresponds to items a) and b).
[2]Corresponds to items c) and d).

3 But can it actually shrink?

For[3] each scenario:

- Show table with Stan summary;

- Show trace plots of chains for all parameters;

- Show prior and posterior predictive distributions;

- Show graph with 95% confidence intervals for all parameters;

4 Choosing λ

The[4]

5 The "Huberised" LASSO

The[5]

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[3]Corresponds to item e).
[4]Corresponds to item f).
[5]Corresponds to item g).