Syllabus

LN3119 Data Mining and Machine Learning, Spring 2020
Course Website: https://wangshan731.github.io/DM-ML/

Teaching team information:

Instructor: Dr. Shan Wang
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Office: J.T. Wu 320
Consultation times: Mon. 1pm-3pm or by appointment
TA: Yuming Xiong (xiongym3@mail2.sysu.edu.cn)

Lecture time & location:

Mon. 10:00-11:40 (Week 1-9, 11 & 14-19)
Sat. 10:00-11:40 (Week 9 & 18)
IP Po-Ting Hall 102

Course introduction:

With vast amount of data being available, we are now in the era of "big data". The knowledge and skills on data mining and machine learning are becoming increasingly important. This course provides a broad introduction to machine learning, including fundamental concepts and basic techniques for supervised learning, unsupervised learning and reinforcement learning.

Course objectives:

1. To provide students a broad introduction to machine learning: know what is machine learning and what it usually covers.
2. Understand state-of-the-art algorithms used in machine learning, and learn how to apply these algorithms to solve problems with R.
3. To provide students extensive hands-on programming and analysis experiences on practical problems.

Course outcomes:

1. Clearly identify and formulate the relevant problem
2. Select and use effective methods to address the problem
3. Use software tools to provide solution to the issue at hand
4. Communicate the solution effectively

Pre-requisites:

LN347 Data Analysis (Basic linear algebra, basic statistics and probability, and basic programming experiences with R.)

Required textbooks: There is no one textbook that covers all of the topics in this course. The instructor will provide materials and recommended references on the course website.

Grading:

Labs/Participations:	Attendance & discussions	25%
Assignments:	Effort and accuracy	40%
Final project:	Effort and accuracy	35%

References:

1. James, G., Witten, D., Hastie, T. and Tibshirani, R., 2013. An introduction to statistical learning (Vol. 112, p. 18). New York: springer.
2. Goodfellow, I., Bengio, Y. and Courville, A., 2016. Deep learning. MIT press.
3. Sutton, Richard S., and Andrew G. Barto. Reinforcement learning: An introduction. MIT press, 2018.
4. Hastie, T., Tibshirani, R. and Friedman, J., 2009. The elements of statistical learning: data mining, inference, and prediction. Springer Science & Business Media.
5. 李航, 2019. 统计学习方法第二版.
6. 周志华, 2016. 机器学习.
7. Murphy, K.P., 2012. Machine learning: a probabilistic perspective. MIT press.
8. Bishop, C.M., 2006. Pattern recognition and machine learning. springer.
9. Ng, A., 2019. Stanford Machine Learning

Schedule：

Week	Date	Topic
		Introduction
1	Feb. 10	Introduction to Machine Learning
2	Feb. 17	Basics in Machine Learning
		Supervised learning
3	Feb. 24	Linear Regression and R
4	Mar. 2	Logistic Regression
5	Mar. 9	SVM I
6	Mar. 16	SVM II
7	Mar. 23	Tree Models
8	Mar. 30	Neural Networks
9	Apr. 6	Deep Neural Networks
	Apr. 11	Case Study I
		Unsupervised learning
11	Apr. 20	Introduction to Unsupervised Learning and Clustering
14	May. 11	Dimension Reduction
15	May. 18	EM Methods
		Reinforcement learning
16	May. 25	Introduction to Reinforcement Learning
17	Jun. 1	Approximation Methods in RL and Deep RL
		Course wrap-up
18	Jun. 8	Case Study II
	June. 13	Course Project Show Case I
19	Jun. 15	Course Project Show Case II and Course Wrap-up