Package ‘EPGLM’

August 23, 2016

Type Package
Title Gaussian Approximation of Bayesian Binary Regression Models
Version 1.1.2
Date 2016-08-23
Author James Ridgway
Maintainer James Ridgway <james.ridgway@ensae.fr>
Description The main functions compute the expectation propagation approximation of a Bayesian probit/logit models with Gaussian prior. More information can be found in Chopin and Ridgway (2015). More models and priors should follow.
License GPL (>= 2)
Depends Rcpp, MASS
LinkingTo Rcpp, RcppArmadillo, BH
RcppModules EPprobitCxx, EPlogitCxx
NeedsCompilation yes
Repository CRAN
Date/Publication 2016-08-23 16:31:11

R topics documented:

EPGLM-package ................................................. 2
EPlogit ....................................................... 2
EPlogitCxx ................................................... 4
EPprobit ...................................................... 4
EPprobitCxx .................................................. 6

Index 7

Description

The package computes a Gaussian approximation of a Bayesian probit/logit using expectation propagation (EP). For the moment the only available prior is a Gaussian. The algorithm is based on the observation of Chopin and Ridgway [2015].

Details

Package: EPGLM
Type: Package
Version: 1.0
Date: 2016-08-23
License: GPL (>= 2)

Author(s)

Author: James Ridgway
Maintainer: James Ridgway <james.ridgway@ensae.fr>

References


Usage

EPlogit(X, Y, s)
Arguments

X  Design matrix. The matrix should include a constant column if a bias is to be considered.
Y  Response vector. The vector should take values in 0,1.
\( \sigma \) Prior variance. The prior is taken to be spherical Gaussian, the variance must therefore be specified in the form of a scalar. For default choices see Chopin and Ridgway [2015].

Details

The implementation is based on the remarks of Chopin and Ridgway (2015) and computes a Gaussian approximation to the Bayesian logit model. The approximation can serve as a very efficient estimation or as the starting point to Monte Carlo algorithms. The output value is given in the form of the parameters of the Gaussian approximation (mean and variance matrix) and an approximation to the log marginal likelihood.

Value

m  Mean of the Gaussian approximation
V  Variance matrix of the Gaussian approximation
Z  Approximated log marginal likelihood

Warning

The current implementation does not include damping or the possibility to use fractional EP (hopefully it will in a future version). This might result in poor performance for large datasets.

Note

More priors and models should be available shortly.

Author(s)

James Ridgway

References

N. Chopin and J. Ridgway. Leave Pima Indians alone: binary regression as a benchmark for Bayesian computation. arxiv:1506.08640

Examples

data(Pima.tr)
Y<-.as.matrix(as.numeric(Pima.tr[,8])-1
X<-.cbind(1,as.matrix(Pima.tr[,1:7]))
Sol<-.EPlogit(X,Y,100)
EPlogitCxx

**Description**

The function is the C++ internal function used by EPlogit

**Usage**

EPlogitCxx(...)

**Arguments**

... See arguments of EPlogit

**Value**

- \( m \): Mean of the Gaussian approximation
- \( V \): Variance matrix of the Gaussian approximation
- \( Z \): Approximated log marginal likelihood

**Note**

More priors and models should be available shortly.

**Author(s)**

James Ridgway

**References**


EPprobit

**Description**

The function computes the EP approximation of a probit regression with Gaussian prior. The user must specify the design matrix, the response vector and the prior variance. For more information on the default prior variance see Chopin and Ridgway [2015].
Usage

`EPprobit(X, Y, s)`

Arguments

- **X**: Design matrix. The matrix should include a constant column if a bias is to be considered.
- **Y**: Response vector. The vector should take values in 0,1.
- **s**: Prior variance. The prior is taken to be spherical Gaussian, the variance must therefore be specified in the form of a scalar. For default choices see Chopin and Ridgway [2015].

Details

The implementation is based on the remarks of Chopin and Ridgway (2015) and computes a Gaussian approximation to the Bayesian logit model. The approximation can serve as a very efficient estimation or as the starting point to Monte Carlo algorithms. The output value is given in the form of the parameters of the Gaussian approximation (mean and variance matrix) and an approximation to the log marginal likelihood.

Value

- **m**: Mean of the Gaussian approximation
- **V**: Variance matrix of the Gaussian approximation
- **Z**: Approximated log marginal likelihood

Note

More priors and models should be available shortly.

Author(s)

James Ridgway

References


Examples

```r
library(MASS)
data(Pima.tr)
Y<-as.matrix(as.numeric(Pima.tr[,8]))-1
X<-cbind(1,data.matrix(Pima.tr[,1:7]))
Sol<EPprobit(X,Y,100)
```
**EPprobitCxx**

C++ internal function to compute the EP approximation (use EPprobit instead).

---

**Description**

The function is the C++ internal function used by EPprobit

**Usage**

EPprobitCxx(...)

**Arguments**

... See arguments of EPprobit

**Value**

- **m** Mean of the Gaussian approximation
- **V** Variance matrix of the Gaussian approximation
- **Z** Approximated log marginal likelihood

**Note**

More prior and model should be available shortly.

**Author(s)**

James Ridgway

**References**

N. Chopin and J. Ridgway. Leave Pima Indians alone: binary regression as a benchmark for Bayesian computation. arxiv:1506.08640
Index

*Topic Bayesian Logit
  EPlogit, 2
  EPlogitCxx, 4

*Topic Bayesian Probit
  EPprobit, 4
  EPprobitCxx, 6

*Topic Bayesian binary regression, Expectation Propagation
  EPGLM-package, 2

*Topic Expectation Propagation
  EPlogit, 2
  EPlogitCxx, 4
  EPprobit, 4
  EPprobitCxx, 6