



East China Normal University
GEC International Summer School

MAT37: Linear Regression Analysis

Term: June 16th to July 18th, 2025

Class Hours: Monday through Friday, 110 minutes each day (2,750 minutes in total)

Instructor: TBD

Home Institution: TBD

Office Hours: TBD

Email: TBD

Course Description

This course reviews simple linear regression and introduces multiple regression with emphasis on theory of least squares estimation, residual analysis, and model interpretation. Within the multiple regression context, transformations of variables, interactions, model selection techniques, ANOVA, influence diagnostics and multicollinearity will be discussed. Topics may also include Box–Cox transformations, weighted regression, and logistic and Poisson regression. This course is supplemented with computer labs involving interactive data analysis using statistical software.

Prerequisite: None.

Course Objectives

Upon successful completion of the course, students will be able to:

- Select, implement and interpret appropriate regression models to explain real-world phenomena.
- Demonstrate an understanding of the limitations and uncertainties associated with regression models.



- State the assumptions of regression models, and investigate these assumptions using appropriate plots and statistics.
- Demonstrate a command of the mathematical foundations of regression models.
- Demonstrate competence in using statistical software to implement regression procedures.
- Effectively communicate a proper interpretation of the results of a regression analysis.

Required Text

Applied Regression Analysis, by Draper and Smith.

Course Hours

The course has 25 class sessions in total. Each class session is 110 minutes in length, for a total of 2750 minutes of in-class time. The course meets from Monday to Friday. ECNU awards 3 credits for this course. Different universities may count course credits differently. Consult officials at your own home institution.

Attendance

Summer school is very intense and to be successful, students need to attend every class. Occasionally, due to illness or other unavoidable circumstance, a student may need to miss a class. ECNU policy requires a medical certificate to be excused. Any absence may impact on the student's grade. Moreover, ECNU policy is that a student who has more than 3 absences will fail the course. Arriving late or leaving early will count as a partial absence.

Grading Policy

ECNU awards grades of A, A-, B+, B, B-, C+, C, D, and F. Most colleges and universities do not award transfer credit for grades of D or F.

In this course, grading will be based on the following:



Assignments*2	10%*2=20%
Participation	10%
Midterm Exam	30%
Final Exam	40%

General Expectations

Students are expected to:

- Attend all classes and be responsible for all material covered in class and otherwise assigned. Any unexcused absence may impact a student's grade.
- Arrive to class on-time: Late arrivals are disruptive to your fellow students and to the conduct of the class.
- Complete the day's required reading and assignments before class.
- Review the previous day's notes before class; make notes about questions you have about the previous class or the day's reading.
- Refrain from texting, phoning or engaging in computer activities unrelated to class during class (不要用手机). It is highly disrespectful to the professor and to the class.
- Participate in class discussions and complete required written work on time.

Course Schedule

The planned schedule sketched out below may be modified to suit the interests or abilities of the enrolled students or to take advantage of special opportunities or events that may arise during the term.

Week 1

- *Day 1*
 - *Overview of the course*
- *Day 2: Simple Linear Regression*
 - *Simple Linear Regression-parameter estimation and inference*
- *Day 3: Simple Linear Regression*
 - *Least squares*
 - *Properties of the least squares estimators*
- *Day 4: Simple Linear Regression*



- *Model assumptions*
- *Prediction*
- *Maximum likelihood estimation*
- *Day 5*
 - *Tutorial/Discussion*

Week 2

- *Day 1: Simple Linear Regression*
 - *The coefficient of determination*
 - *ANOVA for regression*
- *Day 2: Simple Linear Regression*
 - *SLR in matrix form*
- *Day 3: Introduction to Multiple Linear Regression*
 - *Matrix notation*
 - *Properties of the least squares estimators*
- *Day 4: Introduction to Multiple Linear Regression*
 - *Inference on model parameters*
 - *Estimation and prediction*
- *Day 5*
 - *Tutorial/ Discussion*
 - *Assignment 1 due*

Week 3

- *Day 1: Introduction to Multiple Linear Regression*
 - *Interpretation of output*
 - *Standardized regression coefficients*
- *Day 2: Introduction to Multiple Linear Regression*
 - *Multicollinearity*



- *Day 3: Model Assumptions and Checking Model Adequacy*
 - o *Residual analysis*
 - o *Standardized and studentized residuals,*
 - o *Residual plots*
- *Day 4*
 - o *Midterm Review Session*
- *Day 5*
 - o *Midterm*

Week 4

- *Day 1: Polynomial Regression Models*
 - o *Higher order terms in the linear regression model*
- *Day 2: Indicator Variables*
 - o *One-way ANOVA as a regression*
- *Day 3: Transformations and Weighting*
 - o *Variance stabilizing transformations*
 - o *Intrinsically linear models*
- *Day 4: Transformations and Weighting*
 - o *The Box-Cox transformation*
 - o *Weighted least squares*
- *Day 5*
 - o *Tutorial/Discussion*
 - o *Assignment 2 due*

Week 5

- *Day 1: Leverage and Influence*
 - o *Leverage, influence*
 - o *Treatment of influential observations*



- *Day 2: Model Building*
 - o *Model building techniques*
 - o *Forward selection*
 - o *Backward selection*
- *Day 3: Generalized Linear Models*
 - o *Logistic regression estimation, inference*
 - o *Interpretation of parameters*
- *Day 4*
 - o *Final Exam Review Session*
 - o *Tutorial/Discussion*
- *Day 5*
 - o *Final Exam*

Academic Honesty

Students are expected to maintain high standards of academic honesty. Specifically, unless otherwise directed by the professor, students may not consult other students, books, notes, electronic devices or any other source, on examinations. Failure to abide by this may result in a zero on the examination, or even failure in the course.