K740:
Business Applications of Data Analytics and Artificial Intelligence (AI)
Winter 2021 Course Outline

Information Systems
DeGroote School of Business
McMaster University

COURSE OBJECTIVE

This course intends to equip students with in-depth insight into the application of data analytics and artificial intelligence (AI) in business management. It also provides several opportunities to explore and understand how to implement AI projects through several hands-on activities, the analysis of case examples, and discussions. The course also helps students better anticipate AI's current and future role in the business and humans' everyday lives.

INSTRUCTOR AND CONTACT INFORMATION

Instructor and teaching assistant(s)

Course Instructor	Teaching Assistant
Dr. Keiwan Wind	
Email:	
Office:	Office:
Office Hours: by appointment	Office Hours:

Class Meeting Times and Locations

Section	Days	Times	Location
1	Thursday	2:30 pm – 5:30 pm	TBD

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.

COURSE ELEMENTS

Credit Value: 3	Leadership: Yes	IT skills: Yes	Global view: Yes
Avenue: Yes	Ethics: Yes	Numeracy: Yes	Written skills: Yes
Participation: Yes	Innovation: Yes	Group work: Yes	Oral skills: Yes
Evidence-based: Yes	Experiential: Yes	Final Exam: No	Guest speaker(s): Yes

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COURSE DESCRIPTION

AI is an emerging technology that is increasingly becoming an essential part of our everyday lives. It has already disruptively changed the way we do research and business. AI has given innovative and large organizations competitive advantages in product design, marketing, financial and risk management, operations management, and so on and so forth. New research methods have been introduced because of AI. This course provides students with a high-level overview of what AI is, how it works, and what it can and cannot do. The course addresses different AI technologies with an emphasis on Machine Learning through a variety of teaching and learning activities, including lectures, hands-on activities, case studies, and readings. The course explores the subject of AI from critical, managerial, technical, and statistical perspectives.

LEARNING OUTCOMES

Upon completion of this course, students will be confident to provide informed and experienced opinions about the following key issues:

➢ What AI is and how it can be applied to a specific problem
➢ What various AI technologies are and where and when to use them
➢ What Machine Learning is and how it can revolutionize business management
➢ What deep learning and neural networks are and what they are capable of.
➢ What computer vision and natural language processing (NLP) are and how they transform our world
➢ What the dark side of AI is, and why we need ethics of AI
➢ How to implement AI projects in organizations.

REQUIRED COURSE MATERIALS AND READINGS

From Amazon.ca:

1. Davenport, Thomas H., et al. Artificial Intelligence: The Insights You Need from Harvard Business Review. Harvard Business Press, 2019.
   ISBN: 978-1633697898, Suggested list price: CAD27.06 (Paperback) or CAD16.19 (Kindle version)
2. Tom, T. (2019). Artificial Intelligence Basics: A Non-Technical Introduction. *Monrovia, CA, USA: Appres*.
   ISBN: 978-1484250273, Suggested list price: CAD$41.55 (Paperback) or CAD39.47 (Kindle version)

COURSE OVERVIEW AND ASSESSMENT

Learning in this course results from all in-class and out-of-class activities. Students will be evaluated as individuals and as teams when teamwork is assigned. For in group activities, all team members share the same grade, adjusted by peer evaluation. Missed assignments/exams will receive a grade of zero unless the student has submitted and been approved for a Notification of Absence or McMaster Student Absence Form (MSAF). Your final grade will be calculated as follows:

Components and Weights

Component		Weight
Four assignments	Development and validation of machine learning algorithms (Individual) a. R/Python data and visualiations b. Linear and Logistic Regression c. Multi-class classification d. Clustering	(10% each) 40%
Case presentation (In-group)		20%
Final assignment AI proposal (In-group)		30%
Class participation (Individual)		10%
Total		100%

Individual assignments = 50%, Group assignments = 50%

Assignments

Four assignments have been devised to provide students with first-hand experience with data analysis and machine-learning algorithms. **These assignments are worth 20% of your final grade (5% each) and will be marked individually**. You will be given a few datasets and will be asked to develop machine learning models using Python, R, or Octave. Basic and required R or Python tutorials will be part of every week's course outline, and **there is no need for previous programming experience**.

The objective of the first assignment is to provide students with some hands-on experience with R, Python, or Octave, which are the most popular tools for data analysis and visualization. The second assignment intends to provide students with tools they can use in developing predictive models in organizations. In the third assignment, students will try to use the neural network technique for multi-class classification. The aim of the fourth assignment is to be familiar with clustering and unsupervised learning. Details of each assignment will be described in class.

All answers to assignments must be uploaded to Avenue account, as per instructions provided on the assignments.

Assignments will be accepted after the due date, but **a late penalty will apply where 20% will be deducted from the assignment for each day late**. It is each student's responsibility to submit the assignment in advance of the deadline. Note that work-in-progress can be uploaded to AVENUE – the last version uploaded only will be marked.

Case presentation (Group)

Students will choose a chapter (article) from the course textbook (*Artificial Intelligence: The Insights You Need from Harvard Business Review*) to present as a team. The presentation should cover the implication of the issues raised in the article in business management and society coupled with students' critical perspectives about the subject.

Each presentation will be followed by a discussion led by the presenting team around questions or concerns other students will raise. The activity is worth 20% of your final grade, and team members will share the same grade, which will be calculated as follows:

- The quality of presentation: 5%
- The material of the presentation: 5%
- Critical perspective by students: 5%
- Leading the discussion: 5%

Final assignment

This assignment is worth 30% of your final grade, and one report submitted by the group will be graded. For this assignment, your group will find a situation in which an AI solution could be developed. Through this course, you will be introduced to the different aspects of AI project design and implementation. This assignment will allow you to put what you

learn into practice. You can choose an existing problem from the organization in which you are working or a new idea for which an AI solution is applicable. In the report, you will describe the situation, the availability of data to use in your AI solution, the AI technology you find appropriate for the situation described, resources you will need, and estimated cost and benefit of your AI solution, and operational, ethical, and legal considerations you should address to implement your solution. Your group will do a presentation to the class during one of the last two weeks of the class.

Your report should have the following sections:

- A title page with all group members' names
- An executive summary
- An introduction of the situation or the idea
- A description of available/required data, including data structure, availability, privacy/confidentiality restrictions, and strategies to obtain data.
- An analysis of which AI technology or ML algorithm is appropriate to address the situation.
- A Description of what metrics will be used to evaluate the effectiveness of the AI solution.
- A prediction about what impact implementing the AI solution will have on the organization's customers, operation, marketing, human resources, risk management, and so on.
- Any other information your group feels is important.

The report (25% of final grade) should be no more than 15 pages (excluding appendices), double spaced, in either Word or PDF format. You will have 15 min to present (5% of the final grade) your solution to the class plus 5 min for questions. The slides and report are to be emailed to the instructor by midnight on Friday, April 08, 2022. **The final assignment will not be accepted after the due date.**

In-Class Participation

Students are encouraged to engage actively in discussions related to the material being presented by the instructor and TAs in the synchronous sessions. It is very important that you prepare for each class. Debate and challenge are important activities that help in the learning process, and the willingness of students to engage in such activities is appreciated. Opportunities for in-class participation include:

Taking part in discussions during the lecture part of class by:

- Engaging in class discussions
- Asking questions
- Responding to questions posed by the instructor or other students
- Making relevant comments on material covered

COMMUNICATION AND FEEDBACK

Students who wish to correspond with instructors or TAs directly via email must send messages that originate from their <u>official McMaster University email account</u>. 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 are required to provide evaluation feedback for at least 10% of the final grade to students prior to Week #8 in the term.

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

REQUESTING RELIEF FOR MISSED ACADEMIC WORK

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work" and the link below:

http://ug.degroote.mcmaster.ca/forms-and-resources/missed-course-work-policy/

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. **It is your responsibility to understand what constitutes academic dishonesty.**

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.

For information on the various types of academic dishonesty please refer to the *Academic Integrity Policy,* located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/

The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

AUTHENTICITY/PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software.

All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, 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 a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other

applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

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.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University's *Academic Accommodation of Students with Disabilities* policy.

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 should submit their request to their Faculty Office *normally within 10 working days* of the beginning of term in which they anticipate a need for accommodation 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.

EXTREME CIRCUMSTANCES

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.

ACKNOWLEDGEMENT OF COURSE POLICIES

Your enrolment in Commerce K740 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.

PLACES TO GET HELP WITH YOUR WORK

- For help with course content, your instructor is the best source for help. Feel free to ask the professor for explanation of any topic covered in the course. Be sure to read the assigned materials before contacting the course instructor. The best way to interact with your instructor is e-mail.
- For help with assignments, it is best to first talk to the Teaching Assistants for the course (contact information can be found above).

COURSE SCHEDULE

Business Applications of Data Analytics and Artificial Intelligence (AI) Winter 2022 Course Schedule

Week	Date	Topic covered (Lecture)	Reading *(Artificial Intelligence Basics: A Non-Technical Introduction)* /Assignments	Case *(Artificial Intelligence: The Insights You Need from Harvard Business Review)*
1	13-Jan	What is AI? What it can or cannot do?	Chapter One **Students' introduction and team selection**	*The state of AI in business 1) the business of AI BY THE INSTRUCTOR*
2	20-Jan	Data and AI	Chapter Two Assignment One released	5) Is your company's data actually valuable in the AI era?
3	27-Jan	Machine Learning	Chapter Three	4) Three questions about AI that non-technical employees should be able to answer
4	03-Feb	Supervised learning: linear and logistic regression	Assignment One due: midnight on Wednesday, February 02, 2022. Assignment Two released	7) What will happen when your company's algorithms go wrong?
5	10-Feb	Deep Learning	Chapter Four **Deadline for final assignment subject selection: The end of Class 5.**	3) why companies that wait to adopt AI may never catchup
6	17-Feb	Unsupervised learning	Assignment Two due: midnight on Wednesday, February 16, 2022. Assignment Three released	2) Inside Facebook's AI workshop
7	03-Mar	Robotic Process Automation	Chapter Five	9) Collaborative intelligence: Human and AI are joining forces

8	10-Mar	Ethics of AI	Assignment three due: midnight on Wednesday, March 09, 2022. Assignment Four released	10) Three ways AI is getting more emotional
9	17-Mar	Natural Language Processing	Chapter Six	6) How to choose your first AI project
10	24-Mar	AI and future of work	Assignment Four due: midnight on Wednesday, February 23, 2022.	8) How will AI change work? Here are five schools of thought
11	31-Mar	Implementation of AI	Chapter Eight	11) How AI will change strategy: A thought experiment
12	07-Apr	The future of AI	Chapter Nine	12) the future of AI will be about less data, not more
13	14-Apr	AI proposal presentations	--	--