UBC SAUDER SCHOOL OF BUSINESS

ROBERT H. LEE GRADUATE SCHOOL

BAIT 509: Business Applications of Machine Learning

Program: MBAN

Course Outline

COURSE INFORMATION

Term/period: Winter Term 2, Period 3

Instructor: Vincenzo Coia

Email: vincen.coia@stat.ubc.ca

Phone: N/A

Office hours: See vincenzocoia.github.io/BAIT509/

Teaching Assistant: TBD

Credit value: 1.5 credits

Section number: BA1

Class meeting times: M/W 4-6pm

Course duration: Jan 2-Feb 9, 2019

Classroom location: HA 337

Course website: vincenzocoia.github.io/BAIT509/

BRIEF COURSE DESCRIPTION

Introduction to machine learning concepts, such as 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.

The teaching methodology would be problem-based and students will be encouraged to use R and Python.

COURSE GOALS & LEARNING OBJECTIVES

This course is intended to:

- Introduce students to machine learning and help them apply these tools to perform descriptive and predictive analytics.
- Provide students with experience in forming good scientific questions for business applications.
- Broaden students' knowledge of machine learning techniques, with a focus on supervised machine learning.
- Build skills in gaining depth of knowledge in a chosen area of machine learning.
- Build skills using the programming language R and python.
- Understand overfitting and how to address it with re-sampling.

By the end of the period students will be able to:

- Understand supervised and unsupervised machine learning algorithms
- Use the Naïve Bayes algorithm, the k-Nearest Neighbors algorithm, support vector machines, ensemble methods and other algorithms
- Apply these to carry out supervised learning projects.

COURSE MATERIALS & REQUIREMENTS

Reading Materials:

BAIT 509: Business Applications of Machine Learning

Program: MBAN

Course Outline

- "An Introduction to Statistical Learning: with Applications in R" – Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani. Freely available at http://www-bcf.usc.edu/~gareth/ISL/
- Sci-kit learn python package documentation. Freely available at http://scikit-learn.org/stable/documentation.html

Technology Requirements:

- An account with github.com (free).
- R; python

ASSESSMENT SUMMARY

3 Individual Homework Assignments	60%
1 Final Group Assignment	30%
Class participation	10%

ASSESSMENT DESCRIPTION

Individual Assignments

During the term, there will be three individual assignments. 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. 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.

Class Participation

We all bring experience and knowledge into the classroom, and all class participants should share this and benefit by it. Effective class participation includes

- Being prepared for class participation by reading the assigned materials
- asking questions about concepts from lectures or readings that you agree or disagree with;
- sharing your experience or point of view with the class
- building on points raised by others;
- clarifying issues or
- relating topics discussed to previous class discussions.

Direct student-student interaction is encouraged. Such interaction should be both positive and courteous even when your opinions differ. Class attendance is important. Regular and punctual attendance is a necessary but not a sufficient criterion for high class participation grades.
Positive contributions to class discussion increase your score. Attending class and not speaking has neither a positive nor a negative impact on your participation grade. Further, you can demonstrate your class commitment by following course instructions, emailing me any course relevant examples from the media and/or your own industry experience, which you feel may enhance the class discussion. Failing to attend significant portions of a class session, poor preparation, and detrimental participation (including being disrespectful to any class member) decrease your participation score.

Group assignment

BAIT 509: Business Applications of Machine Learning

Program: MBAN

Course Outline

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. You should work in groups of two or three students. You are free to choose your own groups. If you have any difficulty in forming a group, please let the instructor know and the instructor will help you find a group. Also, please note that the all group members will receive the same mark. It is each student's responsibility to ensure that all group members contribute more or less equally to the assignment. In case of any group related issues, please discuss with the instructor.

SCHEDULE

Class #	CLASS TOPICS	ACTIVITIES / READINGS	ASSIGNMENTS / DELIVERABLES
1 – January 2	Introduction to Machine Learning and tools.	In-class exercises	
2 – January 4	Irreducible and Reducible error	In-class exercises	
3 – January 7	Local methods	In-class exercises	Assignment 1 due at the start of class
4 – January 9	Model selection	In-class exercises	
5 – January 14	Decision trees for classification and regression; random forests?	In-class exercises	
6 – January 16	Forming good statistical questions from business questions	Develop project proposals	Introduce the course project
7 – January 21	Naïve Bayes for classification	In-class exercises	Assignment 2 due at the start of class
8 – January 23	Probabilistic forecasts and quantile regression.	In-class exercises	
9 – January 28	Advanced ML techniques	In-class exercises	
10 – January 30	Topics related to the group project	Work on group project	Assignment 3 due at the start of class

KEY REGULATIONS

Attendance: As per RHL Regulations on Professionalism, Attendance and Behaviour, students are expected to attend 100% of their scheduled classes. Students missing more than 20% of scheduled classes for reasons other than illness will be withdrawn from the course. Withdrawals, depending on timing, could result in a "W" or an "F" standing on a student's transcript. Students must notify their instructors at the earliest opportunity if they are

expected to miss a class due to illness. A medical note from a licensed, local doctor is required if more than 20% of scheduled classes for a course are missed due to illness. Students are required to notify the Student Experience Manager if they are absent from two or more classes due to illness.

Tardiness: As per RHL Regulations on Professionalism, Attendance and Behaviour, students are expected to arrive for classes and activities on time and fully prepared. Late arrivals may be refused entry at the discretion of the instructor or activity lead. Students arriving halfway through a scheduled class, or later, will be treated as absent for that class.

Electronic Devices: As per RHL Regulations on Professionalism, Attendance and Behaviour, laptops and other electronic devices (cellphones, tablets, personal technology, etc.) are not permitted in class unless required by the instructor for specific in-class activities or exercises. Cellphones and other personal electronic devices must be turned off during class and placed away from the desktop. Students who fail to abide by the RHL "lids down" policy will be asked to leave the room for the remainder of the class. Research has shown that multi-tasking on laptops in class has negative implications for the learning environment, including reducing student academic performance and the performance of those sitting around them.

ACADEMIC MISCONDUCT

All UBC students are expected to behave as honest and responsible members of an academic community. Failure to follow appropriate policies, principles, rules and guidelines with respect to academic honesty at UBC may result in disciplinary action.

It is the student's responsibility to review and uphold applicable standards of academic honesty. Instances of academic misconduct, such as cheating, plagiarism, resubmitting the same assignment, impersonating a candidate, or falsifying documents, will be strongly dealt with according to UBC's procedures for Academic Misconduct. In addition to UBC's Academic Misconduct procedures, students are responsible for reviewing and abiding by RHL's policy on Academic Integrity.

STANDARD REFERENCE STYLE

The Robert H. Lee Graduate School uses American Psychological Association (APA) reference style as a standard. Please use this style to cite sources in your work unless directed to use a different style.

LATE ASSIGNMENTS

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