Syllabus

CSC 570AG: Machine Learning

Spring 2017

This syllabus is a guideline for the course and not a contract. As such, its terms may be altered. When doing so is, in the opinion of the instructor, in the best interests of the class.

General Information

Professor: Sviatoslav (Svet) Braynov
Office: UHB 3117
Email: sbray2@uis.edu (for a faster response please put "Machine Learning" in the subject)

Course Overview

Machine learning is a central part of both machine intelligence and data analytics. Machine Learning explores the design and the study of algorithms that can learn from data or experience, improve their performance and make predictions. This is an introductory course that provides an overview of the basic ideas of machine learning. Students will learn the main concepts behind several machine learning algorithms without going deeply into the mathematics and gain practical experience applying them. Students will also learn how to read and execute machine learning packages written in R.

Course Objectives

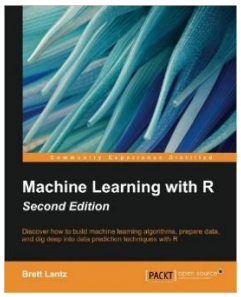
- To learn some fundamental principles and concepts of machine learning.
- To learn how to collect, explore, prepare and analyze data with R.
- To learn how to work with existing machine learning packages written in R
- To learn how to train a model, evaluate and improve its performance

Prerequisites

Knowledge of basic concepts of computer science (such as algorithms and data structures) and familiarity with basic mathematical and statistical concepts. Previous knowledge of R is not required.

Textbook and Other Materials

Required:



The principal textbook is “Machine Learning with R” by Brett Lantz, 2 edition, 2015. ISBN: 1784393908.

Other recommended books on ML:

Tom Mitchell. Machine learning. McGraw-Hill. 1997.

Yaser S. Abu-Mostafa and Malik Magdon-Ismail. Learning From Data. AML Book. 2012.

Hastie, Tibshirani, Friedman. The Elements of Statistical Learning, 2nd ed. Springer. 2009.

Kevin P. Murphy. Machine Learning: A Probabilistic Perspective. MIT Press. 2012.

Other recommended books on R:

John Chambers. Software for Data Analysis: Programming with R. Springer. 2008.

Norman Matloff. The Art of R Programming. No Starch Press, 2011.

Robert Kabacoff. R in Action. Manning. 2011.

Joseph Adler. R in a Nutshell. O’Reilly. 2012.

Paul Teetor. R Cookbook. O’Reilly. 2011.

J. Abedin and K. Das. Data Manipulation with R. PACKT. 2015

Donato Teutonico. Instant R Starter, PACKT. 2013.

Expected Topics

- A brief review of statistics
- Introduction into Machine Learning
- Introduction into R
- Managing data with R
- Exploring and understanding data
- Lazy learning: Classification using nearest neighbors

- Probabilistic learning: Classification using naïve Bayes
- Divide and conquer: Classification using decision trees and rules
- Forecasting numeric data: Regression methods
- Black box methods: Neural networks and support vector machines
- Finding patterns: Market basket analysis using association rules
- Finding groups of data: Clustering with k-means
- Evaluating model performance: accuracy, kappa, sensitivity, specificity, precision, recall, F-measure, ROC, the holdout method, cross-validation, bootstrap sampling,
- Improving model performance: simple and customized parameter tuning, meta and ensemble learning, bagging, boosting and random forests.

Course Format

The course is organized around the following weekly pattern:
1. Every week there will be a reading assignment from the textbook.
2. You read the reading assignment and the PowerPoint slides corresponding to the assignment.
3. You take an online, open book quiz on the reading assignment.

Quizzes and Homeworks

In addition to weekly quizzes, there will be homework assignments/data projects. In each assignment, you will prepare data, run a ML algorithm from R libraries, and evaluate its performance. Previous experience of R is not required and I will get you up and running quickly.

Final Project

There will be no midterm exam or final exam. At the end of the semester, there will be a final data project.

The Course Calendar

The COURSE CALENDAR is very important because it tells you what to do a day-by-day basis. You are REQUIRED to check that calendar each week day. There may be changes to what is up there from day to day. Read any course announcements first, and then check the COURSE CALENDAR. Most weekdays there will be a calendar entry.

The good thing about online courses is that you have time flexibility: you can work on assignments at different times of the day. This, however, does not mean that you can procrastinate. You have to be on schedule and do all necessary work.

Most assignments will be due on midnight of a certain day. Remember that it is your responsibility to check the COURSE CALENDAR and the course announcements.

Some of the material in this course can be complicated. If you cannot understand some topic, read the text several times. If necessary, check previous chapters. Read the lecture slides. It usually helps. You have to read the textbook word for word, do not skip. If you still do not understand, then email me with a SPECIFIC question about what you are confused about. Do not write me "I cannot understand Chapter 3 at all" is not a specific question and I cannot answer it.

Checking your email regularly

You should check your UIS email frequently, preferably each week day. UIS sends you official mail at that email address. When I send the class an email using Blackboard, the default email address it uses for you is that official UIS email address. Do not forget to check your course announcements and the course calendar on a day-by-day basis. You can also forward your email from your UIS account to any email you choose.

Grading

The grading breakdown is the following:

Quizzes	30%
Homeworks	40%
Final project	30%

F	D	C	B	A
< 60	60-70	71-80	81-90	91-100

Where and When to Turn in Homeworks

Each assignment must be prepared with a word processor and must be submitted through Blackboard. I'll take ASCI text documents (like those prepared with NOTEPAD), MS Word documents, PDF and R files. Any other formats you should clear with me in advance.

It is important that you follow the file naming requirements specified in the homework descriptions. Homeworks which are not properly named will receive zero points.

When you prepare your assignments do not try to make them super fancy. The focus is not on the form, but on the content. "Typewriter graphics" are fine. You can scan handwritten diagrams or figures as far as they are readable. Scanned handwritten text is not acceptable. If I cannot read something, I will assume that it is wrong.

Plagiarism

All academic work must be your own. Plagiarism, defined as copying or receiving materials from a source or sources and submitting this material as one's own without acknowledging the particular debts to the source (quotations, paraphrases, basic ideas), or otherwise representing the work of another as one's own, is never allowed. Collaboration, usually evidenced by unjustifiable similarity, is never permitted in individual assignments. Any submitted academic work may be subject to screening by software programs designed to detect evidence of plagiarism or collaboration.

Getting outside help on your homework: it is not allowed. Unless it is otherwise stated in an assignment, you are not to get help on your homework from anyone except me (Svet Braynov, your instructor). You also aren't supposed to use email or the web to find someone else's answers to these questions, or to copy material which is posted on the web. If you are using external material, you have to make it clear by explicitly marking the external material and acknowledging the source. Copying material from the web without making it clear is considered cheating

The UIS Academic Integrity Policy (AIP) covers all academic misconduct, but three common violations are cheating, plagiarism, and facilitating violations of academic dishonesty. The UIS AIP is available at: http://www.uis.edu/academicintegrity/policy/

"Academic integrity is at the heart of the University's commitment to academic excellence. The UIS community strives to communicate and support clear standards of integrity, so that undergraduate and graduate students can internalize those standards and carry them forward in their personal and professional lives. Living a life with integrity prepares students to assume leadership roles in their communities as well as in their chosen profession. Alumni can be proud of their education and the larger society will benefit from the University's contribution to the development of ethical leaders. Violations of academic integrity demean the violator, degrade the learning process, deflate the meaning of grades, discredit the accomplishments of past and present students, and tarnish the reputation of the University for all its members."(UIS Academic Integrity Policy)

Academic sanctions range from a warning to expulsion from the university, depending on the severity of your violation and your history of violations. Whatever the sanction, I will file a report of academic dishonesty to the Office of the Provost.

If you have any doubts about what is cheating or plagiarism, please contact me before submitting your work.

Any student accused of a violation of academic integrity will receive an F for the course.

No Extra Credit Work

Students sometimes ask for some extra credit work near the end of the semester in an attempt to bring up sagging grades. No extra credit work will be given to any student on an individual basis.

Late Policy

Late homework and missed quizzes receive zero points, unless the student has requested and received an extension. If you are ill, traveling or having a problem, email me BEFORE the deadline of the assignment. Requests for extension received AFTER the assignment deadline will be not be honored. If a student misses an exam, homework, or a quiz, he/her will receive a zero for that portion of the grade. There are no make-up exams or assignments.

Illness

In the event of an illness or other mishap, get proper documentation.

Students with disability

If you are a student with a documented temporary or ongoing disability in need of academic accommodations, please contact the Office of Disability Services at 217-206-6666. Disabilities may include, but are not limited to: Psychological, Health, Learning, Sensory, Mobility, ADHD, TBI and Asperger's syndrome. In some cases, accommodations are also available for shorter term disabling conditions such as severe medical situations. Students who have made a request for an academic accommodation that has been reviewed and approved by the ODS will receive an accommodation letter which should be provided by the student to the instructor as soon as possible, preferably in the first week of class. For assistance in seeking academic accommodations, please contact the UIS Office of Disability Services (ODS) in the Human Resources Building, Room 80, phone number 217-206-6666.