Spring 2020

COMPSCI X460 Practical Machine Learning (with R)

BASIC COURSE INFORMATION

Course Meeting Dates & Times: Thursdays, Jan 30, 2020 to Apr 02, 2020

Course Location: UC Berkeley Extension Golden Bear Center, 1995 University Ave. Room 213
Semester Units: 2 semester units in Computer Science

Instructor: Seema Singh Saharan

E-mail: seema.saharan@berkeley.edu

Instructor Availability: Available by email (checked frequently and the best point of contact)

Course Website Address: https://onlinelearning.berkeley.edu

COURSE DESCRIPTION

Course Prerequisites:

- Experience programming in at least one high-level programming language such as BASIC, PASCAL, C, Java, Python, Perl, or Ruby.
- Basic knowledge of statistics as covered in a first-semester undergraduate statistics course.
- There will be some coverage of basic statistical techniques as part of covering core elements of the Machine Learning.
- Personal laptop for running assignments

Overview of Course:

This course builds the conceptual knowledge related to the basic framework of Machine Learning algorithms as well as implementation knowledge of these using the programming language R.

Learning Objectives:

- Distinguish fundamental aspects of machine learning algorithms
- Frame problems to make the suitable for solution via machine learning
- Train machine learning models
- Evaluate machine learning models
- Deploy machine learning models in to operations
- Build prediction, categorization and recommendations
- Collaborate in a group using tools for collaborative/social programming
- Generate high quality, graphical and textual results

Methods of Instruction

- Lectures, In Class Programming Demonstration
- Required reading
- Programming Project
- Programming Problems
- Mid-term exams
- Final exam

COURSE MATERIALS

Primary or Required Textbooks/Readings:

Mandatory

Machine Learning with R (Second Edition), Brett Lanz, Packt Publishers

Applied Predictive Modeling, (2013) Kuhn & Johnson, Springer Verlag

Recommended:

R for Data Science: Visualize, Model, Transform, Tidy and Import Data by Hadley Wickham, Garrett Grolemund, 2016 O'Reilly Media 1st edition (also available online). ISBN 9781491910399
Base R:
R in Action, (Second edition), Kobacoff, Manning Publisher

BEFORE YOU BEGIN

Classroom Visitors
Auditing is not permitted in UC Berkeley Extension courses. You must formally enroll in the course and pay all fees before the second classroom meeting.

Student Disability Services:
All students who have special needs can receive appropriate accommodations. The EXDSS office must determine or verify these accommodations before they can be offered. Students who are requesting academic accommodations are responsible for contacting the EXDSS Coordinator **before your course begins or immediately upon the start of the course**. Students may submit their request by email: extension-dss@berkeley.edu or phone: (510) 643-5732.

Important Deadlines

Drop: You may drop the course up to the second class meeting.
Withdraw and Grade Option Change: Must be submitted before the last class meeting.

You can add, drop or withdraw by logging into your student portal.

Course Assignments:

- Reading assignments:
  - The student is expected to read the chapters that will be discussed in each session ahead of time to familiarize themselves with the material.
- Problem Sets:
  - The instructor will assign programming assignments as HW assignments.

Examinations:

- For students who opt for a letter grade or Pass/No Pass option, the final exam must be taken in order to complete the course.
- There will be 3 examinations during this course that will all take place during the sessions as documented in the course schedule (see below).
- The exams will cover the chapters of the textbook as documented in the course schedule (see below).
- Each exam can consist of multiple choice and essay type questions.
- The exams are all closed book and the students will hand their answers to the instructor to be graded.

Class Participation and Attendance:

Please note that good attendance is a prerequisite to meeting classroom discussion and participation expectations.

Exemplary (90-100%)	- Participates regularly and actively and contributes in ways that help build community - Uses specific examples to support response and invite further discussion - Contributions are relevant and demonstrate a thorough understanding and reflection regarding the question or concept being presented
Accomplished (80-90%)	- Participates regularly and actively - Uses specific examples to support response - Contributions are relevant and demonstrate a thorough understanding regarding the question or concept being presented
Competent (70-80%)	- Participates regularly but not as active in contributing - Communicates ideas, opinions and conclusions clearly and completely - Uses specific examples to support response
Developing (60-70%)	- Does not participate regularly or actively contribute - Communicates ideas but fails to provide examples to support response - Contribution does not demonstrate an understanding of the question or concept being presented
Does not participate (<60%)	Indifferent or hinders the discussion

GENERAL POLICIES

Classroom Decorum:

- Please turn off cell phones
- No eating
- During lectures, please do not talk
- During discussions, please listen to others, do not interrupt and treat others with respect

Student Disability Services:

Students who require a physical, medical, or learning accommodation can contact Disability Student Services at: http://extension.berkeley.edu/static/studentservices/career/#disabled

Academic Integrity and Student Conduct:

Academic misconduct is any action or attempted action that may result in creating an unfair academic advantage for you or any other members of the academic community. This misconduct includes a wide variety of behaviors such as cheating, plagiarism, altering academic documents or transcripts, gaining access to materials before they are intended to be available, and helping another student to gain an unfair academic advantage.

As a student of UC Berkeley Extension, you are encouraged to reach out to your fellow students in your class to avoid isolation, to discuss materials, and to ask each other questions, but there are limits to this collaboration. Please review the following document on academic integrity (http://extension.berkeley.edu/upload/academic_integrity.pdf), which clearly defines what constitutes cheating, as well as plagiarism and other forms of academic misconduct. Students are also responsible for informing themselves about UC Berkeley Extension's Code of Student Conduct and its grounds for discipline (http://extension.berkeley.edu/static/studentservices/policies/#conduct).

UC Berkeley Extension takes academic misconduct very seriously. Depending upon the nature of the incident, the academic disciplinary sanction may vary but can result in consequences such as a failing grade for the course or even suspension and dismissal.

GRADING AND EVALUATION PROCEDURES

Grade Breakdown and Weighting by Category:

Final group project: 60%
In-class exercises and quizzes: 30%
Class and online participation: 10%

Grading Scale for Final Course Grade:

GRADE	RECOMMENDED PERCENTAGE BREAKDOWN	DESCRIPTION
A+ A A-	94 – 100% 94 – 100% 90 – 93%	Excellent: The grade of "A+," when awarded at the instructor's discretion, represents extraordinary achievement, but does not receive grade point credit beyond that received for the grade of A.
B+ B B-	86 – 89% 83 – 85% 80 – 82%	Good
C+ C C-	76 – 79% 73 – 75% 70 – 72%	Fair: Each course in a certificate program must be completed with a grade of C or better, although some programs have higher requirements.
D+ D D-	66 – 69% 63 – 65% 60 – 62%	Barely passed

F	< 60%	Failed
P		Passed at a minimum level of C-minus or 70%
NP		Not Passed — anything below a C-minus or below 70%
NC		Not for Credit: Assigned to students whose attendance is satisfactory but who choose not to fulfill credit requirements.
W		Withdrawal: Withdrawal from a course without academic penalty. Issued based on a student-initiated withdrawal by logging into the student's account and submitting the request on the enrollment history page.

Petition for Grade Option Change:
Form: http://extension.berkeley.edu/upload/grade_option_change.pdf
If you opt to change your grade option, you must inform your instructor as follows. The default for all students is to receive a letter grade. If you opt to change your grade option to a pass/no pass basis (P/NP) or a noncredit basis (NC), you must complete and submit the form above to your instructor before the course end date/final exam/project due date.

Extension will not accept any late grade option change form and cannot change a P/NP grade or NC grade option to a letter grade after recording it.

> • **Passed and Not Passed (P/NP):** Passed/Not Passed can only be assigned to students who complete the requirements for credit. The student must have earned at least a "C-" to receive a Passed (P) grade.
>
> • **Not for Credit (NC):** Not for Credit is assigned to students whose attendance is satisfactory and may not be assigned to students who stop attending class.

Petition to Withdraw
You can submit a request to withdraw by logging into your student account and submitting the request on your enrollment history page before the last course meeting.

Withdrawal after the drop deadlines are non-refundable at the time, and a "W" will appear on your student record.

Petition for Incomplete

Form: https://extension.berkeley.edu/upload/petition_for_incomplete.pdf

Incomplete grades may be assigned by an instructor on an exceptional basis if your coursework has been of passing quality but not finished during the term or enrollment period due to circumstances beyond your control. The following criteria must be met:

- You have successfully completed 75 percent of the assignments, assessments or projects at least three weeks prior to the course end date.
- You and the instructor have made a written agreement on the work required to complete the course and the due date by which you will submit the work to the instructor. The due date must be within three months of the course end date. If you do not complete the agreed-upon work, your instructor can submit a failing grade for you.

- You must sign and present the <u>Petition for "Incomplete" Grade form</u> (referenced above) to the instructor prior to the course end date.

However, even if these criteria are met, it is at the discretion of the instructor whether to grant the Incomplete.

Other Grade Policies:
<u>http://extension.berkeley.edu/static/studentservices/grades</u>

SAFETY AND EMERGENCY PREPAREDNESS

- **Berkeley - Golden Bear Center (1995 University Ave)**

  Building Security (land line): 510-845-8003

  UC Berkeley Police (UCPD)
  Emergency: 9-1-1 (land line)
  Emergency: 510-642-3333 (cell phone)
  Non-Emergency: 510-642-6760

  Berkeley Police Department:
  Emergency: 9-1-1 (land line)
  Emergency: 510-981-5911 (cell phone)
  Non-Emergency: 510-981-5900

  Evacuation Procedures:
  Please refer to map posted in the classroom.

SAFETY AND EMERGENCY PREPAREDNESS

- **Belmont – Belmont Center (1301 Shoreway Rd. Suite 400)**

  Building Security: 650-345-8500 (You will be directed to the cell phone of the guard on duty)

  Belmont Police Department:
  Emergency: 9-1-1 (land line)
  Emergency: 50-593-2122 (cell phone)
  Non-Emergency: 650-595-74

- **San Francisco Campus (160 Spear St.)**

  Building Security: 415-341-8457

  San Francisco Police Department:
  Emergency: 9-1-1 (land line)
  Emergency: 415-553-8090 (cell phone)
  Non-Emergency: 415-553-0123

SCHEDULE

Below is a tentative schedule of what this class will aim to cover in each session.

DAY	Chapter and Topic
DAY 1	Chapter 1 and Chapter 2 Introduction to R and Introduction to Machine Learning Algorithms, Data Selection (Kaggle, UC Irvine)
DAY 2	Chapter 3 Bias Variance Tradeoff Classification Using KNN Nearest Neighbor
DAY 3	Chapter 4, Chapter 5 Classification using Baye's Algorithm Classification Using Decision Trees and Rules
DAY 4	Chapter 6 Forecasting Numeric Data: Regression Methods **Midterm 1**
DAY 5	Chapter 7 Black Box Methods: Support Vector Machine and Neural Networks
DAY 6	Chapter 8 Identification of Patterns using Association Rules
DAY 7	Chapter 9 Clustering with k-means algorithm **Midterm 2**
DAY 8	Chapter 10 ,Chapter 11

	Evaluating Model Performance, Ensemble, Improving Model Performance	
DAY 9	Chapter 11 Specialized Machine Learning Techniques	
DAY 10	Project Submission and Presentation Final Exam	

RIGHTS

Civility and Respect in an Atmosphere of Academic Freedom:
http://students.berkeley.edu/uga/respect.stm

UC Berkeley Extension Code of Student Conduct:
http://extension.berkeley.edu/static/studentservices/policies/#conduct

Course Copyright and Classroom Recording Policies:
http://extension.berkeley.edu/static/studentservices/geninfo/#recording

DISCLAIMER

The syllabus and schedule is subject to change.