

52542 Generalized Linear Models: Theory and Application

Prof. Samuel Oman
room: 4409
tel: 5883 442
oman@mscc.huji.ac.il
Office hours: flexible

Summary

For applications in which we wish to model a non-normally distributed response (e.g., binary) in terms of explanatory variables, the usual linear regression model is not suitable. The Generalized Linear Model (GLIM) is an appropriate generalization, which allows for non-normal responses with possibly constrained expectations (for example, greater than zero for a Poisson response). We shall study the theory of the GLIM, and apply it to analyze several examples.

Topics

1. Introduction

The difference between linear models, general linear models and generalized linear models. Some examples of datasets with non-normal responses.

2. General theoretical framework of the GLIM

Formulation of the Generalized Linear Model: exponential family of distributions, link functions.

Estimating the parameters: iteratively reweighted least squares, Fisher scoring, asymptotic distributions.

3. Application to binary, Poisson and Gamma-distributed responses.

4. Model building and checking: exploratory analysis, measures of goodness-of-fit, residuals.

5. Moment-based (quasi-likelihood) estimates, overdispersion.

Reading Material

Hosmer, DW and Lemeshow, S. (1989), Applied Logistic Regression.
McCullagh, P and Nelder, JA (1989), Generalized Linear Models.
Venables, WN and Ripley, BD (1994), Modern Applied Statistics with S-Plus.

Computing Software

R functions `glm`, `glmm{MASS}`.

Internet site

On the site <http://shum.cc.huji.ac.il/~oman> you will find datasets, examples, computing tips etc. You should check this site at the beginning of each week and download and/or print the relevant material. You will also find (hand-written) notes for the lesson expected to be given that week.

Grade

Each student will receive a set of data to analyze using the methods discussed in the course and will submit, by 31/01/2022 at the latest, a short paper describing the analysis. Papers submitted after that date (but before 07/02/2022) will be graded, but 7 points will be deducted from the final grade.