zbMATH Open
THE FIRST RESOURCE FOR MATHEMATICS

Yi, Nengjun; **Ma, Shuangge**

Hierarchical shrinkage priors and model fitting for high-dimensional generalized linear models. (English) Zbl 1296.92079

Stat. Appl. Genet. Mol. Biol. 11, No. 6, Article No. 3, 23 p. (2012).

Summary: Genetic and other scientific studies routinely generate very many predictor variables, which can be naturally grouped, with predictors in the same groups being highly correlated. It is desirable to incorporate the hierarchical structure of the predictor variables into generalized linear models for simultaneous variable selection and coefficient estimation. We propose two prior distributions: hierarchical Cauchy and double-exponential distributions, on coefficients in generalized linear models. The hierarchical priors include both variable-specific and group-specific tuning parameters, thereby not only adopting different shrinkage for different coefficients and different groups but also providing a way to pool the information within groups. We fit generalized linear models with the proposed hierarchical priors by incorporating flexible expectation-maximization (EM) algorithms into the standard iteratively weighted least squares as implemented in the general statistical package R. The methods are illustrated with data from an experiment to identify genetic polymorphisms for survival of mice following infection with Listeria monocytogenes. The performance of the proposed procedures is further assessed via simulation studies. The methods are implemented in a freely available R package BhGLM (http://www.ssg.uab.edu/bhglm/).

MSC:

92B15 General biostatistics
62J12 Generalized linear models (logistic models)
62F15 Bayesian inference

Keywords:

adaptive lasso; Bayesian inference; generalized linear model; genetic polymorphisms; grouped variables; hierarchical model; high-dimensional data; shrinkage prior

Software:

BhGLM; R

Full Text: DOI

Edited by FIZ Karlsruhe, the European Mathematical Society and the Heidelberg Academy of Sciences and Humanities
© 2021 FIZ Karlsruhe GmbH