Rotman Commerce
UNIVERSITY OF TORONTO

Course Outline

Course Code	RSM 338 H1 S
Course Name	Applications of Machine Learning in Finance
Term, Year	Winter, 2024
Course Schedule	L0101 – Monday 1-3 p.m. HI; L0201 – M 9-11 a.m. WO
Web page URL	https://q.utoronto.ca

Instructor Details

Name	Email	Phone	Office Hours	Virtual Office Link
Zissis Poulos	zissis.poulos@rotman.utoronto.ca	647-272-8506	Monday 3-4pm & Thursday 4-5pm	Room 457 and Zoom link TBA

Course Scope, Mission and Learning Outcomes

Data science is having an increasing impact on the financial sector. Examples of areas where it has been applied are: credit decisions, private equity, algorithmic trading, fraud detection, understanding customer behavior, hedging, and asset management.

This course will introduce students financial business insights from industry practitioner's perspectives and the tools of machine learning with emphasis on their applications in finance. Students will learn enough about machine learning to be able to work productively with data science specialists. This is likely to be an essential skill for finance professionals in the future. The course will cover the main techniques used by data scientists to handle large data sets for prediction, clustering, and interacting with a changing environment. Students are not expected to become programming experts but will gain familiarity with Python. This language is widely used in the finance sector and is particularly useful for handling large data sets. (Python is the new Excel!) Pre-course Python training is provided.

Course Prerequisites / Exclusions

Prerequisite: ECO220Y1/ ECO227Y1/(STA220H1, STA255H1)/(STA237H1, STA238H1)/(STA257H1, STA261H1); CSC108H1/ CSC148H1
Exclusions: RSM358H1; RSM316H1 (Special Topics in Management: Machine Learning), offered in Winter 2020/Fall 2020/Winter 2021

Recommended Prerequisite: Introduction to Python by RC Coding Cafe

Course Materials

Required Readings

Item	Title	Required?	Location
Textbook	Machine learning in Business: An Introduction to the World of Data Science, 3rd Edition John Hull. This is the main text. It can be purchased from amazon.ca.	Required	Purchase from amazon.ca: https://www.amazon.ca/dp/B095L19RG7

Electronic Course Materials

This course will be using the following electronic course materials: None

These materials will cost a total of $0.00. The use of these materials complies with all University of Toronto policies which govern fees for course materials.

Evaluation and Grades

Grades are a measure of the knowledge and skills developed by a student within individual courses. Each student will receive a grade on the basis of how well they have command of the course materials, skills and learning objectives of the course.

Work	Percentage of grade	Due Date /Time	Delivery	Ouriginal
Assignment 1 on Python (individual)	10	Jan 22	Quercus	☐
Assignment 2 (individual)	10	Feb 5	Quercus	☑
Project 1 (group)	10	Feb 26	Quercus	☑
Project 2 (group)	10	Mar 11	Quercus	☑
Project 3 and Presentations (group)	10	Mar 25	Quercus	☐
Class Participation	10	Ongoing	Select or enter	☐
Final Exam (individual)	40	TBD	TBD	☐

Course Format and Expectations

There will be two individual assignments, three group projects and one group presentation. The assignments and projects cover various aspects of data analysis and the implementation of machine learning methodologies.

You are encouraged to work and collaborate with your colleagues. You should, however, independently write up your own answers for individual assignments. The group projects are to be done in a group of four to six. Students as a group will also select a ML related topic to research for project 3 and present the findings to the class.

Both assignments and project reports are due at the start of the class and late ones are not accepted. Except for unusual circumstances, grades on assignments and projects are final and re-grading requests will not be accepted.

The course requires the use of Python. Rotman FinHub provides a pre-course Python for Business training in August to get students better prepared for the class.

Writing Assignments or Presentations

Project 3 is intended to help you develop your communication skills. How well you communicate your ideas, in writing or orally, will be considered in the evaluation of the assignment. In your written assignments, you should aim for clarity, strong organization, concision, professionalism, and correct grammar. Your presentations should reflect strong planning and organization, clarity of speech, and an engaging demeanour. Sources, whether in written or presentation assignments, should always be correctly attributed.

Support is available through the RC Centre for Professional Skills (CPS) for students who would like help or feedback on their writing or speaking (presentations). CPS offers both individual and group appointments with trained writing instructors and presentation coaches who are familiar with the RC program and common types of business assignments. You can also access your college Writing Centres for help with written assignments.

You can book an appointment with a writing or presentation coach through the RC Centre for Professional Skills Writing Centre. For more information about writing centres, student supports, and study resources, see the Writing and Presentation Coaching academic support page.

Team or Group Assignments

Project 1, 2 and 3 requires students to work in teams of four to six. Learning to work together in teams is a crucial transferrable skill you will use not only in your coursework, but also in your future careers. Support is available if you encounter common teamwork challenges such as:

- Team members feeling left out of the team.
- Team members not responding in a timely manner to communication.
- Division or quality of work among team members being unequal or unfair.

Consult the Centre for Professional Skills Teamwork Resources page for tips, strategies, and best practices. You can also book an appointment with a teamwork mentor through the RC Centre for Professional Skills Writing Centre. Teamwork mentors can help you resolve or mitigate conflict, strategize on planning, or improve team communication.

If you are a student registered with Accessibility Services, and extensions are one of your academic accommodations, consult with your Accessibility Advisor about the teamwork in this course.

Class Participation

Students are expected to prepare thoroughly and make every effort to attend every class. As class participation is a graded component of the course, students will be evaluated on the following:

- Thoughtful responses
- Understanding and analysis of topic
- Idea generation
- Promoting further discussion

Missed Tests and Assignments

Students who miss a test or assignment for reasons entirely beyond their control (e.g. illness) may request special consideration **within 2 business days** of the missed midterm/test / assignment due date.

In such cases, students must:

1. Complete the Request for Special Consideration form: https://uoft.me/RSMConsideration
2. Provide documentation to support the request, eg. Absence Declaration from ACORN, medical note etc.

Please note: As of September 2023, students may use the Absence Declaration on ACORN ***one time per term*** to report an absence and request consideration. **Any subsequent absence will require a Verification of Illness form or other similar relevant documentation.**

Students who do not submit their requests and documentation within 2 days may receive a grade of 0 (zero) on the missed course deliverable.

Late Assignments

All assignments are due on the date and at the time specified in Quercus. Late submissions will normally be penalized by 100% if the assignment is not received on the specified date, at the specified time.

Statement on Equity, Diversity and Inclusion

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.

Commitment to Accessibility

The University is committed to inclusivity and accessibility, and strives to provide support for, and facilitate the accommodation of, individuals with disabilities so that all may share the same level of access to opportunities and activities offered at the University.

If you require accommodations for a temporary or ongoing disability or health concern, or have any accessibility concerns about the course, the classroom or course materials, please email Accessibility Services or visit the Accessibility Services website for more information as soon as possible. Obtaining your accommodation letter may take up to several weeks, so get in touch with them as soon as possible. If you have general questions or concerns about the accessibility of this course, you are encouraged to reach out to your instructor, course coordinator, or Accessibility Services.

Ouriginal

Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the University's Plagiarism Detection Tool FAQ page from Centre for Teaching Support & Innovation.

Generative AI / ChatGPT

Students may use artificial intelligence tools, including generative AI, in this course as learning aids or to help produce assignments and projects. However, students are ultimately accountable for the work they submit.

Academic Integrity

Academic Integrity is a fundamental value essential to the pursuit of learning and scholarship at the University of Toronto. Participating honestly, respectfully, responsibly, and fairly in this academic community ensures that the U of T degree that you earn will continue to be valued and respected as a true signifier of a student's individual work and academic achievement. As a result, the University treats cases of academic misconduct very seriously.

The University of Toronto's Code of Behaviour on Academic Matters outlines the behaviours that constitute academic misconduct, the process for addressing academic offences and the penalties that may be imposed. You are expected to be familiar with the contents of this document. Potential offences include, but are not limited to:

In papers and assignments

- Using someone else's ideas or words without appropriate acknowledgement.
- Submitting your own work in more than one course without the permission of the instructor.
- Making up sources or facts.
- Obtaining or providing unauthorized assistance on any assignment (this includes collaborating with others on assignments that are supposed to be completed individually).

On test and exams

- Using or possessing any unauthorized aid, including a cell phone.
- Looking at someone else's answers.
- Misrepresenting your identity.
- Submitting an altered test for re-grading.

Misrepresentation

- Falsifying institutional documents or grades.
- Falsifying or altering any documentation required by the University, including (but not limited to) medical notes.

All suspected cases of academic dishonesty will be investigated by the procedures outlined in the *Code of Behaviour on Academic Matters.* If you have any question about what is or is not permitted in the course, please do not hesitate to contact the course instructor. If you have any questions about appropriate research and citation methods, you are expected to seek out additional information from the instructor or other U of T or RC resources such as the RC Centre for Professional Skills, the College Writing Centres or the Academic Success Centre.

Email

At times, the course instructor may decide to communicate important course information by email. As such, all U of T students are required to have a valid UTmail+ email address. You are responsible for ensuring that your UTmail+ email address is set up and properly entered on ACORN. For more information visit the Information Commons Help Desk.

Forwarding your utoronto.ca email to a Gmail or other type of email account is not advisable. In some cases, messages from utoronto.ca addresses sent to Gmail accounts are filtered as junk mail, which means that important messages from your course instructor may end up in your spam or junk mail folder.

Recording Lectures

Lectures and course materials prepared by the instructor are considered by the University to be an instructor's intellectual property covered by the Canadian Copyright Act. Students wishing to record a lecture or other course material in any way are required to ask the instructor's explicit permission, and may not do so unless permission is granted. Students who have been previously granted permission to record lectures as an accommodation for a disability are excepted. This includes tape recording, filming, photographing PowerPoint slides, Quercus materials, etc.

If permission for recording is granted by the instructor (or via Accessibility Services), it is intended for the individual student's own study purposes and does not include permission to "publish" them in any way. It is forbidden for a student to publish an instructor's notes to a website or sell them in any other form without formal permission.

Weekly Schedule

Class #	Date	Topics	Deliverables	Readings
1	Jan 8	Introduction & Digital Transformation of the Financial Industry		Hull Ch 1
2	Jan 15	Unsupervised learning		Hull Ch 2
3	Jan 22	Supervised Learning with Linear and Logistic Regression	Assignment 1 due Jan 22	Hull Ch 3
4	Jan 29	Decision Trees		Hull Ch 4
5	Feb 5	Neural Networks	Assignment 2 due Feb 5	Hull Ch 6
6	Feb 12	Deep Neural Network Applications		Hull Ch 7
7	Feb 19	Reading Week		
8	Feb 26	Natural Language Processing (NLP)	Project 1 due Feb 26	Hull Ch 9
9	Mar 4	Large Language Models and Applications		Hull: Ch 9
10	Mar 11	Reinforcement Learning and Applications	Project 2 due Mar 11	Hull Ch 8
11	Mar 18	Model Interpretability, Fairness and MLOps		Hull Ch 10
12	Mar 25	Group Presentations	Project 3	TBA
13	Apr 1	Group Presentations	Project 3	TBA
Final Exam	**Exam Period (the Program or Registrar's Office will communicate)**			

Please note that the last day you can drop this course without academic penalty is March 11, 2024.

Other Useful Links

- Become a volunteer note taker
- Accessibility Services Note Taking Support
- Credit / No-Credit in RSM courses
- Rotman Commerce Academic Support

URL links for print

- Book an appointment with a writing or presentation coach: http://uoft.me/writingcentres
- Writing and Presentation Coaching academic support page: https://rotmancommerce.utoronto.ca/current-students/academic-support/writing-and-presentation-coaching/
- Centre for Professional Skills Teamwork Resources page: https://rotmancommerce.utoronto.ca/teamwork-resources
- Book an appointment with a Teamwork Mentor: http://uoft.me/writingcentres
- Request for Special Consideration Form: https://rotmancommerce.utoronto.ca/current-students/forms-requests-and-appeals/forms/
- ACORN: http://www.acorn.utoronto.ca/
- Email Accessibility Services: accessibility.services@utoronto.ca
- Accessibility Services website: http://studentlife.utoronto.ca/as
- University's Plagiarism Detection Tool FAQ: https://uoft.me/pdt-faq
- The University of Toronto's Code of Behaviour on Academic Matters: http://www.governingcouncil.utoronto.ca/policies/behaveac.htm
- Information Commons Help Desk: http://help.ic.utoronto.ca/category/3/utmail.html
- Become a volunteer note taker: https://studentlife.utoronto.ca/program/volunteer-note-taking/
- Accessibility Services Note Taking Support: https://studentlife.utoronto.ca/service/note-taking-support/
- Credit / No-Credit in RSM courses: https://rotmancommerce.utoronto.ca/current-students/degree-requirements/credit-no-credit-option/
- Rotman Commerce Academic Support: https://rotmancommerce.utoronto.ca/current-students/academic-support/