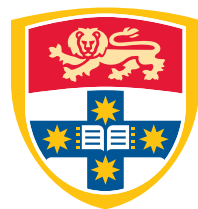


A faster and more accurate Approximate Bayesian Inference approach for bayesian lasso regression

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Mathematics and Statistics



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Statement of originality

This is to certify that to the best of my knowledge, the content of this thesis is my own work. This thesis has not been submitted for any degree or other purposes.

I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this thesis and sources have been acknowledged.

Yuhao Li

Abstract

Lasso penalized regression is a popular technique for simultaneous coefficient estimation and variable selection. Issues associated with this method include potential sensitivity of estimation and variable selection to the choice of tuning parameter, and calculating appropriate standard errors of the estimates. This paper will adopt a Bayesian approach and develop various fast Approximate Bayesian Inference (ABI) methods for this problem. ABI methods include Gaussian Variational Approximate inference, Moment Propagation, Approximate Posterior Statistic Matching, and Population Based Variational Bayes. A variety of model representations will also be considered. We compare these to much slower MCMC and frequentist methods to assess the accuracy of standard error estimates for ABI methods, as well as model selection accuracy.

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Chapter 1

Introduction

1.1 Motivation

Frequentist Bayesian

Stochastic Sampling based Deterministic Approach

Variational Approximation: an optimization based technique for approximate bayesian inference, obtain interval estimate and error variance.

1.2 Contribution

Design of a new posterior parameter correction approach based on the posterior estimate of Mean-Field Variation Bayes parameter

1.3 Thesis Organization

This paper will provide a

Chapter 2

Definition and Literature Review

2.1 Variational Inference

2.1.1 Mean Field Variational Bayes

2.2 Expectation Maximization

2.2.1 Bayesian Expectation Maximization

2.3 Markov Chain Monte Carlo(MCMC)

2.3.1 Gibbs Sampler

2.4 Bayesian Paradigm

2.5 Least Absolute Shrinkage and Selection Operator(LASSO) penalized regression

2.5.1 Lasso penalty formulation

2.5.2 Bayesian Lasso regression

2.5.3 Lasso distribution

Univariate Lasso Distribution

Multivariate Lasso Distribution

Chapter 3

Methodology

Chapter 4

Experiment Result and Analysis

Chapter 5

Conclusion

Chapter 6

Limitation and Future Work

Bibliography