

Syllabus for IE471: Introduction to Financial Engineering (With Applications of AI Techniques to Financial Services)

Instructors

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- TAs
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Objectives

The main objective of this course is to build up the basic knowledge on various financial instruments as well as quantitative models for investment management. The main topics include: equities, fixed-income securities, options, futures and other derivatives. Also, we will discuss about their pricing models and investment strategies. In addition, we will implement basic computational tools and apply various AI techniques for financial services using Excel, VBA, Matlab and Python.

Lectures

- 2:30 to 3:45PM on Tue/Thu
- Class will meet online only.
- <https://kaist.zoom.us/j/89752468048>
- Meeting ID: 897 5246 8048
- Passcode: 520758

Textbook

- Investment Science 1st edition, Luenberger, Oxford University Press, 1998 (main textbook)
 - 2nd edition published in 2013 is also fine. Please note that the international version is available only for the 1st edition. I will cover the additional topics in the 2nd edition, so either version is fine.
- Options, Futures and Other Derivatives, 7th Edition, Hull, Prentice Hall, 2008
- Investments, 8th Edition, Bodie, Kane and Marcus, McGraw-Hill/Irwin, 2008

Evaluation

- AI Projects (40%), Final exam (40%), Homework assignments (20%)
- Attendance: -3% for each absence after first 3
- Attendance will be checked via Zoom usage report. Please make it sure that your Zoom name is set to “KAIST_ID Your_Name” (e.g. 20210000 Woo Chang Kim or 20210000 김우창), and turn on your video at least for the first and the last five minutes.

Course Website

Course materials including lecture notes and homework assignments as well as course announcements will be posted on the KLMS website. Students are required to register to the site and strongly recommended to check the website periodically.

Hands-on Practice on Financial AI

There are 4 mini projects on financial artificial intelligence. Each project requires you 1) to watch a video clip that describes the project, 2) conduct various tests on the given hands-on AI exercise based on the provided codes and data set, and 3) write a report on the project.

- The credit for each project is 8 points.
- You will get full credit if you submit the report as described in the instructions. This will grant you 32 points.
- You can extend one of your projects in order to get the extra 8 pts. Extension means: 1) using different data set other than the ones provided by the instructor, 2) revising the codes significantly, 3) applying different AI algorithms, etc.

The topics are as follows:

- Weeks 1 - 4
 - Stock Price Prediction Using Machine Learning
 - ✓ Focused on Supervised Machine Learning
- Weeks 5 - 8
 - Predicting Direction of Stock Price Using Sentiment Analysis
 - ✓ Focused on Natural Language Processing & Supervised Machine Learning
- Weeks 9 - 12
 - Analysis of Credit Data Using Clustering Methods
 - ✓ Focused on Unsupervised Machine Learning
- Weeks 13 - 16
 - Portfolio Management Using Reinforcement Learning
 - ✓ Focused on Reinforcement Learning

Tentative Schedule

Weeks	Contents		Weeks	Contents	
1	Introduction	AI Project 1	9	capital asset pricing model	AI Project 3
2	The basic theory of interest		10	capital asset pricing model	
3	fixed-income securities		11	forward, futures, and swaps	
4	term structure		12	models of asset dynamics	
5	applied interest rate analysis	AI Project 2	13	basic options theory	AI Project 4
6	mean-variance portfolio theory		14	additional options topics	
7	mean-variance portfolio theory		15	interest rate derivatives	
8			16	final exam	