FINANCE 704
Numerical Methods
Winter 2025 Course Outline

Master of Finance
DeGroote School of Business
McMaster University

COURSE OBJECTIVE

The objective of this course is the get student familiar with algorithms and data used in the financial industry.

INSTRUCTOR AND CONTACT INFORMATION

Instructor: **TA:**
Michael Milewski   See Avenue
milewsmr@mcmaster.ca
Office House: By Appointment
Class Location: See Mosaic

COURSE ELEMENTS

Credit Value:	3	Leadership:	No	IT skills:	Yes	Global view:	No
A2L:	Yes	Ethics:	Yes	Numeracy:	Yes	Written skills:	Yes
Participation:	No	Innovation:	Yes	Group work:	Yes	Oral skills:	Yes
Evidence-based:	Yes	Experiential:	Yes	Final Exam:	No	Guest speaker(s):	No

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COURSE DESCRIPTION

This course will introduce students to machine learning algorithms that are becoming more commonly used in the financial industry. Student will be exposed to programming using Python and alternative sources of data including but not limited to ESG scores, climate risk and textual analysis.

LEARNING OUTCOMES

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

➢ Program Machine Learning algorithm in Python using Scikit-Learn.

➢ Understand how regression and classification algorithms work.

➢ Understand how to measure the performance of machine learning algorithms.

➢ Knowledge of alternative data sources used and finance.

➢ Processing techniques for alternative data sources using Python.

COURSE MATERIALS AND READINGS

Required:
- Book A: Geron, Aurelien, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, 3rd Edition, O'Reilly, 2022, 978-1098125974
  Available through McMaster Library (eBook):
  https://mcmaster.primo.exlibrisgroup.com/permalink/01OCUL_MU/deno1h/alma991033763854407371

Optional:
- Book B: Muller, Andreas and Guido, Sarah. Introduction to Machine Learning with Python: A Guide for Data Scientists, 1st Edition, O'Reilly, 2016, 978-1449369415
  Available through McMaster Library (eBook):
  https://mcmaster.primo.exlibrisgroup.com/permalink/01OCUL_MU/deno1h/alma991033764623207371

EVALUATION

Missed tests/exams not approved by the MFIN Program Office will receive a grade of zero. Late assignments will be penalized 10% for each day they are late.

The course evaluation is primarily based on group work. Individuals are expected to contribute equally to their group. Individuals who are identified as shirking their responsibility will be award grades based on their relative contribution to the assignment.

Your final grade will be calculated as follows:

Components and Weights

Assignment #1	30%
Assignment #2	35%
Presentation	5%
Quizzes	10%
Participation	10%
Project Management Plans	10%
Total	100%

Grade Conversion

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

Grade	Equivalent Percentages	Pass/Fail
A+	90-100	P+
A	85-89	P
A-	80-84	
B+	75-79	
B	70-74	
B-	60-69	
F	59 and under	F

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 are required to provide evaluation feedback for at least 10% of the final grade to students prior to Week #9 in the term. Instructors may solicit feedback via an informal course review with students by Week #4 to allow time for modifications in curriculum delivery.

Course Deliverables

Assignment #1 – Classification

This assignment is worth 30**%** of your final grade and will be marked as a group with individual contribution taken into consideration.

Assignment #2 – Regression

This assignment is worth 35**%** of your final grade and will be marked as a group with individual contribution taken into consideration.

Project Management Plans

Each plan is worth 5% of your final grade, for a total of 10% and will be marked as a group.

Outline the roles and responsibilities for the machine learning assignments. Make sure that you evenly distribute the technical work among group members.

Quizzes

There will be at least 5 in-class quizzes throughout the semester assessing the understanding of Machine Learning concepts covered in class and Python programming. One week notice will be given for each quiz. The quizzes will be combined worth 10% of your final grade.

Participation

Participation is worth 10% of your final grade and is used to encourage active learning of the material. The grade will be earned through attending class (0.5%), or completing an assigned course on DataCamp (0.5%). The maximum that can be achieved is 10% of your final grade.

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

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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.

REQUESTING RELIEF FOR MISSED ACADEMIC WORK

Missed Examinations / Tests / Class Participation
Students can apply for relief from missed term work if they have or are going to miss an evaluated portion of their course. Please contact the Program Administrator for more information.
Reasons for missing course work can include:
- Health-related or extenuating circumstances
- Work-related commitments (for part-time students only)
- Representing the University at an academic or varsity event
- Religious obligations
- Conflicts between two (or more) overlapping scheduled mid-term exams.

Requesting Relief for Missed Term Work
When students miss regularly scheduled term work which contributes 10% or less to the final grade, the activity necessary to compensate for the missed work will be determined by the course instructor. The compensatory activities assigned will vary with the nature of the course and the missed requirement. They include, but are not restricted to, an alternative assignment, a rescheduled midterm exam, or re-weighting the marks for the missed component to other mark components. For missed work which exceeds 10% of the course grade, forms and supporting documentation must be submitted to the Program Administrator within five (5) business days of missing the work or mid-term exam.

Missed Final Exams
Students must be available for the duration of the posted exam period regardless of their personal exam schedule. This is to ensure student availability throughout the entire exam period in the event that an exam must be rescheduled due to unforeseen circumstances (university closure, power outage, storm policy, etc.). A student who misses a final examination without valid reason will receive a mark of 0 on the examination.

Requesting Relief for Term Work in Advance

If evaluated term work is missed, students can request relief/special arrangement in advance. Supporting documentation must be submitted to the Program Administrator at least ten (10) working days before the mid-term exam, test, assignment, etc. The program administrator will provide the required forms to the student. Please complete the Petition for Missed Term Work form in addition to:

- For medical reasons the McMaster University Student Health Certificate and for extenuating circumstances, appropriate documentation is required.
- Due to a business commitment (for part-time students only), have your immediate supervisor provide you with a letter on the company letterhead stating that you are unable to be present due to a specific job commitment.
- For varsity reasons, have a designated University official provide a letter on university letterhead.

In all cases, the request must be handled by The Program Administrator. The appropriate distribution of re-weighting term work will be determined by the instructor. Submitting a request does not guarantee approval or special consideration.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Student Accessibility Services (SAS) offers various support services for students with disabilities. Students are required to inform SAS of accommodation needs for course work at the outset of term. Students must forward a copy of such SAS accommodation to the instructor normally, within the first three (3) weeks of classes by setting up an appointment with the instructor. If a student with a disability chooses NOT to take advantage of an SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. The SAS website is:

http://sas.mcmaster.ca

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.

POTENTIAL MODIFICATION 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.

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.

ACKNOWLEDGEMENT OF COURSE POLICIES

Your enrolment in FINANCE 704 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.

DeGroote
SCHOOL OF BUSINESS
EDUCATION WITH PURPOSE

McMaster University

COURSE SCHEDULE

FINANCE 704
Numerical Methods
Winter 2025 Course Schedule

Week	Date	Topic	Reading	Due Dates*	Application
1	Jan 5th	Introductions Review of Programming	Book A: Chapter 1 & 2		
2	Jan 12th	Classification Algorithms	Book A: Chapter 3		Default Risk
3	Jan 19th	Regression Algorithms	Book A: Chapter 4		Housing Prices
4	Jan 27th	SVM & Decision Trees	Book A: Chapter 5 & 6	PMP 1	Default Risk
5	Feb 3rd	Ensemble Learning and Random Forests	Book A: Chapter 7		Housing Prices
6	Feb 10th	Preprocessing & Clustering	Book A: Chapter 8 & 9		10K Topic
	Feb 17th	Reading Week			
7	Feb 24th	Neural Networks	Book A: Chapter 10 & 11	Assign 1	Realized Volatility
8	Mar 3rd	Neural Networks	Book A: Chapter 12 & 13		Realized Volatility
9	Mar 10th	Sentiment analysis and NLP	Book A: Chapter 15	PMP 2	ChatGPT Sentiment
10	Mar 17th	Sentiment analysis and NLP	Book A: Chapter 15		10K Sentiment
11	Mar 24th	Image Processing	Book A: Chapter 14		Satellite Images
12	Mar 31st	Image Processing			ChatGPT Technical Analysis
13	Apr 7th	Presentations		Assign 2	

*Due Dates are subject to change. Updates will be posted to Avenue.