UNIVERSITY OF GUAM
COLLEGE OF NATURAL & APPLIED SCIENCES

MA 541 Regression Models and Applications (4 credits)

Section Information
Course Delivery Mode: Face-to-Face
WB#1, MW: 5:30-7:20pm

Instructor Information
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Office Location – SC201
Office Hours – MW 2-4pm, F 9-11am
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COURSE CATALOG DESCRIPTION
This course includes linear models, including t-tests, ANOVA, regression, and multiple regression. Residual analyses, transformations, goodness of fit, interaction and confounding. Introduction to generalized linear models: mixed, hierarchical and repeated measures. Binary regression, extensions to nominal and ordinal multicategory responses, count data, Poisson and negative binomial regression, log-linear models. Prerequisite: MA341 (Linear Algebra), MA 387 (Statistics for Sciences) or BI412 (Biometrics) or BI507 (Advanced Statistical Methods) or Admission to the MS in Data Science or Admission to the Graduate Certificate in Applied Statistics Program.

COURSE CONTENT

I. Introduction to Regression Analysis
II. Simple and Multiple Linear Regression
- The simple linear regression model
- Estimating the parameters of the model
- Assessing the fit of the model, variable selection
- Using the model for prediction, interpretation of the results
- Applications of linear regression

III. Polynomial Regression
- The polynomial regression model
- Estimating the parameters of the model
- Assessing the fit of the model
- Using the model for prediction
- Applications of polynomial regression

IV. Nonlinear Regression
- Binary Dependent Variables: Logistic and Probit Regression Models
- Nominal Dependent Variables
- Ordinal Dependent Variables
- Count Data: Poisson Regression, Overdispersion and Negative Binomial Models

V. Log-Linear Models

- Fit and use the log-linear model to explain joint and conditional associations among variables.

VI. Model Selection and Validation
- Selecting the best regression model
- Cross-validation and bootstrapping
- Residual analysis
- Outlier detection and handling

VII. Applications of Regression Models

VIII. Regression Models and Machine Learning
- Trees and Random Forests
- Neural Networks and Deep Learning

IX. Advanced Topics in Regression Analysis (if time permits)
- Ridge regression
- Lasso regression
- Elastic net regression
- Nonlinear regression

COURSE LEARNING OUTCOMES

Course SLOs:	**Program Learning Outcomes (PLOs)**	**University Graduate Learning Outcomes (IGLOs)**	**Method of Assessment**
Describe the principles of different regression modeling in data analysis	PR-1	IGLO-1	Homework assignments, projects
Formulate an appropriate model	PR-1, PR-2	IGLO-1, IGLO-2	Homework assignments, projects
Estimate the parameters of a model using a statistical computer package	PR-2	IGLO-1, IGLO-2	Homework assignments, projects
Apply and explain statistical inference to a model using a statistical computer package	PR-2, PR-3	IGLO-1, IGLO-2	Homework assignments, projects
Evaluate the appropriateness and validity of a model	PR-1	IGLO-1, IGLO-2	Homework assignments, projects
Produce and interpret the results of an estimated model and predict the consequences of these results	PR-2, PR-4, PR-5, PR-6	IGLO-1, IGLO-3, IGLO-4	Homework assignments, projects

MS in Data Science Program Learning Outcomes (PLOs)

PR-1 Design and execute statistical experiments and hypothesis tests to extract meaningful insights from data.
PR-2 Analyze and interpret complex statistical data using advanced statistical methodologies and tools.
PR-3 Visualize data for exploration, analysis, and communication.

PR-4 Develop and implement predictive models and machine learning algorithms to make data-driven decisions.
PR-5 Communicate statistical analyses, findings, and recommendations to both technical and non-technical audiences effectively.
PR-6 Collaborate with interdisciplinary teams to design, implement, and evaluate statistical projects.

Institutional Graduate Learning Outcomes (IGLOs)

IGLO-1: Demonstrate mastery of critical skills, theories, methodologies, and other content knowledge at a level that will enable them to address fundamental questions in their primary area of study;
IGLO-2: Plan, conduct, and complete significant research or creative project;
IGLO-3: Exercise oral and written communication skills sufficient to publish and present work in their field;
IGLO-4: Adhere to the ethical principles of academia and their respective disciplines in coursework, fieldwork, and other appropriate situations; and
IGLO-5: Exemplify, through service, the value of their discipline to the academy and the community at large, interacting productively and professionally with people from diverse backgrounds.

TEXTBOOK

Regression: Models, Methods and Applications 2nd ed. 2021 Edition by Ludwig Fahrmeir, Thomas Kneib, Stefan Lang, Brian D. Marx (required)

Pardoe, I. (2020) Applied Regression Modeling, 3rd edition, John Wiley & Sons (optional)

GRADING INFORMATION

Course Grade Scale (Letter to Percent Range)

A+	98-100%
A	93-97%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	70-76%
D	60-69%
F	<60%

UW: Unofficial withdrawal assigned by Registrar—Student stopped attending classes and did not submit/file required documents.
W: Withdrawal assigned by Registrar—Student stopped attending classes and submits/files required documents.

GRADE CATEGORIES: ASSIGNMENTS AND PERCENTAGES

Assessments/Assignments and Grade Percentage

1. Homework/Mini Projects - 60%
2. Midterm- 20%
3. Final Exam - 20 %

EEO and ADA Statement

Americans with Disabilities Act Amendments Act (ADAAA) Accommodation Services

The University is committed to providing an inclusive and welcoming environment for all members of our community free of all forms of discrimination and harassment in all programs, activities, and employment practices as required by Title VII and Title IX and other applicable statutes and policies. If you experience harassment or discrimination, report it immediately to the Director of EEO/ADA & TITLE IX Office, at 671-735-2244, 671-735-2971, 671-735-2244 (TTY) or eeo-ada@triton.uog.edu. For immediate assistance in an emergency call 911.

For individuals covered under the ADA (Americans with Disabilities Act), if you are a student with a disability requiring academic accommodation(s), please contact the Student Counseling and Advising Service Accommodations Office to discuss your confidential request. Please provide an accommodation letter from the Disability Support Services Student Counseling and Advising Service Accommodation counselor. To register for academic accommodations, please contact or visit the School of Education, Room #110, disabilitysupport@triton.uog.edu , or telephone/(TTY) 671-735-2460.

For applicants or employees with a disability requiring employment or workplace accommodation(s), please contact the Director of EEO/ADA & TITLE IX Office to discuss your specific needs. Please provide documentation concerning your disability and the need for employment or workplace accommodation. Our office is located at the Lya Hami Hall, Dorm 2, right side entrance, first floor, Room #104, and our contact numbers are 671-735-2244, 671-735-2971, 671-735-2244 (TTY).

Student Evaluation of Faculty Information

The student course and faculty evaluations for courses will be administered at the completion of the semester within CollegeNet. Student participation is essential and appreciated. Student responses are anonymous and cannot be traced back to individual students. You will need your WebAdvisor login credentials to complete the evaluation. If you experience login issues, please refer inquiries to OIT staff to assist at 735-2630/40.

Plagiarism Statement

Academic dishonesty cannot be condoned by the University. Such dishonesty includes cheating and plagiarism (examples of which are given below), which violate the Student Conduct Code and could result in expulsion from the University.

Cheating includes but is not limited to giving unauthorized help during an examination, obtaining unauthorized information about an examination before it is administered, using inappropriate sources of information during an examination, altering the record of any grades, altering answers after an examination has been submitted, falsifying any official University record, and misrepresenting the facts in order to obtain exemptions from course requirements.

Plagiarism includes but is not limited to submitting any document, to satisfy an academic requirement, that has been copied in whole or part from another individual's work without identifying that individual; neglecting to identify as a quotation a documented idea that has not been assimilated into the student's language and style, or paraphrasing a passage so closely that the reader is misled as to the source; submitting the same written or oral material in more than one course without obtaining authorization from the instructors involved; or dry-labbing, which includes (a) obtaining and using experimental data from other students without the express consent of the instructor, (b) utilizing experimental data and laboratory write-ups from other sections of the course or from previous terms during which the course was conducted, and (c) fabricating data to fit the expected results.

Communication Policy

University policy states that official communications will be sent using university assigned (@gotriton or @triton) email addresses. University electronic mail and messaging is to be used to enhance and facilitate teaching, learning, scholarly research, support academic experiences, and to facilitate the effective business and administrative processes of the University. (OIT policy manual, 3.10, p. 36)

Tobacco-Free and Smoke-Free Campus

The University of Guam has in place a Tobacco-Free Policy. Please read the policy at:
https://www.uog.edu/smoke-free-uog.php