東吳大學 SOOCHOW UNIVERSITY

COURSE INFORMATION

Course Title: COMP503 Machine Learning	**Semester:** January Session, 2020
CLASS HOURS: Monday through Friday, 180 minutes each day, for three weeks. At the end of each week there will be a one-hour discussion session; the instructor will also be available by appointment. **Discussion Section**: 1 hour each week. **Field Trip**: Not required.	**CREDITS(s): 3**

OVERVIEW

Machine Learning uses interdisciplinary techniques such as statistics, linear algebra, optimisation and computer science to create automated systems for suggesting future predictions about a task. The amount of data in different fields, such as health, finance and social media, has made Machine Learning an increasingly core computer science competency. This course will introduce the basic Machine Learning concepts, covering supervised and unsupervised techniques, evaluation, as well as specific approaches such as Artificial Neural Network (ANN) and Deep Learning. Students will learn how to apply such techniques to a range of problems, using Matlab, and learn how to analyse outputs from the applications. Students will perform assignments that involve a variety of real-world datasets from a variety of domains. The course expects the students to have a basic understanding of Matlab programming.

LEARNING OUTCOME

Upon successful completion of this course, the students should have basic expertise in the following areas:

- Understand the core theories and concepts of Machine Learning.
- Recognise real-world problems as amenable to Machine Learning.
- An ability to explain the properties of various Machine Learning models and to connect a model to statistical principles.
- Understand a wide variety of learning algorithms.
- Formulate an algorithm that instantiates a given Machine Learning model using appropriate data.
- Understand how to evaluate models generated from real-world data.
- Apply the algorithms to a real-world problem, optimise the models learned and report on the expected accuracy that can be achieved by applying the models.
- Interpret the results of Machine Learning running on real data.

LEARNING RESOURCES

Suggested textbooks:

[KM] K . P. Murphy. *Machine Learning: A Probabilistic Perspective.* MIT Press, 2012.

[CB] C. M. Bishop. *Pattern Recognition and Machine Learning.* Springer, 2006.

[EA] E. Alpaydın. *Introduction to Machine Learning (Third Edition)*. MIT Press, 2014.

WEEKLY SCHEDULE

Week	Day	Topic	Reading
1	1	Introduction and course overview	KM – Chapter 1
	2	Linear regression Bias-variance trade-off	KM – Chapter 7 CB – Chapter 3
	3	Over-fitting Regularisation Scarcity Evaluation	KM – Chapter 7 CB – Chapter 3
	4	Logistic regression Naïve Bayes **Quiz 1**	KM – Chapter 5, 8 CB – Chapter 4
	5	Decision trees Instance-based learning (IBL) **Assignment 1 is due**	KM – Chapter 16
2	1	**Mid-semester Examination**	
	2	Artificial Neural Network (ANN) Deep Learning	CB – Chapter 4, 5 KM – Chapter 28
	3	SVM Kernel machines	CB – Chapter 6, 7
	4	Bayesian networks	KM – Chapter 10
	5	Clustering **Quiz 2**	KM – Chapter 25
3	1	Hidden Markov models **Assignment 2 is due**	KM – Chapter 17
	2	Latent variable models	KM – Chapter 27
	3	Reinforcement learning	EA – Chapter 18
	4	Revision	
	5	**Final Examination**	

ASSESSMENT

Assessment Task	Score Percentage
Attendance and Participation	10%
Quiz 1	5%
Quiz 2	5%
Practical Assignment 1	10%
Practical Assignment 2	10%
Mid-semester Examination	20%
Final Examination	40%
Total	**100%**

DETAILS ON GRADE COMPONENTS

1. Attendance and Participation

Students are required to attend all classes and participate actively. Students should treat their classroom obligations as they would treat any serious professional engagement. Your participation grade will be based on the instructor's assessment of how well you contribute

to classroom dynamics relative to your class peers.

NB: In case of an absence, the student is responsible for the materials and assignments for that class; it is the student's responsibility to inform the instructor regarding absences and assignments that are missed. **Unexcused absence from three or more scheduled class sessions will be grounds for failure in this course.** If you do have to miss class due to a personal emergency, please let the instructor know as soon as possible. Such emergencies will be dealt with on a case-by-case basis.

Participation grades will be based on **quality** (in-class performance that reflects intellectual depth, insightfulness, and contribution to class learning) and **quantity** (consistency and regularity of performance).

Accordingly, **you are expected to read the related chapters before participating the class**. Be prepared to be called upon to "open" a class discussion by presenting your full analysis and thoughts on the assigned topic at the start of class, or to be asked through a "cold call" for comment during the discussion.

The grading of class participation is necessarily a subjective exercise. However, high-quality comments have one or more of the following characteristics: **(1) insightfulness, (2) appropriate application of course concepts, and (3) advancement of the in-class discussion at hand**.

2. Quizzes

Quizzes will happen on the first and second weeks to review and reinforce what has been learned in the previous classes.

3. Practical Assignments

To enhance the learning process, students have to submit two practical assignments. Each assignment weighs 10% of the total marks.

Assignment 1 covers Linear regression, Over-fitting and Regularisation. It is due on Friday of the first week.

Assignment 2 covers Decision trees, Artificial Neural Network (ANN), Deep Learning and Clustering. It is due on Monday of the third week.

4. Mid-semester Examination

The mid-semester examination will be held on Monday of the second week. It will cover all the contents of the first week.

5. Final Examination

An in-class final examination will be administered at the end of the course on Friday of the third week. Details of contents, exam format, etc. will be announced in class well before the examination dates.

6. Course Grading

Upon completion of this course, you receive a final grade. A final grade is a letter grade that carries with it a numerical value, as outlined below.

Grade	Mark
A	80-100
B	70-79

C	60-69
D	50-59
E	0-49

To pass this subject, students are required to obtain Grade B or above in order to satisfy all the intended learning outcomes.

CLASSROOM ETHICS & COURSE POLICIES

Being respectful of others' opinions, values and culture

Cell phones are only permitted when the usage is related to the course. Absolutely **NO TEXTING** during class will be tolerated. If you have an emergency situation and you must be able to be reached, set the phone to vibrate and leave the room immediately when it goes off.

Any student with a documented disability needing academic adjustments or accommodations should notify the instructor or the program administrator before the start of the program, so such an arrangement will be made accordingly.

Any student who anticipates a schedule conflict because of religious reasons should make arrangements within two weeks of the start of class.

Academic misconduct

Please follow the guideline of the university policy. Academic dishonesty or misconduct will not be tolerated and may result in disciplinary action including a grade F for the course. Work submitted must be the original work of the student. Original work may include the words and ideas of others, but the source of these words and ideas must be indicated in a manner consistent with an academically recognized form, style, and citation manual. Resubmission of work previously presented in another course is prohibited.