CISC 6352  Advanced Computational Finance

Instructor: Henry Han, Ph.D.  
Office: LL 610A  
Phone: 212-636-6310  
Email: xhan9@fordham.edu  
Office hours: W 4:30 pm-5:30 pm or by appointment.

Course Objectives

• This course aims to enhance students’ data analytics and software development capabilities in finance. It focuses on state-of-the-art big data analytics and machine learning techniques in Finance.

• After taking this class, students should be able to handle deep-level financial data analytics by implementing and designing complicate financial models, and conducting related software development.

Course prerequisites

• CISC5352, equivalent or approved by instructor

Text

• A set of state-of-the-art paper published in finance fields (reference)


• Advanced Analytics with Spark, Ryza and Laserson, O’Reilly, 2015 (reference)

Homework

• There are 5-7 homework assignments.

• Each homework should be clearly typed. Paper-pencil based homework solution will not be accepted.

• Your homework should consist of workable codes and corresponding running results, in addition to typing related problem solutions or question answers.

• Each student or group should submit their homework/project via blackboard system, in addition to turning in a hardcopy.
Projects

- There are three large programming projects. At least one project will be a team project.
- The projects mainly focus on real-world finance problem solving and business analytics.
- Each team will be required to present their projects in class, if the project is a group project.
- Each student is required to come out a 'Job-market' project by the end of semester. The 'Job-market' project should be a well-polished, professional product. It can be a paper to be submitted to mainstream Finance or business analytics journals.
- 'Job-market' project can be a group project with at most two students.

Exam

- Feb 20, 2019

Grading

The grading will be based on the following weighted 100 points.

- Class participation: 5%
- Homework: 25%
- Projects: 35%
- Midterm: 15%
- Final project: 20%

Topics to be covered

- Financial data analytics review
- Dimensional reduction in Finance:
  - PCA, KPCA, SPCA, and NMF
  - LLE, t-SNE
  - Stress testing by PCA
- High-frequency trading analysis
  - HFT data retrieval and analysis
- Market marker prediction and visualization:
  - Manifold learning for HFT

- Machine learning methods in Finance
  - State-of-the-art machine learning models
  - Shallow learning and midlevel learning in Finance
  - Selective learning in Finance
  - Integrative learning in implied volatility prediction

- Credit risk analytics
  - P2P borrower assessment
  - Imbalanced learning in credit risk analytics

- Deep learning in Finance (I): DNN, RBM
- Deep learning in Finance (II): CNN, LSTM
- Blockchain in Finance
- Big Data analytics in Finance (if time permits)

**Course Web**
- The course homepage can be accessed through blackboard in your my.fordham account.
- All lecture notes, homework, projects, and related materials will be posted there.

**Course Policy**
- Every student is required to attend each class/lecture meeting. If you have to miss a class for some reason, please let your instructor know in advance by email, phone call, or other ways.
- There is no make-up for quizzes. Late homework/project will not be accepted unless there is an acceptable reason.
- Discussion for homework/project assignments is encouraged. However, each student should turn in their own independent work. Copying codes and answers from Internet or other resources in homework and projects will be counted as cheating.
- No discussion for take-home quizzes.
- I will give some extra credit problems in homework, projects, and exams.
• You can code in any programming tool you feel comfortable. But we mainly focus on python in this class.

• Class participation: attending class regularly, actively involved in class activities, and good communication with your classmates and professor

Miscellaneous

• Please let your instructor know if you have a disability that requires special arrangements.

  – Under the Americans with Disabilities Act and Section 504 of the Vocational Rehabilitation Act of 1973, all students, with or without disabilities, are entitled to equal access to the programs and activities of Fordham University. If you believe that you have a disability that may interfere with your ability to participate in the activities, coursework, or assessment of the object of this course, you may be entitled to accommodations. Please schedule a meeting to speak with someone at the Office of Disability Services (Rose Hill - O’Hare Hall, Lower Level, x0655 or at Lincoln Center – Room 207, x6282).

• The main office of the Department of Computer and Information Science is in JMH 340 (Phone: 718-817-4480).

• CIS department Computer Labs: LL 602.