BMSC-GA 4439: Machine Learning
New York University Spring 2016
Machine Learning, 3 credits

Course meeting times and location:
• 227 East 30th Street (Translational Research Building), TBD
• Friday afternoon from January 29, 2016 to May 6, 2016 (TBD)

Instructor contact info & office location:
Sisi Ma, Ph.D.
• 227 East 30th Street (Translational Research Building), 7th floor, Office #738
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Prerequisites:
Calculus, Linear Algebra, Algorithms and Data Structures, and Statistics. Experience in either Matlab, Python, or R is highly recommended. In some circumstances, students who do not meet the above requirements can obtain permission of the instructor to take the course.

Course topics by weeks (subject to change):
1. Introduction to key concepts of machine learning
2. Basic principles of statistical machine learning
3. Unsupervised learning: Theory and Application
4. Unsupervised learning: Theory and Application (continued)
5. Basic principles of supervised learning (classification) and necessary mathematical concepts
6. Support vector machines for binary classification
7. Model selection and accuracy estimation
8. Variable selection
9. Feature reduction and construction
10. Other methods for binary classification
11. Multicategory classification
12. Regression
13. Machine learning algorithms: overview of the state of the art
14. Student project presentation
15. Student project presentation

Course materials:
Recommended books:
• Pattern Recognition and Machine Learning (Information Science and Statistics) by Christopher Bishop (Author) ISBN-10: 0387310738
Computer tools and software:
• Matlab (with Bioinformatics, Statistics, Neural Network, Optimization toolboxes); or Python (with numpy, scipy, scikit-learn), or R. Matlab is recommended.
• LibSVM library for Matlab/python (http://www.csie.ntu.edu.tw/~cjlin/libsvm/)
• LibLinear library for Matlab/python (http://www.csie.ntu.edu.tw/~cjlin/liblinear/)

Assignments and Assessment:
• 5 practical take-home assignments (50% of the grade)
• Paper presentation (10% of the grade): each student will do a 10 min presentation of a machine learning related paper/concept during the semester.
• Final project (40% of the grade): Final project is evaluated by a in-class presentation (20%) and a 3 page paper (20%).