Rotman Commerce
UNIVERSITY OF TORONTO

Course Outline

RSM 456 H1
Big Data and Marketing Analytics
Winter 2022
Course Meets: Wednesday – 17:00-19:00 (L5101), 19:00-21:00 (L5201), Location: OI 5250

Instructor:	Hemant Sangwan
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Course Scope, Mission, and Learning Outcomes

The course is designed to introduce students to tools used in marketing analytics. Companies have been collecting vast databases to aid them in making sound marketing decisions. Examples include retail scanner panel data which keeps track of customers' purchase histories, loyalty-program data monitoring purchasing under different promotional environments, social network and online shopping history data. The course uses several marketing data sources to illustrate how to use statistical marketing models to evaluate the impacts of marketing-mix, and manage customer lifetime value.

The objectives of this course are:

1. to develop your decision-making skills and deepen your logical analysis skills
2. to expose you to the main concepts of Big Data and Marketing analytics.
3. to learn how to define the problem and propose a research study with investigation and characterization in order to better understand the goal
4. to manipulate and prepare data
5. to analyze data using descriptive statistics and visualization to better understand the data
6. to learn about and apply machine learning algorithms, to evaluate them and to select the ones to investigate further to improve the results
7. to make predictions and present results and thereby improve presentation skills
8. to gain knowledge about the tools to create accurate models and work projects end-to-end
9. to acquire related programming skills

Course Prerequisites

Prerequisite: ECO220Y1/ECO227Y1/(STA220H1, STA255H1)/(STA237H1, STA238H1) /(STA257H1, STA261H1)

Exclusion: RSM411H1 (Special Topics in Management: Marketing Data, Models and Decisions)

Course Materials

Required Readings

- Materials posted on Quercus (e.g. slides, articles, links, videos, etc.)
- Python Download and Installation
  - Installation link. Retrieved from https://www.anaconda.com/products/individual
  - Installation Guide. Retrieved from https://docs.anaconda.com/anaconda/install/
  - Anaconda Distribution Starter Guide. Retrieved from https://docs.anaconda.com/_downloads/9ee215ff15fde24bf01791d719084950/Anaconda-Starter-Guide.pdf
  - Getting anaconda. FAQs. Retrieved from https://docs.anaconda.com/anaconda/user-guide/faq/

- **Suggested Readings**: Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython by Wes McKinney (latest edition).

Electronic Course Materials

This course will be using the following electronic course materials:

- Materials on Quercus (e.g. slides, articles, video, case studies, etc.)
- DataCamp (https://www.datacamp.com) will be provided at **NO** additional **COST** to you.
- I strongly recommend you install the full Python ANACONDA distribution on your laptop, which you need to bring to class to work on coding exercises. https://www.anaconda.com/download/ The ANACONDA distribution is open source

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 performance of a student in individual courses. Each student shall be judged on the basis of how well they have command of the course materials.

Work	Type	Weight	Due date
Datacamp modules (individual)	Individual coding exercises (Datacamp)	12%	Ongoing (March 27th for all modules)
Research requirement (BRL)	Individual research participation	3%	April 2nd
Group project			
Group project–Part A	Data manipulation and analysis (code + report)	12%	Feb 28th
Group project–Part B	Data modeling and recommendations (code + final report)	13%	March 24th

Term Test 1 (individual)		17%	Feb 15th
Term Test 2 (individual)		18%	March 22nd
Term Test 3 (individual, cumulative)		25%	April 5th

Course Format and Expectations

RC Centre for Professional Skills Writing and Presentation Support:

Please note that **clear, concise and correct writing and/or speaking** will be considered in the evaluation of ALL Assignments. You may lose points for writing or presenting that impedes communication: poor organization, excessive wordiness, hard-to-follow sentence structure, grammatical errors, or distracting tone, pace or body language.

Students who require support or would like to develop their writing or presenting skills are encouraged to book an appointment with writing and presentation coaches offered by the RC Centre for Professional Skills. CPS offers both individual and group appointments with trained writing instructors and presentation coaches who are familiar with the RC program and common genres of business assignments.

For students seeking help with writing skills, these coaches can provide feedback on idea organization, paragraph development, sentence structure, or spelling mistakes and grammatical errors. You can also access your college Writing Centres for help with written assignments.

For students seeking help with presentation skills, coaches can help with the structure of your presentation, with voice, body language and proper transitions, as well as persuasive speaking and connecting with the audience.

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.

Group Assignment:

The group project requires students to work in teams of 4-6 students (self-selected), 5 per group is the most preferred i.e., they will work together to conduct required analysis and submit it on Quercus as per the guidelines. Working as a team is challenging; this is true both in the real world and in your academic classes. However, learning to work together in teams is an important aspect of your education and preparation for 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.

Missed Tests and Assignments (including mid-term and final-term assessments)

Students who miss a test or assignment for reasons entirely beyond their control (e.g. illness) may request special consideration.

In such cases, students must:

1. Notify the instructor AND the Rotman Commerce Program Office **on the date** of the missed course deliverable, e.g. missed test, final assessments, assignment or class (in the case of participation marks).
2. Complete a Request for Special Consideration Form and submit it along with your Absence Declaration on ACORN (please read the instructions on how to use the Absence Declaration in ACORN) within **2 business days** of the originally scheduled course deliverable. Please email your documents to rotmancommerce.info@utoronto.ca

Students who do not provide this information will be given a grade of 0 (zero) for the missed course deliverable.

If you miss any assignment for unforeseen reasons and submitted appropriate documentations, your grades will be reweighted on the basis of your performance in the remaining individual assignments.

If you miss a term test, your grade will be redistributed based on your performance in the remaining term tests. If you miss term test 3 – you can be assigned additional work in form of individual assessments (e.g., makeup test, reviewing a paper, assignment, etc.)

Late Assignments

Please note that all assignments are due by the specified deadlines. The exact date and time will be given in the Quercus assignment. No late assignments will be accepted, except for students who, for reasons beyond their control, are unable to submit an assignment by its deadline must obtain approval from the instructor for an extension. Supporting documentation will be required as per the policy on missed tests and assignments. **Late assignment, when it requires electronic submission, will carry a 15% grade penalty per day.**

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.

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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.

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.

Research with Human Participants:

Marketing and Organizational Behaviour researchers run experimental studies to test theories about human behaviour. The research requirement is intended to supplement this course's material, by giving you direct exposure to research in these fields. You may fulfill this requirement by:

1. Participation in three hours (credits) of research studies, ***or***
2. Analysis of three research articles, ***or***
3. A combination of research studies and article analyses

Note, this is **not** an extra credit assignment; credit-hours of participation translate into real percentage values, as determined by the professor (check your syllabus). You will receive one credit for each one-hour of research participation you complete, up to a maximum of three credits.

USING SONA: PRE-REGISTERED ACCOUNT AND COURSE REGISTRATION

To participate in a research study, you will need to sign into our Rotman Behavioural Research Lab (BRL) research participation website (SONA): https://rotman.sona-systems.com/. Please add both the Sona Admin, rotman-admin@sona-systems.net, and Behavioural Research Lab, Behavioural.Lab@rotman.utoronto.ca, email addresses to your contact list. This will ensure that

registration, password reset links, and important updates regarding your account/study participation are not mistakenly marked as spam.

Former Participants: those with existing BRL credit-pool accounts on SONA can use their previous credentials to log-in, and immediately begin registering for courses and studies. **New Users:** your account has already been created for you by our Lab Manager. This account is linked to your "[Username]@mail.utoronto.ca" email address, and a link to complete the registration has been sent to that address.

Trouble Logging In: if you have overlooked your password registration link, or forgotten details of your log-in information, please use the "**Forgot Password**" feature on the SONA log-in page to have these credentials sent to your email.

Please familiarize yourself with the "**Student Research-Participation Guide**," made available to you by your professor: this guide, as well as the FAQ on Sona, cover all the pertinent steps and criteria for registering for studies and completing your participation requirement through either study participation or article analyses. Feel free to email Behavioural.Lab@rotman.utoronto.ca if you have any question.

Research opportunities for the winter session are anticipated to begin the week of **January 9th 2023**, and end on **March 31st, 2023**.

Weekly Schedule

Session	Date	Topic	Readings
1	Jan 11th	Introduction – course modules, learning outcomes, key deliverables	• Asking Better Questions in Analytics https://dataedge.ischool.berkeley.edu/2015/schedule/using-decisions-framing-analytics-problems-consulting-perspective • Data analytics is a team sport-IBM https://www.ibm.com/downloads/cas/NZRDABJV • Data Analytics is a team sport—which position do you play? https://www.chiefmarketer.com/data-analytics-team-sport-position-play/2/
2	Jan 18th	Problem solving, algorithms and Python basic (download, setup, basic functioning)	• Competing on analytics (HBR article) https://hbr.org/2006/01/competing-on-analytics • How analytics has changed in the past 10 years https://hbr.org/2017/06/how-analytics-has-changed-in-the-last-10-years-and-how-its-stayed-the-same • Jupyter Notebook Tutorial. Retrieved from https://www.dataquest.io/blog/jupyter-notebook-tutorial/ • A Complete Python Tutorial to Learn Data Science from Scratch (2016). Retrieved from https://www.analyticsvidhya.com/blog/2016/01/complete-tutorial-learn-data-science-python-scratch-2/

3	Jan 25th	Data Structure in Python	• Indexing and selecting data. Retrieved from https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html • Pandas and Dataframe. Retrieved from https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html
4	Feb 1st	Data Manipulation -1 & 2	• Describing a dataset. Anil Doshi. Retrieved from https://www.scribd.com/document/495644797/How-to-Describe-a-Data-Set • Structured vs Unstructured data https://www.datamation.com/big-data/structured-vs-unstructured-data.html • 12 Useful Pandas techniques. Retrieved from https://www.analyticsvidhya.com/blog/2016/01/12-pandas-techniques-python-data-manipulation/ • Use Pandas Groupby to Group and Summarise DataFrames. Retrieved from https://www.shanelynn.ie/summarising-aggregation-and-grouping-data-in-python-pandas/ • Hierarchical Indexing. Retrieved from https://jakevdp.github.io/PythonDataScienceHandbook/03.05-hierarchical-indexing.html • How to Use MultiIndex in Pandas to Level Up Your Analysis. Retrieved from https://towardsdatascience.com/how-to-use-multiindex-in-pandas-to-level-up-your-analysis-aeac7f451fce
5	Feb 8th	Machine Learning methodology (Supervised) – Linear regression	• 7 Stories behind the world's most popular machine learning algorithms (2018, September 13). BCG GAMMA. Retrieved from https://medium.com/bcggamma/7-stories-behind-the-worlds-most-popular-machine-learning-algorithms-51472939d14b
6	Feb 15th	**Term Test 1 (18%) Topics covered: session 1 to 4**	• **Test 1 (18%) Online via Quercus (open book)**
7	Feb 22nd	**Reading week**	• **NO CLASS**
8	March 1st	Descriptive and Exploratory Analytics	• What is exploratory data analysis? Retrieved from https://www.ibm.com/cloud/learn/exploratory-data-analysis • **Due: Group project A (12%), Feb 28th, 11pm**
9	March 8th	Machine learning methodology (unsupervised) – clustering	• How Does Spotify Know You So Well? https://medium.com/s/story/spotifys-discover-weekly-how-machine-learning-finds-your-new-music-19a41ab76efe • Convergent Cluster Analysis (CCA) system. Retrieved from Sawtooth website http://www.sawtoothsoftware.com/download/techpap/ccatech.pdf

10	March 15th	Data Visualization -1 / 2	
11	March 22nd	**Term Test 2 (17%) Topics covered: session 5 to 10**	• **Test 2 (17%) Online via Quercus (open book)** • **Due: Datacamp completion (12%): March 27th, 11pm** • **Due: Group project B (13%), March 28th, 11pm**
11	March 29th	BigData Applications – Recommender system / Ethics and privacy in BigData analytics (time permitting)	• Neerja Doshi (2018). Recommendation Systems — Models and Evaluation. Retrieved from https://towardsdatascience.com/recommendation-systems-models-and-evaluation-84944a84fb8e • Recommendation Engines: How They Work (in Plain English!). Retrieved from https://blog.dataiku.com/recommendation-engines-how-they-work-in-plain-english • How companies use personal data to charge different people different prices for the same product. Retrieved from https://www.cbc.ca/news/business/marketplace-online-prices-profiles-1.4414240 • Bias In AI Algorithms- *Karan Praharaj* • https://towardsdatascience.com/how-are-algorithms-biased-8449406aaa83 • Racist and Sexist AI — A Tale of Algorithmic Bias • https://medium.com/swlh/racist-and-sexist-ai-a-tale-of-algorithmic-bias-3dc9128cc0ab • **Due: Research Participation (3%), April 2nd, 11pm**
12	April 5th	**Term Test 3 (topics covered: ALL, cumulative, 25%)**	• **Test 3 (25%) Online via Quercus (open book)**

Please note that the last day you can drop this course without academic penalty is March 19th, 2023

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/