THE UNIVERSITY OF BRITISH COLUMBIA

Land Acknowledgement

We respectfully acknowledge the Syilx Okanagan Nation and their peoples, in whose traditional, ancestral, unceded territory UBC Okanagan is situated.

DATA 310: Applied Regression Analysis Course Outline

Faculty: Irving K. Barber Faculty of Science

Department: Computer Science, Mathematics, Physics, and Statistics

Instructor: Dr Paramjit Gill

Instructor Email: paramjit.gill@ubc.ca

Duration: Term 2 Winter 2022

Delivery Modality: In-Person

Course Location: FIP-250

Course Days: Tue/Thu

Class Hours: 5:00 PM - 6:30 PM

Office hours: Tuesday, Friday 3:45PM - 4:45 PM Science 112.

Students are expected to consult the instructor in person for any help on completing the assignments. In general, the instructor will not be able to answer questions by email. Feel free to ask for an appointment outside of office hours.

Other Instructional Staff

1	Teaching Assistant: Nima Eslami (nima.eslami@ubc.ca)
2	Teaching Assistant will conduct weekly computer lab sessions for this course. Some of the home work assignments will involve data analysis. TA will provide help to students in completing data analysis assignments. However, course TA will not answer any questions on assignments that dont involve computing. Students should consult the course instructor for any questions regarding course policies (such as late submissions).
3	Computer Lab Schedule: Monday 7PM - 8PM Online

DATA 310: Applied Regression Analysis

Course Description

Theory and application of simple and multiple linear regression models, estimation, inference (confidence intervals, prediction intervals and hypothesis testing), polynomial regression, ANOVA and ANCOVA, variable selection, model adequacy and residual diagnostics.

Course Format

The course lectures will be conducted in person. Some course material will be posted on canvas. Computer labs will be conducted on line by the course TA. We will use the R software for statistical analysis of data. It is expected that all students are familiar with using R and have installed R on their personal laptops. It is expected that students will seek help for completing computing assignments during the scheduled lab hours or during the in-person office hours conducted by the instructor.

Course Overview, Content and Objectives

To introduce the widely used method of regression analysis, including the mathematical and statistical theory. To demonstrate the breadth of the scope of regression methodology applications, real datasets from various fields will be used as examples and in the exercises. Students will use statistical software to get some experience in drawing conclusions from calculated results. A substantial part of this course will involve a research project on the analysis of a large and realistic data.

Learning Outcomes

Upon successful completion of this course, students will be able to…

Understand the statistical theory of linear regression analysis
Recognize what kind of data may be analyzed using linear regression analysis methods
Analyze real life data using the linear regression analysis with the help of R software
Draw conclusions from the linear regression analysis of real life data to answer practical questions
Recognize the limitations of the linear regression methodology for analysis of data at hand

Assessments of Learning

1. Assignments (weight 20%): There will be regular homework assignments due approximately every 10 days with firm deadlines. Assignments will be submitted and evaluated online. Some of the assignments will involve data analysis that can be completed during the online computer lab hour. Course TA will help students to complete the computing assignments. Students may also seek help from the instructor and may ask for a quick review (at least 3 days) before submission. Students may work in groups for solving assignment questions but must submit their own work. If two or more students submit the same work, all of them will get a mark of zero in that assignment.
2. Two Tests (weight 40%): Term tests will be conducted during the class time on Feb 16 and March 23, 2023. Each test will have two parts. Part 1 will be closed book with short answer questions on concepts and theory. Part 2 will be open book with questions involving data analysis, very similar to assignments. Students are expected to bring their own laptop

computers.
3. Optional Research Project (weight 20%). Students have choice if they want to conduct a research project involving real life data case study. Detailed information about the research project will be provided soon.
4. Final Exam (weight 40% or 20%). Final exam will be comprehensive covering all the course material. Final exam will also have two parts like the term test. For students taking the research project option, the final exam will be worth 20% of the course grade.

Course schedule

Week	Topics covered
Weeks 1:3 Jan 9 - Jan 27	Chapter 1 Introduction Chapter 2 Simple Linear Regression Model, Least Squares Estimation, Hypothesis Testing, ANOVA, Interval Estimation, Prediction, Coefficient of Determination, Use of Regression, Regression Through the Origin. Skip Sections 2.7 and 2.10
Weeks 4:6 Jan 30 - Feb 17	Test 1, Chapter 3 Multiple Linear Regression, Least Squares Estimation, Hypothesis Testing, Confidence Intervals, Prediction, Multi-collinearity. Skip Sections 3.2.6, 3.4.3, 3.6.
Weeks 7:9 Feb 27 - Mar 10	Chapter 4 Model Adequacy Checking: Residual Analysis, PRESS, Outliers, Lack of Fit. Skip Section 4.2.5.
Week 10 Mar 13 - Mar 17	Chapter 5 Transformations. Skip Sections 5.4, 5.5
Week 11 Mar 20 - Mar 24	Test 2, Chapter 6 Model Diagnostics, Influential Observations, Leverage, Measures of Influence
Week 12 Mar 27 - Mar 31	Chapter 8 Indicator Variables
Week 13 Apr 3 - Apr 7	Chapter 9 Variable Selection and Model Building, Subset Regression, All Possible Regressions, Stepwise Regression
Week 14 Apr 10 - Apr 14	Research Project Presentations, Review

Late Policy Late submission of homework assignments will not be accepted. Check with the instructor if you are unable to meet the deadline.

Missed Activity Policy:

If a student is unable to take the term test at the scheduled time, the weight for the test will be transferred to the final exam.

Passing/Grading Criteria

Your final grade will be the sum of marks obtained in the homework assignments, term test, research project and the final exam.

Learning Materials

Required Text: Introduction to Linear Regression Analysis by D. C. Montgomery, E. A. Peck and G. G. Vining - Wiley Series in Probability and Statistics
Lecture slides will be posted on canvas but these slides will not contain comprehensive matter. Details will be presented in the class where students are expected to take notes.

Other Course Policies

Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. **For example, incidences of plagiarism or cheating usually result in a failing grade or mark of zero on the assignment or in the course.** Careful records are kept to monitor and prevent recidivism.

A more detailed description of academic integrity, including the University's policies and procedures, may be found in the Academic Calendar at:
http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,54,111,0

Final Examinations

You can find the Senate-approved term and examination dates here. Except in the case of examination clashes and hardships (three or more formal examinations scheduled within a 27-hour period) or unforeseen events, students will be permitted to apply for out-of-time final examinations only if they are representing the University, the province, or the country in a competition or performance; serving in the Canadian military; observing a religious rite; working to support themselves or their family; or caring for a family member. Unforeseen events include (but may not be limited to) the following: ill health or other personal challenges that arise during a term and changes in the requirements of an ongoing job.

Further information on Academic Concession can be found under Policies and Regulation in the Okanagan Academic Calendar http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,48,0,0

Grading Practices

Faculties, departments, and schools reserve the right to scale grades in order to maintain equity among sections and conformity to University, faculty, department, or school norms. Students should therefore note that an unofficial grade given by an instructor might be changed by the faculty, department, or school. Grades are not official until they appear on a student's academic record.

http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,41,90,1014

Resources to Support Student Success:

UBC Okanagan Disability Resource Centre

The DRC facilitates disability-related accommodations and programming initiatives to remove barriers for students with disabilities and ongoing medical conditions. If you require academic accommodations to achieve the objectives of a course please contact the DRC at:

UNC 215 250.807.8053
Email: drc.questions@ubc.ca
Web: www.students.ok.ubc.ca/drc

UBC Okanagan Equity and Inclusion Office

Through leadership, vision, and collaborative action, the Equity & Inclusion Office (EIO) develops action strategies in support of efforts to embed equity and inclusion in the daily operations across the campus. The EIO provides education and training from cultivating respectful, inclusive spaces and communities to understanding unconscious/implicit bias and its operation within in campus environments. UBC Policy 3 prohibits discrimination and harassment on the basis of BC's Human Rights Code. If you require assistance related to an issue of equity, educational programs, discrimination or harassment please contact the EIO.

UNC 325H 250.807.9291
Email: equity.ubco@ubc.ca
Web: www.equity.ok.ubc.ca

Student Wellness

At UBC Okanagan health services to students are provided by Student Wellness. Nurses, physicians and counsellors provide health care and counselling related to physical health, emotional/mental health and sexual/reproductive health concerns. As well, health promotion, education and research activities are provided to the campus community. If you require assistance with your health, please contact Student Wellness for more information or to book an appointment.

UNC 337 250.807.9270
Email: healthwellness.okanagan@ubc.ca
Web: www.students.ok.ubc.ca/health-wellness

Office of the Ombudperson

The Office of the Ombudsperson for Students is an independent, confidential and impartial resource to ensure students are treated fairly. The Ombuds Office helps students navigate campus-related fairness concerns. They work with UBC community members individually and at the systemic level to ensure students are treated fairly and can learn, work and live in a fair, equitable and respectful environment. Ombuds helps students gain clarity on UBC policies and procedures, explore options, identify next steps, recommend resources, plan strategies and receive objective feedback to promote constructive problem solving. If you require assistance, please feel free to reach out for more information or to arrange an appointment.

UNC 328 250.807.9818
Email: ombuds.office.ok@ubc.ca
Web: www.ombudsoffice.ubc.ca

Student Learning Hub

The Student Learning Hub is your go-to resource for free math, science, writing, and language learning support. The Hub welcomes undergraduate students from all disciplines and year levels to access a range of supports that include **tutoring in math, sciences, languages, and writing, as well as help with study skills and learning strategies**. Students are encouraged to visit often and early to build the skills, strategies and behaviors that are essential to being a confident and independent learner. For more information, please visit the Hub's website.

LIB 237 250.807.8491
Email: learning.hub@ubc.ca
Web: www.students.ok.ubc.ca/slh

The Global Engagement Office

The Global Engagement Office provides advising and resources to assist International students in navigating immigration, health insurance, and settlement matters, as well as opportunities for intercultural learning, and resources for Go Global experiences available to all UBC Okanagan students, and more.

Come and see us – we are here to help! You may also contact geo.ubco@ubc.ca

Safewalk

Don't want to walk alone at night? Not too sure how to get somewhere on campus? Call Safewalk at ***250-807-8076.***

For more information, see: www.security.ok.ubc.ca