Course - Linear Models

- Least squares estimator.
- Exact results about sampling distributions.
- With basis expansions and interactions this is a very flexible model class.
- Most suitable for additive error with constant variance.

Course - Generalized Linear Models

- Suitable when the variance depends on the mean.
- The mean-variance relation is given mathematically via the variance function or implicitly via the specification of the reponse distribution.
- The mean-variance relation is specified in R via the `family` argument. Only the mean-variance relation matters for the estimation and statistical inference.
- The primary practical purpose of the link function is to map the mean value interval to the entire real line.
- Results about sampling distributions are approximations.

Course - Survival models

- Survival distributions are naturally expressed in terms of the hazard function.
- Parametric inference via the likelihood, which can be expression in terms of the hazard.
- Nonparametric inference via the empirical likelihood and the partial likelihood (a profile likelihood).
- Cox's proportional hazards model is the "linear model" of survival analysis. It
  - is semiparametric and does not make assumptions about the baseline (similar to no assumptions about the error ε_i),
  - it is efficient without such assumptions (the least squares estimator is too),
  - but it does assume proportionality (similar to the constant variance assumption).

Course - Other Topics

- Emphasis on likelihood based methods and interval estimation via the likelihood.
- Bootstrapping and empirical likelihood methods are useful for calibration
  - if the distribution of the estimator / combinant does not have a known theoretical approximation (e.g. if you don't have an estimate of the standard error),
  - if the model assumptions for the theoretical approximation are wrong or questionable,
  - but works best if the combinant is approximately a pivot.
- Model diagnostics via residuals.
- Practical computations in R for exploratory data analysis, graphics, numerical optimization, standard modeling functions `lm`, `glm`, `coxph` and how they interpret the formula argument, automatic report generation etc.

Exam

- You have to upload a pdf-file, but there are no strict requirements about the format.
- Include R code (either directly or as an appendix), but remember to clearly report and explain the results and what you have done.
- The exam will include
  - open-ended questions as well as relatively closed-ended questions,
  - practical questions and theoretical questions,
  - and standard questions as well as more challenging questions.
- Use the time intelligently. Don't use time on formatting issues (graphics, tables etc.) and don't spent an hour on a fringe aspect of a question before you have answered the core part of all other questions. Have the R code from the course available for easy copy-paste. Don't spent (too much) time googling.