

### COURSE INFORMATION

Course title:	Business Applications of Machine Learning		
Course code:	BAIT509	Credits:	1.5
Session, term, period:	2021W2, Period 4	Class location:	Online
Section(s):	BA1	Class times:	Mon & Wed 8:00-10:00
Course duration:	Apr 19 – May 29 2021	Pre-requisites:	n/a
Division:	n/a	Co-requisites:	n/a
Program:	MBAN		

### INSTRUCTOR INFORMATION

Instructor:	Hayley Boyce		
Phone:	n/a	Office location:	ICCS 215
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### COURSE DESCRIPTION

Introduction to machine learning concepts, such as model training, model testing, generalization error and overfitting. Exposure to a variety of machine learning techniques, with deeper exploration of a few chosen techniques. Forming good scientific questions to address business objectives with machine learning. Python will be the primary programming language used.

### COURSE FORMAT

Class time will be used for a combination of lectures, discussion, demonstrations and exercises that students will work through individually or in groups.

### LEARNING OBJECTIVES

By the end of this course, students will be able to:

1. Describe fundamental machine learning concepts such as: supervised and unsupervised learning, regression and classification, overfitting, training/validation/testing error, parameters and hyperparameters, and the golden rule.
2. Broadly explain how common machine learning algorithms work, including: naïve Bayes, k-nearest neighbors, decision trees, support vector machines, and logistic regression.
3. Identify when and why to apply data pre-processing techniques such as scaling and one-hot encoding.
4. Use Python and the scikit-learn package to develop an end-to-end supervised machine learning pipeline.
5. Apply and interpret machine learning methods to carry out supervised learning projects and to answer business objectives.

### Summary

<u>Component</u>	<u>Weight</u>
Assignments	60%
Group project	30%
Quiz	10%
Total	<u>100%</u>

### Details of Assessments

#### Assignments

During the term, there will be three individual assignments, each worth 20%. Each assignment will focus on a combination of theory and application. Each assignment will require the analysis of a data set. You will be provided with the data, and a set of questions, some of which will be auto graded used tests and students will get feedback instantly on if they have answered correctly. You will need to submit the assignment in the form of a report. Your marks will be based on the depth of the analysis and the presentation in the form of a report.

#### Group Project

The group assignment will involve the analysis of a more complex data set. The format and submission requirements will be similar to the individual assignment, except that instead of simply answering the specified questions, you will be required to perform a thorough analysis of the case and submit a report summarizing your main findings. Groups will consist of two or three students and will be allocated randomly. All group members will receive the same mark: it is each student's responsibility to ensure that all group members contribute equally to the assignment. In case of any group related issues, please discuss with the instructor.

#### Quiz

There will be one quiz in the middle of the course that should be completed individually. You will have a 24 hours window to complete it but only 45mins to write it. It will be a mix of multiple choice; true or false questions and long answer questions and it will be hosted on Canvas.

### LEARNING MATERIALS

#### Reading Materials:

The following are recommended (i.e., not mandatory) reading material to supplement the course.

- "Data Mining: Practical Machine Learning Tools and Techniques" – Ian Witten, Eibe Frank, Mark Hall, Christopher Pal. Freely available at: <https://www.cs.waikato.ac.nz/~ml/weka/book.html>
- Scikit-learn Python package documentation. Freely available at: <http://scikit-learn.org/stable/documentation.html>

#### Technology Requirements:

- Laptop

- Python Version 3.6 or above (it is recommended to install Python using the Anaconda distribution <https://www.anaconda.com/distribution/#download-section>)

### COURSE-SPECIFIC POLICIES AND RESOURCES

#### *Missed or late assignments, and regrading of assessments*

Late submissions will not be accepted and will receive a grade of zero.

#### *Academic Concessions*

If extenuating circumstances arise, please contact the RHL Graduate School program office as early as reasonably possible, and submit an [Academic Concession Request & Declaration Form](https://webforms.sauder.ubc.ca/academic-concession-rhlee) <https://webforms.sauder.ubc.ca/academic-concession-rhlee>. If an academic concession is granted during the course, the student will be provided options by RHL, or by the instructor in consultation with RHL, per [UBC's policy on Academic Concession](#).

#### *Other Course Policies and Resources*

##### *Code Plagiarism*

Code plagiarism falls under the UBC policy for [Academic Misconduct](#). Students must correctly cite any code that has been authored by someone else or by the student themselves for other assignments. Cases of "reuse" may include, but are not limited to:

- the reproduction (copying and pasting) of code with none or minimal reformatting (e.g., changing the name of the variables)
- the translation of an algorithm or a script from a language to another
- the generation of code by automatic code-generations software

An "adequate acknowledgement" requires a detailed identification of the (parts of the) code reused and a full citation of the original source code that has been reused.

Students are responsible for ensuring that any work submitted does not constitute plagiarism. Students who are in any doubt as to what constitutes plagiarism should consult their instructor before handing in any assignments.

### POLICIES APPLICABLE TO COURSES IN THE ROBERT H. LEE GRADUATE SCHOOL

#### *Attendance*

Excepting extenuating circumstances, students are expected to attend 100% of their scheduled class hours. Absent students limit their own academic potential, and that of their classmates, and cause unnecessary disruption to the learning environment. Students missing more than 20% of the total scheduled class hours for a course (including classes held during the add/drop period) without having received an academic concession will be withdrawn from that course. Withdrawals, depending on timing, could result in a "W" or an "F" standing on the transcript.

#### *Punctuality*

Students are expected to arrive for classes and activities on time and fully prepared to engage. Late arrivals may be refused entry at the discretion of the instructor or activity lead. Students arriving later than halfway through a scheduled class will be treated as absent for that class.

#### *Electronic Devices*

During online lectures, students are not permitted to use any electronic devices other than the primary one used for attending the online lecture (e.g. laptop or desktop). Only Zoom should be open during the

online lecture unless an instructor advises the use of another program/website for an in-class activity. Feedback from students indicates that personal devices are the number one distraction from effective learning and participation in the online learning environment.

### *Citation Style*

Please use the American Psychological Association (APA) reference style to cite your sources.

Details of the above policies and other RHL Policies are available at:

<http://www.calendar.ubc.ca/vancouver/index.cfm?tree=12,199,506,1625>

### UNIVERSITY POLICIES AND RESOURCES

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website at <https://senate.ubc.ca/policies-resources-support-student-success>.

### *Respect for Equity, Diversity, and Inclusion*

The UBC Sauder School of Business strives to promote an intellectual community that is enhanced by diversity along various dimensions including status as a First Nation, Metis, Inuit, or Indigenous person, race, ethnicity, gender identity, sexual orientation, religion, political beliefs, social class, and/or disability. It is critical that students from diverse backgrounds and perspectives be valued in and well-served by their courses. Furthermore, the diversity that students bring to the classroom should be viewed as a resource, benefit, and source of strength for your learning experience. It is expected that all students and members of our community conduct themselves with empathy and respect for others.

### *Academic Integrity*

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the breakdown of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating may result in a mark of zero on the assignment or exam and more serious consequences may apply if the matter is referred to the President's Advisory Committee on Student Discipline. Careful records are kept in order to monitor and prevent recurrences.

### *Academic Freedom and Students Studying from Outside Canada*

During this pandemic, the shift to online learning has greatly altered teaching and studying at UBC, including changes to health and safety considerations. Keep in mind that some UBC courses might cover topics that are censored or considered illegal by non-Canadian governments. This may include, but is not

limited to, human rights, representative government, defamation, obscenity, gender or sexuality, and historical or current geopolitical controversies. If you are a student living abroad, you will be subject to the laws of your local jurisdiction, and your local authorities might limit your access to course material or take punitive action against you. UBC is strongly committed to academic freedom, but has no control over foreign authorities (please visit <http://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,33,86,0> for an articulation of the values of the University conveyed in the Senate Statement on Academic Freedom). Thus, we recognize that students will have legitimate reason to exercise caution in studying certain subjects. If you have concerns regarding your personal situation, consider postponing taking a course with manifest risks, until you are back on campus or reach out to your academic advisor to find substitute courses. For further information and support, please visit: <http://academic.ubc.ca/support-resources/freedom-expression>

### COPYRIGHT

All materials of this course (course handouts, lecture slides, assessments, course readings, etc.) are the intellectual property of the instructor or licensed to be used in this course by the copyright owner. Redistribution of these materials by any means without permission of the copyright holder(s) constitutes a breach of copyright and may lead to academic discipline and could be subject to legal action. Any lecture recordings are for the sole use of the instructor and students enrolled in the class. In no case may the lecture recording or part of the recording be used by students for any other purpose, either personal or commercial. Further, audio or video recording of classes are not permitted without the prior consent of the instructor. Students may not share class Zoom links or invite others who are not registered to view sessions.

### ACKNOWLEDGEMENT

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the x<sup>w</sup>məθk<sup>w</sup>əyəm (Musqueam) people, who for millennia have passed on their culture, history, and traditions from one generation to the next on this site.

### ONLINE TEACHING TOOL & REQUIREMENTS

This course will be taught using Zoom for synchronous classes and office hours.

For this course, you are required to use a Zoom account during synchronous classes and office hours. If you do not have a Zoom account, you can create one here: <https://zoom.us/signup>. Note: creating a Zoom account requires that you provide a first name, last name, and email address to Zoom. For privacy purposes, you may consent to using your existing email address and your real name. Alternatively, if you prefer, you may sign up using an alternative email address and an anonymized name that does not identify you (i.e. Jane Doe, [jane.doe@email.com](mailto:jane.doe@email.com)). If you have trouble creating an account, or accessing a Zoom session, please contact [CLCHelp@sauder.ubc.ca](mailto:CLCHelp@sauder.ubc.ca). You will be required to provide the email address associated with your Zoom account in a Canvas quiz for identification purposes.

To help replicate the classroom experience, make sessions more dynamic and hold each person accountable, both students and instructors are required to have their cameras on during Zoom sessions. Students who require an accommodation with regard to the “camera on” requirement must contact their instructors in advance of the first class to discuss options. As professional graduate students, students are expected to conduct themselves professionally by joining sessions on time, muting mics when not speaking, refraining from using any other technology when in-session, attending in business casual dress (at a minimum), and participating from a quiet environment. Content from synchronous sessions will be

selectively recorded per instructor discretion and made available to students on Canvas for a maximum duration of the course length. This is done to allow students the opportunity to return to lecture content to solidify learnings.

**COURSE SCHEDULE**

(Subject to change with class consultation)

Class	Date	Topic	Readings or Activities	Assessments due
1	Apr 19, 2021 (Mon)	Introduction to machine learning and Decision Trees	In-class exercises	
2	Apr 21, 2021 (Wed)	Splitting and cross-validation	In-class exercises	
3	Apr 26, 2021 (Mon)	Baseline models, KNN and SVM	In-class exercises	
4	Apr 28, 2021 (Wed)	Feature pre-processing	In-class exercises	Assignment 1 due
5	May 3, 2021 (Mon)	Naïve Bayes/ Hyperparameter optimization	In-class exercises	
6	May 5, 2021 (Wed)	Linear Regression/ Logistic Regression	In-class exercises	Quiz
7	May 10, 2021 (Mon)	Feature and model Selection	In-class exercises	Assignment 2 due
8	May 12, 2021 (Wed)	Business questions and workflow	In-class exercises	
9	May 17, 2021 (Mon)	Classification and Regression Metrics	In-class exercises	
10	May 19, 2021 (Wed)	Topics related to the group project	Work on group project	Assignment 3 due
	May 25-29, 2021	Exam Week		Group Project – To be scheduled by RHL Office