

Stat 305 $\widehat{\text{syllabus}}$

Below is a list of topics for the course. We will get through the first 5 blocks of topics. We will see some but of course not all of the last two blocks. Hence the hat on the syllabus.

This course is about dealing with real valued responses. The main tool is the linear model. But we also learn about alternatives.

Below are the topics to be covered in the 29 or so classes we have in a given quarter. Primary topics, marked with a \bullet , are designed to take one whole class. Secondary topics, marked with \circ , are expected to take less than a class. Two or more of them might be merged into one lecture. Or if one a primary topic runs over to the next class we can complete it with a secondary topic.

Background

- Overview of applied statistics and the linear model
- Random vectors and matrices and their moments
- Least squares, normal equations, geometry, estimability, Gauss Markov
- Review of normal and other distributions
- Distribution of LS estimates
- Computation: QR, SVD

1,2,...,K groups

- One sample: t test, p values, confidence, power, sample size
- Dark side of the t test
- Two sample problems, and permutations
- k samples: Anova, contrasts, multiple comparisons
- Two way anova: fixed, random, mixed, nested and crossed effects

Real valued x

- Simple linear regression
- Parallel lines, quadratics, bent lines
- Errors in variables

Vector valued x

- Multiple regression, coefficients, partial correlations
- Extra sum of squares, pure error & lack of fit
- Model selection AIC, BIC to ZIC

Problems and fixes

- Residuals and model bias
- Nonnormality and robustness
- Unequal variance and Huber-White
- Outliers, influence, leverage
- Dependence in the errors
- Bootstrapping regressions
- Empirical likelihood

Not the usual $Z\beta$

- Local linear regression
- Regression splines
- Penalized regression
- Kriging
- MARS

Given time or high interest, 0 or more of:

- Generalized estimating equations
- Quantile regression
- Isotonic regression
- Nonlinear least squares
- Missing data
- path models
- regression trees