BUSI 5510
Data Science for Business
Fall 2023

Instructor: Dr. Qi Deng
Email: qi.deng@carleton.ca
Phone: 613-520-2600 x2390
Office: 6031 Nicol Building
Office Hours: Monday 3:00 pm – 5:00 pm

Class Meeting: Thursday 14:35 – 17:25, Nicol Building 4040, In-Person

Course Calendar Description: *Application of advanced quantitative and qualitative techniques to collect, store, clean, analyze and visualize structured and unstructured data. Discussion of data-driven business decision making.*

Course Description: *In today's data-driven landscape, understanding how to derive value from data is a crucial asset for any aspiring business professional. This course aims to equip students with the fundamental understanding and essential skills to harness data analytics using Python. Machine learning techniques will also be introduced. Students will expose to various Python libraries for data analytics, such as, Pandas, Matplotlib, NLTK, Scikit-learn, etc.*

Course Learning Objectives:

This course will help students to become familiar with using Python to conduct data analysis tasks. By doing so, it will give students a foundation from which they can learn more advanced and specialized data analytic skills in the future. Upon completion of this course, students will:

1. gain data science fundamentals, including data retrieving, manipulation, cleaning, and visualization using Python libraries like *Pandas* and *Matplotlib*

2. understand the unique challenges of working with textual data and master basic techniques for text preprocessing, manipulation, and sentiment analysis using Python libraries like *NLTK*

3. dive into the world of machine learning, learning about supervised and unsupervised learning, and training and evaluating simple predictive models using Python libraries like *Scikit-learn*

4. apply your skills to real business scenarios, understanding how companies have leveraged data to optimize operations, enhance customer experiences, and drive innovation

Course Prerequisites: *There is no prerequisite for this course.*

Required Materials:

Textbooks
- Sweigart, A. (2020). Automate the boring stuff with Python: practical programming for total beginners (Second edition.). No Starch Press. (You can access the eBook here for free from the

author's website: https://automatetheboringstuff.com/ or purchase in print online)
- Brains, M. (2023). Python for Data Science and Machine Learning: Zero to Hero. Manning Publications. (This is video learning material; you can access it online via Carleton Library for free)
- Note: Every week we will use electronic learning materials developed in Jupyter provided by the instructor. There will be readings provided throughout the course which could be useful to completing your course deliverables.

Device
- Students need to bring their own laptops for in-class exercises.

Software
- Virtually all technical components of this course will be conducted using Jupyter Notebook running via a distribution of the Python programming languages called Anaconda. This software is entirely open source and can be downloaded using this link. (https://www.anaconda.com/).
- Note: There will be a demo on how to set up the software environment in the beginning of the semester, so you do not need to worry about it if you are unfamiliar with it.

Final Exam Date: *There is no final examination for this course.*

Drop Course Policy: The deadline for academic withdrawal is the last day of classes (each term).

Grading Scheme:

In-class Exercises (10 × 3%)	30%
2 Individual Assignments	25%
Group Project	40%
Feedback to other group presentations	5%
TOTAL	**100%**

Each component of your grade will be assigned a percentage score. Your final course grade will be a weighted average of each of these components.

- In-class exercises: Every week, we will work on small in-class exercises together following the lecture. 10 exercises (from week 2 to 11) must be submitted on Brightspace for 3 points each. The exercises are always due on Wednesday (of the week following when the exercises are released) at 11:55 pm. For example, the exercise released in week 2 will be due on Wednesday of week 3.

- Individual assignments: *Throughout the term, you will do two individual assignments covering various data analytics topics. The assignment format may be a data analytics project, a case analysis project, etc. The objective of these assignments is to help you build the linkages between data analytics skills and concepts and real-world problems.*

- Final group project: *You are expected to form a group of 3-5 members in this course and apply the data analytics skills learned in this class in analyzing real-world data. The purpose of the project is for you to develop an understanding of how data analytics skills can be employed to answer business-related questions and create value for individuals, organizations, or even society. In this group project, you can select a field of interest, develop a series of questions, find online data or collect your own*

data, clean and analyze the data, and report your findings. The group project is subject to the instructor's approval and includes three components described below: (1) Project proposal (5%); (2) Project presentation (10%); (3) Project report (25%). Detailed requirements of the presentation and report will be discussed in class later this semester.

- Feedback to other group presentations: *You will provide the 'rated feedback' to the other groups' presentations in terms of given criteria. The format of feedback will be available later the semester. The instructor will partially incorporate this peer-evaluated rated-feedback into the grades of the group project presentation.*

Note: Peer evaluation will be used for all group works. Details will be available later the semester.

Late Assignments:

To ensure fairness for all students, penalties will be applied to late assignments: Late submission will be penalized 10% of the deliverable grade per day (e.g., an assignment graded 8 marks will be penalized 0.8 marks per day). No late deliverables will be accepted after one week past the stated deadline. Missing deliverable will receive a mark of zero. Requests for extension will be considered in cases of illness, family emergency, or other exceptional circumstances. You must discuss these circumstances with your instructor at least 24 hours before the assignment due date (Note: Discussing the situation is not the same as merely informing your instructor).

Preparation and Participation:

- *You are not expected to be a technical expert or have programming experience to perform well in this course. The course will start from step zero and has an ultimate objective of making you feel comfortable with playing with data using Python.*
- *This course will heavily rely on in-class hands-on exercises. Students are expected to embrace the 'learning by doing' style.*
- *Although this course is less theory-intense, students are still expected to complete the required readings before attending weekly classes.*
- *This course will rely on group works. The objective is to provide students with peer-support when completing the required deliverables. Students are expected to work with peers, contribute to group works, and provide fair feedback to their peers.*

Contribution to Program Learning Goals:

MFIN Learning Goal	Not Covered	Introduced	Taught but Not Assessed	Taught and Assessed
MF1 Ethical and Professional Conduct *Graduates will conduct themselves in alignment with the CFA Code of Ethics and Standards of Professional Conduct.*	✓			

MF2 Financial Markets, Institutions, and Instruments *Graduates will demonstrate an understanding of financial markets, instruments, and institutions.*	✓			
MF3 Portfolio Management *Graduates will understand the motivations of investors and manage an investment portfolio that achieves those objectives.*	✓			
MF4 Data Analysis *Graduates will be proficient in data management, analytics, and modeling.*				✓
MF5 Communication *Graduates will be effective communicators.*		✓		

ADDITIONAL INFORMATION

Course Sharing Websites:

Materials created for this course (including presentations and posted notes, labs, case studies, assignments and exams) remain the intellectual property of the author(s). They are intended for personal use and may not be reproduced or redistributed without prior written consent of the author(s).

Recommended Calculator for Examinations:

If you are purchasing a calculator, we recommend any one of the following options: Texas Instruments BA II Plus (including Pro Model), Hewlett Packard HP 12C (including Platinum model), Staples Financial Calculator, Sharp EL-738C & Hewlett Packard HP 10bII

Group Work:

The Sprott School of Business encourages group assignments. They provide you with opportunities to develop and enhance interpersonal, communication, leadership, followership and other group skills. Group assignments are also an effective way to learn integrative skills for putting together a complex task. Your professor may assign one or more group tasks, assignments, or projects in this course. Before embarking on a specific problem as a group, it is your responsibility to ensure that the problem is meant to be a group assignment and not an individual one.

(If peer evaluation will be used as an input when assigning grades to group work, specify the procedure. An example appears below.)

Peer Evaluation for Group Work

To deter social loafing and ensure fairness in grading, you will be asked to assess the contribution of your fellow group members. This information will be used when assigning the grade for the final project. The procedure is as follows: Each student should take 100 points and allocate those points to the various members of the group (including him/her/themself) to reflect the contributions made by each member. For instance, if there are four members in a group and everyone contributed equally, each individual would receive 25 points. Conversely, if an individual contributed relatively little, the remaining group members might allocate few points to that member. To ensure that these peer evaluation scores are reasonable and free from personal bias, you will be asked to provide a detailed written explanation for your point allocation.

Letter Grades:

In accordance with the Carleton University Undergraduate Calendar (p. 34), the letter grades assigned in this course will have the following percentage equivalents:

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

Grades entered by Registrar:
    WDN = Withdrawn from the course
    DEF = Deferred

Academic Regulations:

University rules regarding registration, withdrawal, appealing marks, and most anything else you might need to know can be found on the university's website, here:
http://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/

Requests for Academic Accommodation:

You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

- **Pregnancy**
  Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

- **Religious Obligations**
  Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: https://carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf

- **Students with Disabilities**
  If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. https://carleton.ca/pmc/

- **Survivors of Sexual Violence**
  As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and its survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: https://carleton.ca/sexual-violence-support/

- **Student Activities**
  Carleton University recognizes the substantial benefits, to both the individual student and the university, that result from participating in activities beyond the classroom experience. Reasonable accommodation will be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first

two weeks of class, or as soon as possible after the need for accommodation is known to exist. https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf

For more information on academic accommodation, please contact the departmental administrator or visit: https://students.carleton.ca/course-outline/

Academic Integrity:

Violations of academic integrity—presenting another's ideas, arguments, words or images as your own, using unauthorized material, misrepresentation, fabricating or misrepresenting research data, unauthorized co-operation or collaboration or completing work for another student—are a serious academic offence, weaken the quality of the degree, and will not be tolerated. Penalties may include; a grade of Failure on the submitted work and/or course; academic probation; a refusal of permission to continue or to register in a specific degree program; suspension from full-time studies; suspension from all studies at Carleton; expulsion from Carleton, amongst others. Students are expected to familiarize themselves with and follow the Carleton University Student Academic Integrity Policy which is available, along with resources for compliance at: https://carleton.ca/registrar/academic-integrity/

Centre for Student Academic Support:

The Centre for Student Academic Support (CSAS) is a centralized collection of learning support services designed to help students achieve their goals and improve their learning both inside and outside the classroom. CSAS offers academic assistance with course content, academic writing and skills development. Visit CSAS on the 4th floor of MacOdrum Library or online at: https://carleton.ca/csas/

Other Important Information:

- Students must always retain a hard copy of all work that is submitted.
- All final grades are subject to the Dean's approval.
- For us to respond to your emails, we need to see your full name, CU ID, and the email must be written from your valid CARLETON address. Therefore, in order to respond to your inquiries, please send all email from your Carleton cmail account. If you do not have or have yet to activate this account, you can do so by visiting https://carleton.ca/its/get-started/new-students-2/

Covid-19 Information:

> It is important to remember that COVID is still present in Ottawa. The situation can change at any time and the risks of new variants and outbreaks are very real. There are a number of actions you can take to lower your risk and the risk you pose to those around you including being vaccinated, wearing a mask, staying home when you're sick, washing your hands and maintaining proper respiratory and cough etiquette.

> **Feeling sick?** Remaining vigilant and not attending work or school when sick or with symptoms is critically important. If you feel ill or exhibit COVID-19 symptoms do not come to class or campus. If you feel ill or exhibit symptoms while on campus or in class, please leave campus immediately. In all situations, you must follow Carleton's symptom reporting protocols.

> **Masks:** Carleton has paused the COVID-19 Mask Policy, but continues to strongly recommend masking when indoors, particularly if physical distancing cannot be maintained. It may become

necessary to quickly reinstate the mask requirement if pandemic circumstances were to change.

Vaccines: Further, while proof of vaccination is no longer required as of May 1 to attend campus or in-person activity, it may become necessary for the University to bring back proof of vaccination requirements on short notice if the situation and public health advice changes. Students are strongly encouraged to get a full course of vaccination, including booster doses as soon as they are eligible, and submit their booster dose information in cuScreen as soon as possible. Please note that Carleton cannot guarantee that it will be able to offer virtual or hybrid learning options for those who are unable to attend the campus.

All members of the Carleton community are required to follow requirements and guidelines regarding health and safety which may change from time to time. For the most recent information about Carleton's COVID-19 response and health and safety requirements please see the University's COVID-19 website and review the Frequently Asked Questions (FAQs). Should you have additional questions after reviewing, please contact covidinfo@carleton.ca.

COURSE SCHEDULE

NOTE: While every attempt will be made to keep to the schedule listed below, unforeseen circumstances may necessitate modifications throughout the semester.

Session / Date	Topic / ICE & Assignment	Reading
1 / Sept 7	Course Overview	Required: Sweigart (2020) Ch. 0 & 1
2 / Sept 14	Getting started with Python I / ICE1	Required: Sweigart (2020) Ch. 2 & 3 Recommended: Brains (2023): Course Content
3 / Sept 21	Getting started with Python II / ICE2	Sweigart (2020) Ch. 4 & 5
	Assignment 1 due on Sept 27 at 11:55 pm	
4 / Sept 28	Data Retrieving, Cleaning, Exploration & Visualization I / ICE3	Required: Sweigart (2020) Ch. 13 & 16 Recommended: Sweigart Chapters 6, 7 and 9.
5 / Oct 5	Data Retrieving, Cleaning, Exploration & Visualization II / ICE4	Required: 10 minutes to pandas. Pandas User Guide. Recommended: Brains (2023): DataFrames and Series in Python's Pandas Brains (2023): Data Cleaning Techniques for Better Data
6 / Oct 12	Data Retrieving, Cleaning, Exploration & Visualization III / ICE5	Required: Visualization. Pandas User Guide. (Click Here.) Tutorials – Introductory. Matplotlib. (Click Here.) Recommended: Brains (2023): Exploratory Data Analysis in Python Brains (2023): Python for Data Validation: Library, Resources and Sample Graphs
	Assignment 2 due on Oct 18 at 11:55 pm	
7 / Oct 19	Natural Language Processing I / ICE6	TBD
October 23-27, 2023: Fall break, no classes.		
	Project proposal due on Nov 1 at 11:55 pm	
8 / Nov 2	Natural Language Processing II / ICE7	TBD
9 / Nov 9	Machine Learning I / ICE8	Required: Davidson, J. (2018). No, machine learning is not glorified statistics. (Click Here.) Scikit Learn (2023). An introduction to machine learning with scikit-learn. (Click Here.) Recommended: Brains (2023): The Basics of Machine Learning
10 / Nov 16	Machine Learning II / ICE9	TBD
11 / Nov 23	Working with AI for data analysis / ICE10	TBD
12 / Nov 30	Group Project Presentation	
	Group Project Report due on December 8 at 11:55 pm	