Department of Economics
Hong Kong University of Science and Technology

Econ 6100W
Financial Econometrics
Spring 2019

Lecture Information:
Monday, 12:00PM - 02:50PM, Rm 1409
Webpage: http://canvas.ust.hk/

Instructor Information:
Instructor: Xun (Sean) Lu
Office: Room LSK6077
Office Hour: Tuesday 11:30am-12:30pm (or by appointment, or any time you can find me)
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Teaching Assistant (TA) Information:
TBA

Course Overview:
This course provides you with modern **machine learning** methods to analyzing financial data. The main focus is on forecasting. These machine learning forecasting tools are nowadays widely used in many fields, especially in dealing with "big data". Machine learning methods are often shown to outperform traditional econometric methods, such as simple linear or nonlinear regressions. Machine learning can be broadly classified as supervised learning and unsupervised learning. We mainly discuss supervised learnings. We will study the methods such as penalized least squares, decision trees, random forests, neutral networks, support-vector machines, among others.

Intended Learning Outcomes:
Even though we focus on financial data in this course, the forecasting methods are general and applicable to many different areas. By the end of the course, you should be skilled users of these methods and should be able to build your own forecasting models for the variable you are interested in, and even design some algorithmic trading strategies for stock markets.

Prerequisites:
ECON5280

Computer Programming:
This course will involve **substantial programming**. The software we will use is **Python** or **Matlab**.

Readings:

The reading is mainly based on lecture slides. I will specify required readings in details along the course. Below are some reference books on the methodology.

- ✧ **ISLR:** Gareth James, Daniela Witten, Trevor Hastie and Robert Tibsharani (2013), An Introduction to Statistical Learning with Applications in R , Springer.
  - ■ A free legal pdf is at: http://www-bcf.usc.edu/~gareth/ISL/
- ✧ **ESL:** Trevor Hastie, Robert Tibsharani and Jerome Friedman (2009), The Elements of Statistical Learning: Data Mining, Inference and Prediction, Springer.
  - ■ A free legal pdf is at: http://statweb.stanford.edu/~tibs/ElemStatLearn/index.html
- ✧ Bradley Efron and Trevor Hastie (2016), Computer Age Statistical Inference: Algorithms, Evidence and Data Science, Cambridge University Press.
  - ■ A free legal pdf is at: https://web.stanford.edu/~hastie/CASI/

Grading:

The grades in this course will be based on the following:

45%	Three individual problems sets (each 15%)
10%	Presentation of a research report or paper
45%	Final project
100%	Total

- ✧ For the presentation, I will assign some research reports or papers for you to present. You can form a group up to three people.
- ✧ For the final project, you can form a group up to three people. If you have difficulty in forming a group, the TA can help you. All group members will receive the same grade for the final project. If you prefer, you can also work on the project individually.
- ✧ For the 45% weight of the final project, 10% will be given to the presentation and 35% will be given to the written report. The written report should include all the data and programs.
- ✧ More details on the requirement of the final project will be provided later.

Tentative Topics:

Topic 1: An Overview of Financial Data and Machine Learning

Topic 2: Forecasting and Regularization

Topic 3: Decision Trees, Random Forecast and Boosting

Topic 4: Neural Networks

Topic 5: Support-Vector Machines