CSE474: Introduction to Machine Learning
Spring 2018

Instructor: Varun Chandola

Syllabus

	Topics	Weeks	Reference
A	**Machine Learning Basics and Theory**		
1	Introduction	W1	Ch1, MITCHELL
2	Concept Learning	W1	Ch2, MITCHELL
3	Online Learning and Mistake Bounds	W2	Ch7, MITCHELL
4	Perceptrons	W2	Ch4, MITCHELL
5	Neural Networks	W3	Ch4, MITCHELL
6	PAC Learning and VC Dimension	W4	Ch7, MITCHELL
B	**Probabilistic Methods**		
1	Probability Theory Review	W5	Ch2, MURPHY
2	Generative Models	W5, W6	Ch3/Ch4, MURPHY
3	Bayesian Learning	W6, W7	Ch5, MURPHY
	March 16	**Mid Term Exam** (*8.00 AM - 10.00 AM*, Knox 109)	
	Spring Break	W8	
C	**Linear Models**		
1	Linear regression models	W9,W10	Ch7, MURPHY
2	Logistic regression	W10	Ch8, MURPHY
3	Maximum Margin Classifiers & SVM	W11,W12	Ch7, BISHOP
4	Comparing Linear Models	W12	Ch7, BISHOP
D	**Kernel Methods**		
1	Introduction	W13	Ch6, BISHOP
2	Kernel Support Vector Machines	W13	Ch7, BISHOP
E	**Latent Models**		
1	Clustering	W13	Ch11, MURPHY
2	Mixture Models	W14	Ch11, MURPHY
3	Latent Linear Models	W14,W15	Ch12, MURPHY
	Course Review	W15	
	May 16	**Final Exam** (*8.00 AM - 11.00 AM*, Davis 101)	

Readings

- **MITCHELL: Tom Mitchell, Machine Learning. McGraw-Hill, 1997.**
- **MURPHY: Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.**
- **BISHOP: Chris Bishop, Pattern Recognition and Machine Learning, Springer, 2006.**
- MACKAY: David Mackay, Information Theory, Inference, and Learning Algorithms, Cambridge Press, 2003.
- HASTIE: Trevor Hastie, Robert Tibshirani and Jerome Friedman, The Elements of Statistical Learning. Springer, 2009.

Grading Scheme

- Grading Scheme
  - Short weekly quizzes using Gradiance (12) – 20%
  - Programming Assignments (3) – 30%
  - Mid-term Exam (in-class, open book/notes) – 20%
  - Final Exam (in-class, open book/notes) – 30%
- All components will be individually curved
  - Final grade (*Tentative*):

A	$[92.5, 100]$	B-	$[72.5, 77.5)$
A-	$[87.5, 92.5)$	C+	$[67.5, 72.5)$
B+	$[82.5, 87.5)$	C	$[62.5, 67.5)$
B	$[77.5, 82.5)$	C-	$[57.5, 62.5)$

Deliverables

Deliverable	Release Date	Due Date
Gradiance 0	Jan 29	Feb 04
Gradiance 1	Feb 05	Feb 11
Assignment 1	Feb 12	Mar 07
Gradiance 2	Feb 12	Feb 19
Gradiance 3	Feb 19	Feb 25
Gradiance 4	Feb 26	Mar 04
Gradiance 5	Mar 05	Mar 11
Gradiance 6	Mar 12	*Mar 25*
Gradiance 7	Mar 26	Apr 01
Assignment 2	Mar 26	Apr 11
Gradiance 8	Apr 02	Apr 08
Gradiance 9	Apr 09	Apr 15
Assignment 3	Apr 16	May 09
Gradiance 10	Apr 16	Apr 22
Gradiance 11	Apr 23	Apr 29
Gradiance 12	Apr 30	May 06

Recitation Schedule - *Tentative*

Week	Topic
1	No recitation
2	Python introduction I
3	Python introduction II
4	Optimization basics
5	Probability Basics I
6	Probability Basics II
7	Mid Term Review
8	Spring Break
9	Using Scikit-learn
10	Decision Trees & Random Forests
11	Feature Selection
12	Clustering Methods
13	Dimensionality Reduction
14	Final Review

Every recitation will also include a short discussion of Gradiance quiz problems from previous week.

Notes

- Gradiance quizzes
  - Will be released every Monday at 9.00 AM EST
  - Due next Sunday at 11.59 PM EST
  - Gradiance 0 will not be evaluated (warm up)
  - Gradiance 6 will be released on March 12 but will be due on March 25
- All assignments are electronically due on Wednesdays by 08.59 AM EST through UBLearns.
- Hard copies of assignment reports will be due in-class on Wednesdays before the end of the class.

Accessibility Services and Special Needs

If you have a disability and may require some type of instructional and/or examination accommodation, please inform me early in the semester so that we can coordinate the accommodations you may need. If you have not already done so, please contact the Office of Accessibility Services; 25 Capen Hall; email: stu-accessibility@buffalo.edu Phone: 716-645-2608 (voice); 716-645-2616 (TTY); and on the web at http://www.student-affairs.buffalo.edu/ods/. All information and documentation is confidential.

The University at Buffalo and the School of Engineering and Applied Sciences are committed to ensuring equal opportunity for persons with special needs to participate in and benefit from all of its programs, services and activities.

Academic Integrity

This course will operate with a zero-tolerance policy regarding cheating and other forms of academic dishonesty. Any act of academic dishonesty will subject the student to penalty, including the high probability of failure of the course (i.e., assignment of a grade of F). It is expected that you will behave in an honorable and respectful way as you learn and share ideas. Therefore, recycled papers, work submitted to other courses, and major assistance in preparation of assignments without identifying and acknowledging such assistance are not acceptable. All work for this course must be original for this course. Please familiarize yourself with the CSE Departments' and University at Buffalo's Academic Integrity Policy and Procedure outlined at `http://www.cse.buffalo.edu/shared/policies/academic.php`.