



北京航空航天大学

— 经济管理学院 —

BEIHANG UNIVERSITY
SCHOOL OF ECONOMICS AND MANAGEMENT

Generalized Linear Models

Lecture 12: Review



- Sample space of conditional response (Reals, Positive Reals, Non-negative counts, 0/1, proportions, ...)
- Nature of predictors (numerical, categorical, random)
- Relationship between response and predictors (linear, additive, interacting, nesting)

1 LM: Linear models

2 GLM: Generalized Linear Models

3 LMM: Linear Mixed-Effect Models

4 GLMM: Generalized Linear Mixed-Effect Models

5 AM: Additive Models

6 GAM: Generalized Additive Models

7 GAMM: Generalized Additive Mixed-Effect Models

- Interpreting graphs
- Appropriate plots to highlight relationships (e.g., interactions)
- Transformations to allow linear models
- Dealing with outliers
- Bootstrap
- Tests

- Interactions between a numerical and categorical predictor
- Outliers
- Leverage
- Cook's distance
- Residual diagnostics
- F-tests
- QQ plots
- LOO residuals
- Cross-validation

- Logistic regression, log-odds interpretations
- Binomial regression
- Poisson regression
- Negative binomial regression
- Beta regression
- Over/under dispersion and quasi likelihood
- Deviance residuals
- χ^2 tests for deviance
- Confidence intervals
- AIC
- Zero-inflated models
- Exponential family distributions
- Link functions, canonical link functions

- When to use a random effect?
- Nesting and grouping
- Panel/longitudinal data
- REML and MLE
- Interpreting a fitted model

- Kernel and local polynomial regression
- Smoothing splines
- Regression splines
- Curse of dimensionality
- Linear smoothers and degrees of freedom
- Additive models
- Generalized additive models

- **Thursday, 28 June**
- Half-open book.
- Five questions: $20 \times 5 = 100$ marks. Questions are in English, but your answers can be either English or Chinese.
- You will need to interpret lots of R output (3 out of 5 questions with R output).
- Focus on data analysis, modelling and interpretation.
- Emphasis on what we actually use for modelling, not on the theory that led up to it.

- Show something is in the exponential family
- Derive the canonical link function and variance function
- Derive the log likelihood function

- Describe your understanding of the model we have learnt.

Thanks and best wishes!