CSCE 5215 - 004 Machine Learning

I. Course Information:

Instructor: Weishi Shi (Weishi.Shi@unt.edu)

Office: Discovery Park F227

Office Hours: 4:00 pm - 6:00 pm Fri.

Office Hours (IAs):

Lecture Time: 5:30pm-8:20pm Tu.

Lecture Location: WH-216.

II. Course Description:

Machine learning algorithms are able to learn directly from data to make predictions and decisions without being explicitly programmed. Topics include a wide variety of supervised learning methods, both regression and classification, with an emphasis on those that perform well on large feature sets. Ensemble methods are used to combine independent approaches efficiently. Unsupervised and semi-supervised methods will demonstrate the power of learning from data without an explicit training target or goal.

Learning outcomes: Students in this course will learn how to apply sophisticated algorithms to large data sets, focusing on practical application. The goal will be to create models that can make automated predictions or classifications on new data, or make inferences on unlabelled data to aid in understanding and future prediction models.

III. Course Requirements:

- Comfortable with python programming.
- Good understanding of data structures and scientific computing operations on computer(dot product, inverse, pseudo inverse, determinant, expectation, etc.)
- Undergraduate level calculus, linear algebra, and statistics.
- Attendance: Attendance is not mandatory.

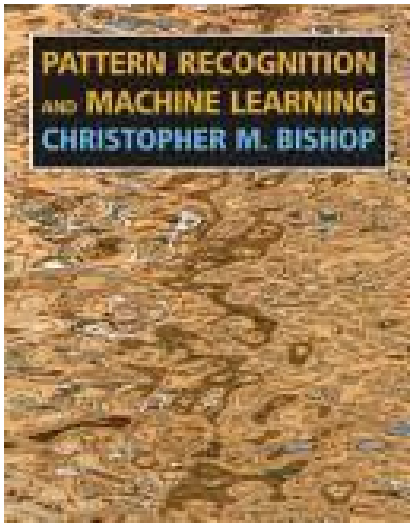
IV. Course Outcomes:

After taking this course, the student will:

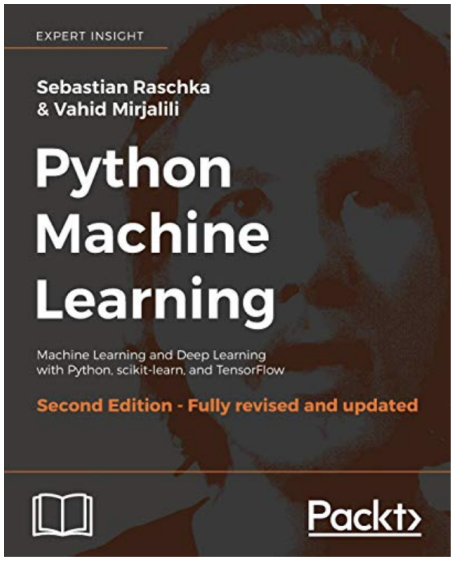
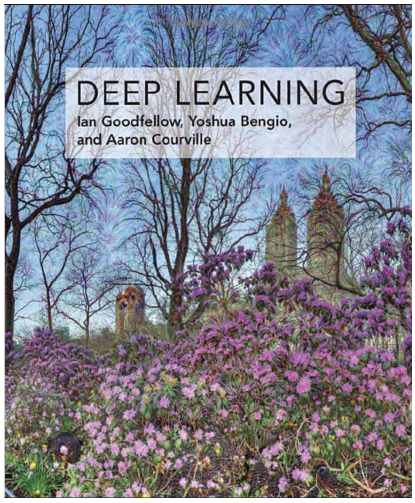
- Learn the essentials of linear models. (Linear regression, Logistic Regression)
- Learn the advanced kernel models. (Gaussian Processes, SVM)
- Understand the fundamental theorems behind machine learning algorithms.
- Be able to implement classical machine learning models and deep neural networks with open-source libraries.

V. Course Textbooks:

Highly Recommended:

	**NAME:** Pattern Recognition and Machine Learning **Author:** C. Bishop **Availability:** Full PDF online

Recommended:

	**NAME:**Python Machine Learning - Second Edition: Machine Learning and Deep Learning with Python, scikit-learn, and TensorFlow (2th Edition) **Author:** Raschka, Sebastian; Mirjalili, Vahid **Availability:** Full PDF online
	**NAME:** Deep Learning **Author:** Ian Goodfellow et al. **Availability:** Full PDF online

VI. Course Schedule:

Calendar	Major Topic(s)	Content Covered in TextBook	Activities
Week1 (1.17)	Introduction (1)	Ch1	Team-Up start
Week2 (1.24)	Introduction (2)	Ch1	Team-Up due. Project1 publish
Week3 (1.31)	Probability Theory	Ch2	**In-class quiz1**
Week4 (2.7)	Guest Lecture		
Week5 (2.14)	Linear Model for Regression(1)	Ch3	Project 1 due. Project 2 publish Assignment1 publish
Week6 (2.21)	Linear Model for Regression(2)	Ch3	
Week7 (2.28)	Active Learning		**In-class quiz2**
Week8 (3.7)	**Mid-Term Exam**		**Mid-Term Exam**
~~Week9 (3.14)~~			Spring Break
Week10 (3.21)	Linear Model for Classification(1)	Ch4	Assignment 1 due, Assignment 2 publish
Week11 (3.28)	Linear Model for Classification(2)	Ch4	
Week12 (4.4)	Neural Nets	Ch5	Project 2 due. Project 3 publish
Week13 (4.11)	Kernel Methods	Ch6	**In-class quiz3** Assignment 2 due. Assignment 3 publish
Week14 (4.18)	Sparse Kernel Methods	Ch7	
Week15 (4.25)	Mixture Models and EM	Ch9	Assignment 3 due. Assignment 4 publish
Week16 (5.2)	Other Types of Learning (meta, active, continual, reinforcement)		**In-class quiz4**

(5.9)	**Final Exam**		**Final Exam** Project 3 due. Assignment 4 due

Grade & Evaluation:

Component	**Weight**
Assignments	4 * 5 = 20%
Team Project	1.Proposal 10% 2.Implementation 10% 3.Report 10% Total: 30%
In-class Quiz	4*5=20%
Mid Term	15%
Final	15%
Extra Credits for Participating in the Class Discussion	0% ~ 10%

Percentage	**Grade**
A	[90%,100%]
B	[80%,90%)
C	[70%,80%)
D	[60%,70)
F	[0%,60)

VII. Course Rules:

- Emails will be answered as promptly as possible. Emails outside normal working hours (8 am to 5 pm) will be answered on the next working day.

- Work handed in for grade (homework, project report, etc.) MUST BE YOUR OWN effort only. Students are NOT allowed to use online solutions from previous course offerings, websites, etc. This will be strictly checked and enforced. The students should adhere to the UNT policies and procedures on the Code of Academic Integrity. 06.003 Student Academic Integrity https://policy.unt.edu/policy/06-003. Plagiarism WILL result in a score of 0 for the assessment in which it occurs.

- Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Center for Student Rights and Responsibilities to consider whether the student's conduct violated the Code of Student Conduct. The university's expectations for student conduct apply to all instructional forums, including university and electronic classrooms, labs, discussion groups, field trips, etc. The Code of Student Conduct can be found at https://policy.unt.edu/policy/07-012

- Usage of cell phones, earphones, and other electronic devices, or recording of lectures is strictly prohibited. Usage of laptops and tablets is permitted for class purposes, only after obtaining permission from the instructor. Usage of classrooms computers, if any, are not allowed, while the class is in session. Any student who uses an unauthorized device will lose 1 point (out of 100) and may be asked to leave the classroom.