Commerce 4KG3
Data Mining and Business Analytics
Fall 2022 Course Outline

Information Systems
DeGroote School of Business
McMaster University

COURSE OBJECTIVE

Business Analytics (BA) is a technology-driven process for analyzing data and presenting actionable information to help corporate executives, business managers and other end users make more informed business decisions. Students will learn the concepts, techniques, and applications of data mining for business intelligence through lectures, class discussions, hands-on assignments, and seminar presentations. Data mining and business intelligence is a very important topic in information systems area as well as in other areas such as finance, marketing, supply chain management, healthcare etc. It will help students to advance in their future career.

INSTRUCTOR AND CONTACT INFORMATION

Course Instructor	
Dr. Keiwan Wind email: **windkei@mcmaster.ca** Office: TBD Virtual Office: **https://mcmaster.zoom.us/my/windkei** Office Hours: by appointment	Section 01: Mon 8:30 – 11:30 Class Location: DSB B107
Course website: http://www.avenue.mcmaster.ca The course website will be the primary mode of information dissemination. Please check this website regularly for posts concerning the course.	

Teaching Assistants	
Mahdi Abouei **aboueim@mcmaster.ca** will grade four assignments	Bhumik Dedhia **dedhiab@mcmaster.ca** will grade class participation and group projects

COURSE ELEMENTS

Credit Value: 3	Team skills: Yes	IT skills: Yes	Global: Yes
Avenue: Yes	Verbal skills: Yes	Numeracy: No	Political: No
Participation: Yes	Written skills: Yes	Innovation: Yes	Social: Yes

COURSE DESCRIPTION

This advanced commerce course introduces basic data mining technologies and their use for business analytics. Students will learn how to analyze the business needs for knowledge discovery in order to create competitive advantages and how to apply data mining technologies appropriately in order to realize their real business value. Students will gain hands-on experience through assignments and learn from real world practice through seminar presentations.

The course will cover the following topics:

- The need for business intelligence
- Data mining concepts, methods, and process
- Data mining technologies
- Data mining applications
- Data mining case studies

LEARNING OUTCOMES

Upon completion of this course, students will be able to complete the following key tasks:

- Understand the basic concept of business analytics
- Understand the basic concept and the process of data mining
- Learn basic data mining technologies
- Learn how to use business analytics to solve business problems

REQUIRED COURSE MATERIALS AND READINGS

"4KG3 Lecture Notes" available at Avenue course website	Free

[Shmueli] Galit Shmueli, Peter C. Bruce, Mia L. Stephens, and Nitin R. Patel, “Data Mining for Business Analytics: Concepts, Techniques, and Applications with JMP PRO”, John Wiley & Sons, Inc. 2017, (ISBN 978-1-118-87743-2) Hardcopy and E-book are available to buy at Wiley	$135.00
JMP Documents (In JMP software Home window, select help > books)	Free

OPTIONAL COURSE MATERIALS AND READINGS

Reference Textbook (Reserved in INNIS Library)
[Sharda] Ramesh Sharda, Dursun Delen, and Efraim Turban, “Business Intelligence, Analytics and Data Science: A Managerial Perspective”, 4th edition, Pearson Prentice Hall, 2018 (ISBN 978-0-13-463328-2)
$113.80

[Shmueli] Galit Shmueli, Peter C. Bruce, Peter Gedeck, Nitin R. Patel, “Data Mining for Business Analytics: Concepts, Techniques and Applications in Python”, John Wiley & Sons, Inc. 2017, (ISBN 978-1-119-54986-4)
$129.99
Hardcopy and E-book are available to buy at Wiley

Reference Material on the Web
[W1] The resource for business intelligence http://www.businessintelligence.com/
[W2] SAS Business Intelligence http://www.sas.com/technologies/bi/
[W3] Microsoft Business Intelligence http://www.microsoft.com/bi/
[W4] Data warehouse information centre http://www.dwinfocenter.org/
[W5] Guide to Data Mining http://www.data-mining-guide.net/
[W6] BI service Adastra Canada http://www.adastracorp.com/
[W7] Dataset for data mining http://www.kdnuggets.com/datasets/
[W8] Data Mining Book http://www.dataminingbook.com/
[W9] Conferences / Workshops http://www.kmining.com/info_conferences.html
[W10] IBM Power System https://www.ibm.com/power/solutions/bigdata-analytics

COURSE OVERVIEW AND ASSESSMENT

Learning in this course results primarily from reading, in-class discussion, assignments, seminars, and exams. Final exam is in the form of true/false, multiple choices and sort-answer questions. Your final grade will be calculated as follows:

Components and Weights

Component		Weight
Participation	Attendance and engagement report	10%
Quizzes	Weekly quizzes on avenue 1.5% x 10	15%
Four assignments	1) Linear Regression (individual)	15%
	2) Decision tree analysis (individual)	15%
	3) Clustering analysis (individual)	15%
	4) Neural Networks (individual)	15%
Seminar	Proposal: Business analytics applications (group)	3%
	Presentation: Business analytics applications (group)	10%
	Evaluate seminar presentation (individual)	2%
Total		100%

Individual assignments = 87%, Group assignments = 13%

NOTE: The use of a McMaster standard calculator is allowed during examinations in this course.

See McMaster calculator policy at the following URL: www.mcmaster.ca/policy/Students-AcademicStudies/UndergraduateExaminationsPolicy.pdf

At the end of the course your overall percentage grade will be converted to your letter grade in accordance with the following conversion scheme:

Letter Grade	Percent	Letter Grade	Percent
A+	90-100	C+	67-69
A	85-89	C	63-66
A-	80-84	C-	60-62
B+	77-79	D+	57-59
B	73-76	D	53-56
B-	70-72	D-	50-52
		F	0-49

Activity	Delivery	Description	Tool(s)
Lecture Core Content	In-person	Lecture notes and presentation decks	Available on Avenue
Readings	Async	Tied to weekly assigned book chapters and websites	Readings linked in Avenue, from course pack, or in assigned textbook
TA hours	Sync	1hr. live Q & A with TA	Zoom, Microsoft Teams, or in office (by appointment)
Seminar presentation and Group preparation	In person	Synch: Breakout rooms during lecture Asynch: Microsoft Teams private groups	In person: DSB B107
Live Lectures	In person	2hr. live session; opportunity to elaborate on content, present challenges, engage discussion	In person: DSB B107
Group Discussions	Both	Synch: Discussion groups during lecture Asynch: Microsoft Teams private groups	Asynch: Zoom / Microsoft Teams

Course Deliverables

Participation and engagement (10%)

Students are required to attend all the classes, virtual tutorials and actively participate in class discussions. Students are encouraged to engage actively in class discussions related to the material being presented by the instructor or TA. The instructor or the TA can cold-call anyone at any time to engage in discussion. Hence, it is very important that you prepare for each and every class and tutorials as appropriate. Opportunities for in-class participation include: Taking part in discussions during the lecture part of the class by 1) Engaging in class exercises 2) Asking questions 3) Responding to questions posed by the instructor or other students 4) Making relevant comments on material covered. Your class engagement will also be evaluated by posting and answering questions in weekly discussion forum in avenue. Students are required to submit class participation report two times. The progress report is submitted in the middle of the term. Feedback will be provided but will not be graded. However, if you do not submit the progress report, 2 marks (2%) will be deducted. The final report should be submitted at the end of the term and will be graded.

Weekly review Quizzes (15%)

The weekly review quizzes are designed to test your understanding of reading materials. Students are required to read lecture notes and specified textbook chapters each week before taking the quiz. You need to finish the quiz within the specified time period each week and you can attempt only once.

Assignment #1 – Linear Regression (15%)

This assignment assesses the understanding of linear regression principles and how to perform linear regression using JMP software. Students need to predict user car price by using linear regression based on the provided dataset.

Assignment #2 – Classification and Decision tree analysis (15%)

A bank customer dataset will be provided from which the students need to classify customers based on the potential to accept personal loans. The assignment is based on Naive Bayes classification and decision tree methods.

Assignment #3 – Clustering analysis (15%)

This assignment requires students to find clusters in the provided airline passengers' dataset using hierarchical and k-means clustering methods, profile the groups, and discuss the business importance of identified clusters.

Assignment #4 – Neural Networks (15%)

In this assignment, the wineries need to be classified using multiple attributes using neural networks and compare results with the decision tree method.

Group Seminar proposal (3%)

Students are expected to work as a team to present a research topic that investigate the application, the new trend, and the issues associated with data mining and business intelligence. Students are randomly assigned to form a team with up to 5 students and submit a proposal for the topic presentation. The topic of your seminar may be on any contemporary issue relating to data mining technology and business applications. You may search and collect relevant information from news and articles from variety of sources but mainly from Internet. Following are suggested (but not limited) topics to explore:

1. Review business analytics applications in a specific field
2. Business analytics case studies
3. Advances of data mining technologies such as text mining or social network analysis
4. Data mining application issues and success factors
5. New trends of big data and business analytics

The proposal should include the team member name, title, brief description of the topic under investigation, the importance of the topic, and the references. The group seminar is for student teams to learn how the business analytics are actually used in the real word and learn how to work together as a team. Each team member is expected to make equal contribution and receive equal mark. If a team member does not make any contribution, it should be reported by other team members to the TA or instructor. The person who does not contribute to the team work will not receive any mark.

Group Seminar presentation (10%)

Each team should prepare a well-designed PowerPoint presentation file with about 10-15 slides. The file should be submitted to the drop box before presentation. Each team will make 12 minutes presentation plus 3 minutes discussion. You need to have clear focus and to organize your presentation in a very clear and effective way. Each team member is required to present jointly. Student presentation will be evaluated by classmates and the instructor based on the well-defined objectives, the business value of the presentation topic, the interesting content, the useful references, the quality of presentation, and the knowledgeable discussion. During the presentation, each student should peer-review the other teams' presentations.

Seminar Presentation Evaluation (2 %)

Students will be required to evaluate other team's presentation and submit their evaluation report individually. Each student will receive up to 2% for the effort and quality of evaluation. The students' evaluation report will be used as the input for the grading of group seminar presentation.

COMMUNICATION AND FEEDBACK

Students who wish to correspond with instructors or TAs directly via email must send messages that originate from their official McMaster University email account. This protects the confidentiality and sensitivity of information as well as confirms the identity of the student. Emails regarding course issues should NOT be sent to the Area Administrative Assistants.

Instructors may solicit feedback via an informal course review with students by Week #4 to allow time for modifications in curriculum delivery.

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at: www.mcmaster.ca/academicintegrity

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations

AUTHENTICITY/PLAGIARISM DETECTION

In this course we will be using a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. Students will be expected to submit their work electronically either directly to Turnitin.com or via Avenue to Learn (A2L) plagiarism detection (a service supported by Turnitin.com) so can be checked for academic dishonesty. Students who do not wish to submit their work through A2L and/or Turnitin.com must still submit an electronic and/or hardcopy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com or A2L. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). To see the Turnitin.com Policy, please go to: www.mcmaster.ca/academicintegrity.

ONLINE COURSE COMPONENTS

Whenever necessary, we will be using X*, in this course. Students should be aware that when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure.

If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

X* = Microsoft Teams, Zoom, Avenue to Learn, e-mail, LearnLink, web pages, capa, Moodle, ThinkingCap, etc

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

REQUESTING RELIEF FOR MISSED ACADEMIC WORK

Students may request relief from a regularly scheduled midterm, test, assignment or other course components. Please refer to the policy and procedure on the DeGroote website at the link below: http://ug.degroote.mcmaster.ca/forms-and-resources/missed-course-work-policy/

STUDENT ACCESSIBILITY SERVICES

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca.

For further information, consult McMaster University's Policy for Academic Accommodation of Students with Disabilities:

http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation should submit their request, including the dates/times needing to be accommodated and the courses which will be impacted, to their Faculty Office normally within 10 days of the beginning of term or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

POTENTIAL MODIFICATIONS TO THE COURSE

The instructor reserves the right to modify elements of the course during the term. There may be changes to the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

The University reserves the right to change the dates and deadlines for any or all courses in extreme Circumstances (e.g., severe weather, labour disruptions, etc.). Changes will

be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

RESEARCH USING HUMAN SUBJECTS

All researchers conducting research that involves human participants, their records or their biological material are required to receive approval from one of McMaster's Research Ethics Boards before (a) they can recruit participants and (b) collect or access their data. Failure to comply with relevant policies is a research misconduct matter. Contact these boards for further information about your requirements and the application process.

McMaster Research Ethics Board (General board): https://reo.mcmaster.ca/

Hamilton Integrated Research Ethics Board (Medical board): http://www.hireb.ca/

ACKNOWLEDGEMENT OF COURSE POLICIES

Your enrolment in Commerce 4KG3 will be considered to be an implicit acknowledgement of the course policies outlined above, or of any other that may be announced during lecture and/or on A2L. **It is your responsibility to read this course outline, to familiarize yourself with the course policies and to act accordingly.**

Lack of awareness of the course policies **cannot be invoked** at any point during this course for failure to meet them. It is your responsibility to ask for clarification on any policies that you do not understand.

COURSE SCHEDULE (SUBJECT TO POSSIBLE MODIFICATION)

COMMERCE 4KG3 Fall 2023 Course Schedule

W	Date	Topic	Readings/Assignments
1	Sep 12	Introduction to business analytics	[Shmueli] Ch. 1
2	Sep 19	Data mining objectives, functions and process	[Shmueli] Ch. 2 Seminar proposal (due on Sep 30)
3	Sep 26	Learning to use JMP PRO Data exploration and preparation	[Shmueli] Ch. 3, 4
4	Oct 03	Multiple linear regression Case: Predicting Used Car Prices	[Shmueli] Ch. 5, 6 [Shmueli] Ch. 6 Problem 6.1 pp. 150-151 Assignment 1 (due on Oct 10)
5	Oct 10	Spring recession (Reading week)	
6	Oct 17	Classification performance evaluation K-Nearest Neighbors The Naïve Bayes Classifier	[Shmueli] Ch. 7, 8 Class participation progress report (due on Oct 22)
7	Oct 24	Classification and Regression trees Case: Acceptance of Personal Loan	[Shmueli] Ch. 9 [Shmueli] Ch. 9.4 Example 2. p.193 Assignment 2 (due on Oct 31)
8	Oct 31	Guest speech (to be arranged)	Student Presentation Slides (due on Nov 05)
9	Nov 07	Student Seminar Presentation	Student presentation evaluation (due Nov 12)
10	Nov 14	Association rules and cluster analysis Case: EastWest Airlines Frequent Flier Program	[Shmueli] Ch. 14 [Shmueli] Ch. 18.6 Assignment 3 (due on Nov 21)
11	Nov 21	Logistic regression and combining methods	[Shmueli] Ch. 10, 13
12	Nov 28	Neural Nets Case: Winery classification	[Shmueli] Ch. 11, Assignment 4 (due on Dec 05)
13	Dec 05	Business performance management	Class participation final report (due on Dec 10)