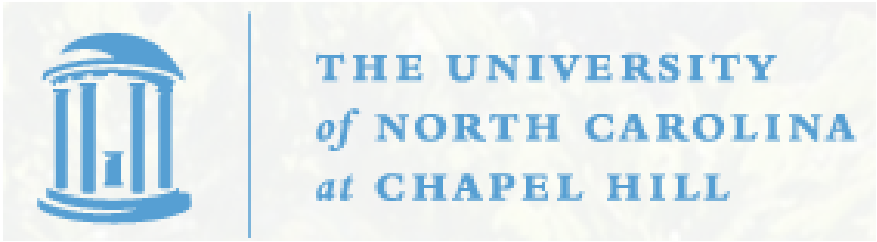
STOR 590:
ADVANCED LINEAR MODELS
Instructor: Richard L. Smith

Class Notes:

September 9, 2020



CLASS ANNOUNCEMENTS

- HW3 posted — due Friday
- Structured office hours — try again next week
- Post September 26, 6pm, return September 28, 6pm???

  Let me know if this does NOT work
- Final exam — also planning take-home, schedule to be fixed
- Spring 2020 midterm and final exams have been posted
- Also posted an update to the "GLM" handout

Outline of Chapter 8 (see "GLM Handout")

1. Some preliminary results about likelihood functions

2. Exponential families — definitions

3. Exponential families — examples (Normal, Poisson, Binomial, Gamma, Inverse Gaussian)

4. Estimating parameters — the general algorithm

5. Hypothesis tests, confidence intervals, residuals, diagnostics and all the usual stuff

GLM Algorithm (p. 155)

1. Model defined by means μ_i, link function $\eta_i = g(\mu_i)$, variance function $V(\mu)$ and dispersion parameter ϕ.

2. Initial estimates $\widehat{\mu}^{(0)}$ and hence $\widehat{\eta}^{(0)}$

3. At iteration k form $z^{(k)} = \widehat{\eta}^{(k)} + (y - \widehat{\mu}^{(k)})\frac{d\eta}{d\mu}|_{\widehat{\eta}^{(k)}}$

4. Weights $\frac{1}{w^{(k)}} = \left(\frac{d\eta}{d\mu}\right)^2|_{\widehat{\eta}^{(k)}} V(\widehat{\mu}^{(k)})$

5. Fit ordinary linear model to $z^{(k)}$ with weights $w^{(k)}$

6. Set $k = k + 1$ and return to step 3

7. Iterate to convergence

8. Estimate $\text{Var}(\widehat{\beta}) = (X^T W X)^{-1}\widehat{\phi}$.