PRE-CLASS CHECKLIST

Please complete the pre-class checklist to ensure you meet the course prerequisites. You may skip the corresponding items if you possess the requisite skills and knowledge.

☐ **Install R and RStudio.**

Instruction will be done using the statistical software R (https://cloud.r-project.org). For a user-friendly interface, download the RStudio IDE. It is free and compatible with Windows, Mac, and Linux/Unix. See installation support.

If you prefer to use a different statistical software or programming language, you are free to do so. You will be responsible for seeing that you have sufficient access to software tools and technical assistance for the various topics covered in the course.

☐ **Review basics of R Programming, Data Manipulation, Data Analysis, Visualization, Data Tidying.**

Courses on DataCamp: Introduction to R, Exploratory Data Analysis in R, Data Manipulation with dplyr, Introduction to the Tidyverse, Introduction to Data Visualization with ggplot2.

The first part (Whole game) of the book "R for Data Science" (available online).

Other resources:

o Introduction to R. https://cran.r-project.org/doc/manuals/R-intro.html

o Quick-R by DataCamp. https://www.statmethods.net/

o Kelly Black. R tutorial. https://www.cyclismo.org/tutorial/R/

Register/Sign In to our Datacamp Group using your *@uwo.ca* address. Datacamp won't recognize your *@ivey.ca* address.

Class Invitation for free access to resources: [https://www.datacamp.com/groups/shared_links/c221a5548a43b88ecdb3809f60dd9b45d1b1aadb9d79c4911643a9735e3974fb]

☐ **Review basics of Probability, Random Variables, Expected Values, and Limit Theorems from a resource such as the following.**

Chapters 2-8 from *A First Course in Probability* by *Sheldon Ross*
Library Link

Chapters 1-5 from *Mathematical Statistics and Data Analysis 3e by* John A. Rice
Library 2-hour loan

☐ **Review basic Statistical Concepts, Statistical Learning, and Linear regression.**

Chapters 2-3 from *An Introduction to Statistical Learning with Applications in R, 2e* by G. James, D. Witten, T. Hastie and R. Tibshirani
Ebook and Resources

Chapters 1-2 from *Regression Analysis by Example 4e (or newer)* by S. Chatterjee and AS Hadi
Ebook through Library

Courses on DataCamp: *Introduction to Statistics in R, Intro to Regression in R, Sampling in R.* Register to Datacamp for free resource access.

MULTIVARIATE ANALYSIS
BUSINESS 9702
Fridays 09:30 am - 12:30 pm

Professor: Mustafa Hayri Tongarlak
Office: 4366
E-mail: mtongarlak@ivey.ca

Assistant: Vanessa Sage
Email: vsage@ivey.ca

COURSE DESCRIPTION

Modern statistical concepts and methods developed in a mathematical framework: statistical inference, point and interval estimation, hypothesis testing, maximum likelihood estimation, and large sample theory. This course introduces statistical regression models (ANOVA, linear regression, non-linear regression) with an applied focus. Students will learn the basic concepts behind linear and nonlinear statistical models and apply them to analyzing real data sets from various fields. A significant component of the course will be data analysis in R.

COURSE OBJECTIVES

This course introduces statistical theory, methods, and applications. It should serve as a background preparation for many intermediate statistical methods and applications courses. We will cover the following topics:

- Descriptive Analytics

- Limit Theorems and Sampling Distributions

- Point Estimation, Confidence Intervals

- Fitting Probability Distributions

- Linear Regression, Advanced Regression Techniques, Regression Diagnostics

- Hypothesis Testing, Goodness of Fit Tests

- ANOVA

- Logistic Regression

- Further Topics

MATERIALS

An Introduction to Statistical Learning with Applications in R, 2e (2023) by G. James, D. Witten, T. Hastie and R. Tibshirani - Ebook and Resources.

Regression Analysis by Example using R, 6e (2024) by S. Chatterjee and AS Hadi - Library and Ebook (4e)

Data Mining for Business Analytics: Concepts, Techniques, and Applications in R by Shmueli, G., Bruce, P. C., Yahav, I., Patel, N. R., Lichtendahl, K. C. (2018). Ebook through Library

EVALUATION

Weekly Labs (20 points)

Ten weekly labs (2 points each) are due by noon on Mondays (except before sessions 1 and 12). Labs can be submitted late by 9 am on Friday for a 1-point penalty.

Bi-weekly Individual/Group Assignments (50 points)

There will be five assignments (10 points each). Group discussion of individual assignments is permitted, but sharing complete solutions or software code is prohibited. If you worked with classmates on the assignment, please list their names at the top of your assignment.

Submissions are due by noon on Thursdays.
Late submissions will be accepted by 9 am on Friday for a 2-point penalty.

Class Contribution (10 points)

Your class contribution grade will be based on a daily performance assessment. Both the quantity and quality of your class contribution will be assessed. No credit will be given for missed classes. although you might be asked to provide evidence of your preparation in writing.

Remember, the main objective of your contribution is not evaluation but learning and helping your colleagues to learn.

Final project/exam (20 points)

The final project will be assigned in mid-November. It is exclusively an individual effort and must be completed as such. It is due Friday, December 6, 2024.

ATTENDANCE

On-time attendance in all sessions is mandatory. If absenteeism has reached 25 percent (i.e., more than 9 hours), your absences will be reported to the Dean's Designate, the PhD Program Director. You may not be eligible to submit the final project. This UWO policy is outlined at:
http://www.uwo.ca/univsec/pdf/academic_policies/exam/attendance.pdf

See also Western's Policy on Accommodation for Medical Illness at:
www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

In the event of an illness requiring medical documentation, please see the PhD Program office for specific instructions. Note that medical documentation must meet Western's requirements and be submitted to the PhD Program office, not the course instructor. Any non-medical absences from assignments, reports, and examinations must be approved by the PhD Program office and accommodation for such absences will only be granted under extenuating circumstances.

Notice of Absence
If you are unable to attend class, please email the professor in advance. Submitting assignments on time remains your responsibility.

ENROLLMENT RESTRICTIONS

Enrollment in this course is restricted to graduate students in the Ivey PhD Program and any student who has obtained special permission to enroll in this course from the course instructor and the Graduate Chair (or equivalent) from the student's home program.

ACADEMIC OFFENCES: PLAGIARISM AND ACADEMIC INTEGRITY

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at
https://grad.uwo.ca/administration/regulations/13.html

All required papers may be subject to submission for textual similarity review to the commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

SUPPORT SERVICES: HEALTH AND WELLNESS

Students who are in emotional/mental distress should refer to Health and Wellness at Western University https://www.uwo.ca/health/psych/index.html for a complete list of options about how to obtain help. Additionally, students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), program coordinator or other relevant administrators in their unit.

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. See https://www.uwo.ca/health.

ACCESSIBLE EDUCATION WESTERN (AEW)

Western is committed to achieving barrier-free accessibility for all its members, including graduate students. As part of this commitment, Western provides a variety of services devoted to promoting, advocating, and accommodating persons with disabilities in their respective graduate program.

Graduate students with disabilities (for example, chronic illnesses, mental health conditions, mobility impairments) are strongly encouraged to register with Accessible Education Western (AEW), a confidential service designed to support graduate and undergraduate students through their academic program. With the appropriate documentation, the student will work with both AEW and their graduate programs (normally their Graduate Chair and/or Course instructor) to ensure that appropriate academic accommodations to program requirements are arranged. These accommodations include individual counselling, alternative formatted literature, accessible campus transportation, learning strategy instruction, writing exams and assistive technology instruction.