

Syllabus (updated: 11-19-2007): Stat 455 - Linear Models (Fall 2007)

(Based on Dr. Jiming Jiang's previous teaching)

Class Web Site <http://stat.cwru.edu/~junfeng/455.html>.

Class Schedule 10:00-11:15 am (Tuesday and Thursday) at Yost 327.

Instructor Junfeng Liu; jxl322@case.edu; Office: Yost 233. (Tele) (216)368-2246. Office hours: Tu,Th (4-5pm), or by appointment.

Course Outline Stat 455 introduces linear mixed models (LMM) and generalized linear mixed models (GLMM) where random effects and fixed effects are highlighted for statistical inference. Students who have exposure to traditional linear regression models and interest in modern theoretical computation techniques are encouraged to take this course. Main topics include REML, Henderson's RSS decomposition, MINQUE, asymptotic adjustment for non-Gaussian models, prediction, model diagnostics and selection, Bayesian inference, Fisher scoring method, PQLE by Laplace approximation, random effects prediction, estimating equations, Markov-transition model, zero-inflated model, etc.

Prerequisite Linear Regression.

Text Books Required: Jiming Jiang (2007), Linear and Generalized Linear Mixed Models and Their Applications, 1st Edition. Springer. ISBN: 0-387-47941-4.

References

- ◇ Geert Molenberghs and Geert Verbeke (2005), Models for Discrete Longitudinal Data. Springer.
- ◇ McCullagh, P. and Nelder, J.A. (1989), Generalized Linear Models, 2nd Edition, Chapman & Hall, London.
- ◇ Hocking R. R. (1996), Methods and Applications of Linear Models: Regression and the Analysis of Variance. John Wiley and Sons, Inc.

Grades Homework assignments (5) [30%], mid-term paper review [30%] and take-home final exam [40%] (due on Dec 11). No late homework will be accepted. The minimal score to pass the course is 60 out of 100 scale.

Attendance Role will not be taken. However, poor attendance may have an adverse affect on grades. Missing classes due to instructor are to be made up by lecture or giving detailed lecture

notes to students.

Table 1: Lecture Plan (♠=out of town)

Date	Contents	
<i>Linear Mixed Models (LMM)</i>		
(28-Aug, 30-Aug)	Syllabus/Normal theory	LMM: introduction w/ examples
(04-Sep, 06-Sep)	Gaussian: ML	Gaussian: REML
(11-Sep, 13-Sep)	Henderson's RSS decomposition	MINQUE, non-Gaussian: estimation (♠)
(18-Sep, 20-Sep)	Computation: closed-form (♠)	EM algorithm
(25-Sep, 27-Sep)	Test: Gaussian	Test: non-Gaussian
(02-Oct, 04-Oct)	C.I. in LMM	Prediction in LMM
(09-Oct, 11-Oct)	Model diagnostics and selection	Bayesian inference
<i>Generalized Linear Mixed Models (GLMM)</i>		
(16-Oct, 18-Oct)	Generalized LMM (GLMM)	Fisher scoring method
(23-Oct, 25-Oct)	Fall Break	PQLE: Laplace approximation
(30-Oct, 01-Nov)	Random effects prediction (I)	Random effects prediction (II)
(06-Nov, 08-Nov)	Likelihood inference (I): MCEM	Likelihood inference (II): MBP
(13-Nov, 15-Nov)	Likelihood inference (III): Bayesian	Estimating equations (I): GEE
(20-Nov, 22-Nov)	Estimating equations (II): IEE	Thanksgiving
(27-Nov, 29-Nov)	Estimating equations (III): MSM	Model selection: Fence Method
(04-Dec, 06-Dec)	Markov-transition model	ZIP (zero-inflated Poisson)
(11-Dec, 13-Dec)	Final (take-home exam due)	Final
(18-Dec, 20-Dec)	Final	Final

Table 2: Assignment Schedule

Assignment date	Due date
(13-Sep)	(27-Sep) (hw 1 due)
(27-Sep)	(09-Oct) Cancelled
(09-Oct)	(25-Oct) (Midterm paper review due, hw 2 due)
(25-Oct)	(06-Nov) (hw 3 due)
(06-Nov)	(27-Nov) (hw 4 due)
(20-Nov)	(07-Dec) (take-home final due)