Outline: Bayesian (Generalized) Linear Models

Lona Koers

0. Abstract
1. Introduction
    - Motivation of bayesian GLMs
    - Current research and related work
    - Structure of the paper
2. Bayesian Linear Regression

    2.1 Model definition

    - Regular linear model
    - Bayesian linear model

    2.2 Prior choice

    - Uninformative priors (for β and σ^2 or just for σ^2)
    - Prior distributions for regularization
        - Motivation of regularization
        - Ridge regularization $\iff$ Gaussian prior
        - Focus: Lasso regularization $\iff$ Laplace prior (and other methodes for real variable selection)
    - Other prior distributions and use-cases (i.e. heavy-tailed priors)

    2.3 Bayesian inference with closed form priors

    - Posterior and marginal (parameter) distribution
    - Posterior predictive distribution
3. Bayesian Generalized Linear Regression

    3.1 Extending linear regression: Bayesian GLMs

    3.2 (Binary) Logistic regression

    - Model definition
    - Parameter priors

    3.3. Inference methods

    - Laplace approximation
    - MCMC and Hamilton Monte Carlo
    - Predictive posterior estimation
4. Simulation Study

    4.1. Linear Regression (= Regression): prior choice for (Lasso) regularization

    4.2. Logistic Regression (= Classification)
5. Conclusion and Outlook
    - When would the use of Bayesian regression be preferred over regular regression?
    - Alternatives for more complex problems: Hierarchical GLMs and GLMMs, Bayesian GAMs