Examination paper for **TMA4315 Generalized Linear Models**

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Examination date: 13. December 2013

Examination time (from–to): 09:00–13:00

Permitted examination support material: C. **NO** written or handwritten examination support materials are permitted. A simple calculator is permitted.

Other information:
You may write your answers for this exam in English, *Norsk (bokmål/nynorsk)*, or a mix of these. All answers should be justified.

Language: English

Number of pages: ??

Number pages enclosed: 0

Checked by:

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Date   Signature

Problem 1   We will consider the following Poisson regression

$$y_i \sim \text{Poisson}\left(\exp(\eta_i)\right), \qquad i = 1, \ldots, n$$

where the linear predictor is

$$\eta_i = \boldsymbol{x}_i^T \boldsymbol{\beta}.$$

Here, $\boldsymbol{x}_i$ is the vector of the p covariates for the i'th observation y_i, and $\boldsymbol{\beta}$ is the p vector of unknown regression coefficients.

Write an introduction to Poisson regression and its practical usage, for a student with a good background in statistics, but no knowledge about Generalized Linear Models (GLM). Topics you may want to consider, are

- When to use it? Underlying assumptions.

- Parameter estimation, limiting results for the MLE, Fisher information and observed Fisher information, confidence intervals and hypothesis testing.

- Output analysis, residual plots and interpretation of results.

- Deviance and its usage.

- What do we do when a covariate is a factor, and should the results be interpreted?

- The use of Poisson regression in the analysis of contingency tables.