Statistics III: Multivariate Data and Regression
BSDS Second Year
2025-26 Semester 1

Class time: MW 2:30-4:00pm

Tutorial time: F 2:30-4:00pm

Instructor: Rituparna Sen rsen@isibang.ac.in

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Grading:

In-class quiz (4):	10%, Only two top scores will be taken. Dates will NOT be announced.
Homework (6):	20%, Lowest score will be dropped.
Midterm:	20%
Final:	50%

Midterm and final will have both theory and practical questions.

Syllabus:

1. Review of bivariate Normal distribution: Conditional distribution and its relation to the simple linear regression model.

2. Multiple linear regression: Least squares estimation. Normal equations. Properties of residuals. Multiple and partial correlation coefficients.

3. Inference on linear regression: Properties of least squares estimators under Gaussian noise. Hypoth esis tests and confidence intervals for regression coefficients.

4. Analysis of Variance for one-way classified data. Interpretation of identifiability constraints. ANOVA table. Tests of hypothesis.

5. Review of Multinomial distribution: Conditional and marginal distributions. Large sample properties.

6. Graphical summary of categorical response: Stacked bar plot, tile chart, sunburst chart, parallel coordinates plot.

7. Regression with binary response: Odds ratio. Logistic regression and probit models. Estimation using Fisher scoring (description only).

8. Goodness of fit for categorical response: Tests of independence and homogeneity in contingency tables.

Reference Books

1. Practical Regression and ANOVA with R by Julian Faraway

2. Applied Logistic Regression by David W. Hosmer, Stanley Lemeshow

3. Categorical Data Analysis by Alan Agresti

4. Applied Regression Analysis by Norman N. Draper and Harry Smith