Course Outline of AST 409

University of Dhaka

Institute of Statistical Research and Training

Course: Generalized Linear Models (AST 409), Session: 2018-19

Course Instructor	:	Md Hasinur Rahaman Khan, PhD
Email	:	hasinur@isrt.ac.bd
Lecture time	:	Sunday 2:00 PM – 3:30 PM; Wednesday 2:00 PM – 3:30 PM
Course Web-page	:	https://sites.google.com/site/teachingsitehasinur/

Text book : [1] *An Introduction to Generalized Linear Models*, (Third Edition (2008) Chapman and Hall/CRC Press), Dobson, Annette J. & Barnett, Adrian G.

[2] *Generalized Linear Models*, (Second Edition (1989), CRC Press), McCullagh, P. & Nelder, John A.

Introduction

This course deals with different statistical models for the analysis of quantitative and qualitative data, of the types usually encountered in research.

Objectives

To introduce to the students about the statistical methods including the general linear model for quantitative responses (including multiple regression, analysis of variance and analysis of covariance), binomial regression models for binary data (including logistic regression and probit models), and models for count data (including Poisson regression and negative binomial models). All of these techniques are covered as special cases of the Generalized Linear Model, which provides a central unifying statistical framework for the entire course.

Learning Outcome

After completing the course:

You will be familiar with the exponential family of distributions and know that the normal, the binomial, the Poisson and the gamma distributions belong to this family. You will know the class of generalized linear models (GLM) as regression models with responses from the exponential family of distributions. You will be trained in analyzing data from important special cases of GLMs, in particular logistic regression and Poisson regression. You will know the concepts of link functions for modeling the correspondence between the expected value of the responses and covariates and of variance functions for specifying the correspondence between the expected values and variances of the responses. You will be familiar with extensions of the GLM framework using quasi likelihood based on specified link and variance functions.

Lecture Plan (tentative)

Lecture 1–2	Review of Likelihood Theory.
Lecture 2–5	Generalized linear models: exponential family of distributions.
Lecture 6–8	Estimation: method of maximum likelihood, method of least squares, estimation of generalized linear models.
Lecture 8–11	Inference: sampling distribution for scores, sampling distribution for maximum likelihood estimators, confidence intervals for model parameters, adequacy of a model, sampling distribution for log-likelihood statistic, log-likelihood ratio statistic (deviance), assessing goodness of fit, hypothesis testing.
Lecture 12–13	Multiple regression: maximum likelihood estimation, log-likelihood ratio statistic.
Lecture 14–17	Models for binary responses: probability distributions, generalized linear models, dose response models, general logistic regression, maximum likelihood estimation and log-likelihood ratio statistic, other criteria for goodness of fit, least square methods.
Lecture 18–19	Multinomial distributions.
Lecture 20–21	Nominal logistic regression models.
Lecture 22–23	Ordinal logistic.
Lecture 24–29	Models for count data, Poisson regression and log-linear models: probability distributions, maximum likelihood estimation, hypothesis testing and goodness of fit.
Lecture 30	Review and Extra Computational Statistics Using R.