AI for Investment Analysis

(Course Orientation on Artificial Intelligence for Investment Analysis)

1082AIIA01
MBA, IMTKU (M2399) (8409) (Spring 2020)
Wed 3, 4 (10:10-12:00) (B206)

Min-Yuh Day
Associate Professor

Dept. of Information Management, Tamkang University

http://mail.tku.edu.tw/myday/
2020-03-04
人工智慧
投資分析
AI for Investment Analysis
淡江大學108學年度第2學期
課程教學計畫表
Spring 2020 (2020.03 - 2020.06)

• 課程名稱：人工智慧投資分析
  (AI for Investment Analysis)
• 授課教師：戴敏育 (Min-Yuh Day)
• 開課系級：資管所碩士班 (TLMXM1A)
• 開課資料：選修 單學期 2 學分 (2 Credits, Elective)
• 上課時間：週三 3, 4 (Wed 10:10-12:00)
• 上課教室：B206 (淡江大學淡水校園)
淡江大學資訊管理系(所)教育目標

• 致力於資訊科技與經營管理知識之科際整合研究發展，為國家與社會培育兼具資訊技術能力與現代管理知識的中高階人才。
淡江大學資訊管理系(所)核心能力

• A. 現代管理知識應用。(10%)
• B. 邏輯思考。(10%)
• C. 關鍵分析。(10%)
• D. 結合資訊技術與管理。(30%)
• E. 研究與創新。(10%)
• F. 資料分析與應用。(20%)
• G. 資通安全管理。
• H. 言辭與文字表達。(10%)
課程簡介

• 本課程介紹人工智慧投資分析
• 課程內容包括

- AI 金融科技:金融服務創新應用、
  機器人理財顧問與AI交談機器人、
  投資心理學與行為財務學、
  財務金融事件研究法、
  Python AI投資分析基礎、
  Pandas量化投資分析、
  Python Scikit-Learn 機器學習投資分析、
  TensorFlow 深度學習投資分析、
  投資組合最佳化與程式交易、
  與人工智慧投資分析個案研究。
Course Introduction

• This course introduces the fundamental concepts, research issues, and hands-on practices of artificial intelligence for investment analysis.

• Topics include
  – AI in FinTech: Financial Services Innovation and Application,
  – Robo-Advisors and AI Chatbots,
  – Investing Psychology and Behavioral Finance,
  – Event Studies in Finance,
  – Foundations of AI Investment Analysis in Python,
  – Quantitative Investing with Pandas in Python,
  – Machine Learning for Investment Analysis with Scikit-Learn In Python,
  – Deep Learning for Investment Analysis with TensorFlow,
  – and Case Study on Artificial Intelligence for Investment Analysis
課程目標
(Objective)

• 瞭解及應用人工智慧投資分析基本概念與研究議題。
  (Understand and apply the fundamental concepts and research issues of AI for investment analysis.)

• 進行人工智慧投資分析相關之資訊管理研究。
  (Conduct information systems research in the context of AI for investment analysis.)
<table>
<thead>
<tr>
<th>週次 (Week)</th>
<th>日期 (Date)</th>
<th>內容 (Subject/Topics)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2020/03/04</td>
<td>人工智能投資分析課程介紹&lt;br&gt;(Course Orientation on AI for Investment Analysis)</td>
</tr>
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<td>2</td>
<td>2020/03/11</td>
<td>AI 金融科技: 金融服務創新應用&lt;br&gt;(AI in FinTech: Financial Services Innovation and Application)</td>
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<td>3</td>
<td>2020/03/18</td>
<td>機器人理財顧問與AI交談機器人&lt;br&gt;(Robo-Advisors and AI Chatbots)</td>
</tr>
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<td>4</td>
<td>2020/03/25</td>
<td>投資心理學與行為財務學&lt;br&gt;(Investing Psychology and Behavioral Finance)</td>
</tr>
<tr>
<td>5</td>
<td>2020/04/01</td>
<td>財務金融事件研究法&lt;br&gt;(Event Studies in Finance)</td>
</tr>
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<td>6</td>
<td>2020/04/08</td>
<td>人工智能投資分析個案研究Ⅰ&lt;br&gt;(Case Study on AI for Investment Analysis I)</td>
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<td>Week</td>
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<td>Subject/Topics</td>
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| 7    | 2020/04/15 | Python AI 投資分析基礎  
(Foundations of AI Investment Analysis in Python) |
| 8    | 2020/04/22 | Python Pandas 量化投資分析  
(Quantitative Investing with Pandas in Python) |
| 9    | 2020/04/29 | 期中報告 (Midterm Project Report) |
| 10   | 2020/05/06 | Python Scikit-Learn 機器學習投資分析  
(Machine Learning for Investment Analysis with Scikit-Learn In Python) |
| 11   | 2020/05/13 | TensorFlow 深度學習投資分析 I  
(Deep Learning for Investment Analysis with TensorFlow I) |
| 12   | 2020/05/20 | TensorFlow 深度學習投資分析 II  
(Deep Learning for Investment Analysis with TensorFlow II) |
<table>
<thead>
<tr>
<th>週次 (Week)</th>
<th>日期 (Date)</th>
<th>內容 (Subject/Topics)</th>
</tr>
</thead>
</table>
| 13         | 2020/05/27 | 人工智慧投資分析個案研究 II  
(Case Study on Artificial Intelligence for Investment Analysis II) |
| 14         | 2020/06/03 | TensorFlow 深度學習投資分析 III  
(Deep Learning for Investment Analysis with TensorFlow III) |
| 15         | 2020/06/10 | 投資組合最佳化與程式交易  
(Portfolio Optimization and Algorithmic Trading) |
| 16         | 2020/06/17 | 期末報告 I (Final Project Presentation I) |
| 17         | 2020/06/24 | 期末報告 II (Final Project Presentation II) |
| 18         | 2020/07/01 | 教師彈性補充教學 |
教學方法與評量方法

• 教學方法
  - 講述、討論、
    發表、實作

• 評量方法
  - 討論、實作、報告
教材課本

- 教材課本
- 講義 (Slides)
- 人工智慧投資分析相關個案與論文 (Cases and Papers related to AI for Investment Analysis)


作業與學期成績計算方式

• 作業篇數
  - 3篇

• 學期成績計算方式
  - 期中評量：30 %
  - 期末評量：30 %
  - 其他（課堂參與及報告討論表現）：40 %
AI and Big Data Analytics in Finance

• 金融科技 (Spring 2017, EMBA IMTKU)
  – Financial Technology, FinTech

• 財務金融大數據分析 (Fall 2017, EMBA IMTKU)
  – Big Data Analytics in Finance

• 人工智能投資分析 (Fall 2018, EMBA IMTKU)
  (Spring 2020, MBA IMTKU)
  – Artificial Intelligence for Investment Analysis

• 人工智能財務金融應用 (Fall 2019, EMBA IMTKU)
  – AI in Financial Application

• 智慧金融大數據分析 (Fall 2019, MBA DBETKU)
  – AI in Finance Big Data Analytics
Yves Hilpisch (2018), *Python for Finance: Mastering Data-Driven Finance*, O'Reilly

Source: [https://www.amazon.com/Python-Finance-Mastering-Data-Driven/dp/1492024333](https://www.amazon.com/Python-Finance-Mastering-Data-Driven/dp/1492024333)
Paolo Sironi (2016)

**FinTech Innovation:**
From Robo-Advisors to Goal Based Investing and Gamification,

Wiley

Doron Kliger and Gregory Gurevich (2014),

Palgrave Macmillan

沈中華、李建然 (2000),
事件研究法：財務與會計實證研究必備

Source: 沈中華、李建然 (2000)，事件研究法：財務與會計實證研究必備，華泰文化
Yuxing Yan (2017),

Python for Finance: Apply powerful finance models and quantitative analysis with Python,


Source: https://www.amazon.com/Python-Finance-powerful-quantitative-analysis/dp/1787125696

https://github.com/ageron/handson-ml2

Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow

Notebooks
1. The Machine Learning landscape
2. End-to-end Machine Learning project
3. Classification
4. Training Models
5. Support Vector Machines
6. Decision Trees
7. Ensemble Learning and Random Forests
8. Dimensionality Reduction
9. Unsupervised Learning Techniques
10. Artificial Neural Nets with Keras
11. Training Deep Neural Networks
12. Custom Models and Training with TensorFlow
13. Loading and Preprocessing Data
14. Deep Computer Vision Using Convolutional Neural Networks
15. Processing Sequences Using RNNs and CNNs
16. Natural Language Processing with RNNs and Attention
17. Representation Learning Using Autoencoders
18. Reinforcement Learning
19. Training and Deploying TensorFlow Models at Scale

https://github.com/ageron/handson-ml2
Sequences using RNNs and CNNs

```python
np.random.seed(43)
series = generate_time_series(1, 50 + 10)
X_new, Y_new = series[:50], series[50:]
Y_pred = model.predict(X_new[::-1]..., np.newaxis)

plot_multiple_forecasts(X_new, Y_new, Y_pred)
plt.show()
```

Welcome to Colaboratory!

Colaboratory is a free Jupyter notebook environment that requires no setup and runs entirely in the cloud. See our FAQ for more info.

Getting Started

- Overview of Colaboratory
- Loading and saving data: Local files, Drive, Sheets, Google Cloud Storage
- Importing libraries and installing dependencies
- Using Google Cloud BigQuery
- Forms, Charts, Markdown, & Widgets
- TensorFlow with GPU
- Machine Learning Crash Course: Intro to Pandas & First Steps with TensorFlow

Highlighted Features

Seedbank
Looking for Colab notebooks to learn from? Check out Seedbank, a place to discover interactive machine learning examples.

TensorFlow execution

Colaboratory allows you to execute TensorFlow code in your browser with a single click. The example below adds two matrices.

\[
\begin{bmatrix}
1. & 1. & 1.
\end{bmatrix}
+ \begin{bmatrix}
1. & 2. & 3.
\end{bmatrix}
= \begin{bmatrix}
2. & 3. & 4.
\end{bmatrix}
\]
Financial Technology
Financial Technology

FinTech

“providing financial services by making use of software and modern technology”

Source: https://www.fintechweekly.com/fintech-definition
Financial Services
Financial Services

Source: http://www.crackitt.com/7-reasons-why-your-fintech-startup-needs-visual-marketing/
Financial Revolution with Fintech

A financial services revolution
Consumer Trends

1. Simplification
2. Transparency
3. Analytics
4. Reduced Friction

Source: http://www.hedgethink.com/fintech/european-fintech-top-100/
FinTech: Financial Services Innovation

Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf
FinTech: Financial Services Innovation

1. Payments
2. Insurance
3. Deposits & Lending
4. Capital Raising
5. Investment Management
6. Market Provisioning

Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf
FinTech: Financial Services Innovation

- **Payments**
  - 無現金世界 (Cashless World)
  - 新興支付 (Emerging Payment Rails)

- **Insurance**
  - 價值鏈裂解 (Insurance Disaggregation)
  - 保障串接裝置 (Connected Insurance)

- **Deposit & Lending**
  - 替代管道 (Alternative Lending)
  - 通路偏好移轉 (Shifting Customer Preferences)

- **Capital Raising**
  - 群眾募資 (Crowdfunding)

- **Investment Management**
  - 賦權投資者 (Empowered Investors)
  - 流程外部化 (Process Externalisation)

- **Market Provisioning**
  - 機器革命 (Smarter, Faster Machines)
  - 新興平臺 (New Market Platforms)

Source: https://www.stockfeel.com.tw/2015年世界經濟論壇－未來的金融服務/
FinTech: Payment

Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf
FinTech: Payment
Cashless World
Emerging Payment Rails

無現金世界
Cashless World

新興支付
Emerging Payment Rails

流線型支付 (Streamlined Payment)、次世代安全 (Next Generation Security)、帳單整合、手機支付

密碼協定 (Cryptographic Protocols)、行動錢包、P2P

Source: https://www.stockfeel.com.tw/2015年世界經濟論壇－未來的金融服務/
FinTech: Insurance

Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf
FinTech: Insurance

Insurance Disaggregation

Connected Insurance

Source: https://www.stockfeel.com.tw/2015年世界經濟論壇－未來的金融服務/
FinTech: Deposits & Lending

Source: http://www3.weforum.org/docs/WEF_The_future_of_financial_services.pdf
3 FinTech: Deposits & Lending
Alternative Lending
Shifting Customer Preferences
FinTech: Capital Raising

Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf
FinTech: Capital Raising
Crowdfunding

另類仲裁 (Alternative Adjudication)、賦權天使投資者 (Empowered Angel Investors)

資料來源：Fugle團隊整理

Source: https://www.stockfeel.com.tw/
FinTech: Investment Management

Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf
FinTech: Investment Management
Empowered Investors
Process Externalization

Source: https://www.stockfeel.com.tw/2015年世界經濟論壇－未來的金融服務/
FinTech: Market Provisioning

Source: http://www3.weforum.org/docs/WEF_The_future__of_financial_services.pdf
FinTech: Market Provisioning
Smarter, Faster Machines
New Market Platforms

Source: https://www.stockfeel.com.tw/2015年世界經濟論壇－未來的金融服務/
Artificial Intelligence and Deep Learning for Fintech
From Algorithmic Trading to Personal Finance Bots: 41 Startups Bringing AI to Fintech

Source: https://www.cbinsights.com/blog/artificial-intelligence-fintech-market-map-company-list/
From Algorithmic Trading To Personal Finance Bots: 41 Startups Bringing AI To Fintech

AI in Fintech

41 Startups Bringing Artificial Intelligence To Fintech

General Purpose/Predictive Analytics
- AYASDI
- KENSHE
- Turi
- H2O
- DataRobot
- Nervana Systems

Market Research & Sentiment Analysis
- Indico
- Acuity Insights
- Lucena Quantitative Analytics
- Numerai
- Dataminr

Search Engine
- Alphasense

Quantitative Trading
- Sentient Technologies
- Clone Algo
- Alpaca
- Walnut Algorithms

AI Assistants/Bots
- KASIST
- TRIM
- PENNY
- Sure

Credit Scoring
- Typescore
- Aire
- Creditvidya
- ZestFinance
- ADF Applied Data Finance

Blockchain
- Skry
- Euclid

Fraud Detection
- Feedzai
- Biocatch

Debt Collection
- TrueAccord

Personal Banking
- Personetics
- SBDAGroup
Artificial Intelligence (AI) in Fintech

General Purpose/Predictive Analytics

- AYASDI
- Digital Reasoning
- context relevant
- H2O
- KENSHO
- cortical.io
- Numenta
- turi
- DataRobot
- nervana systems

Market Research & Sentiment Analysis

- indico
- acuity
- Lucena
- NUMERAI
- Dataminr

Search Engine

- alphasense

Source: https://www.cbinsights.com/blog/artificial-intelligence-fintech-market-map-company-list/
Artificial Intelligence (AI) in Fintech

Quantitative Trading
- sentient technologies
- CLONE ALGO
- Alpaca
- WALNUT ALGORITHMS

AI Assistants/Bots
- KASIST
- TRIM
- Penny
- INSURIFY SURE.

Credit Scoring
- TypeScore
- aire
- creditvidya
- zest finance
- ADF
- APPLIED DATA FINANCE
- Wecash

Blockchain
- Skry
- EUKLID

Debt Collection
- TrueAccord

Fraud Detection
- feedzai
- BIOLINQ
- BIOMETRICS

Personal Banking
- personetics
- SBDA group

Source: https://www.cbinsights.com/blog/artificial-intelligence-fintech-market-map-company-list/
Wealthfront Robo Advisor

Source: https://www.wealthfront.com/
1

金融科技
Financial Technology,
FinTech
Big Data Analytics in Finance
Artificial Intelligence for Investment Analysis
4

人工智能
財務金融應用

AI in Financial Application
5

AI in Finance Big Data Analytics
References


Summary

• This course introduces the fundamental concepts, research issues, and hands-on practices of artificial intelligence for investment analysis.

• Topics include
  – AI in FinTech: Financial Services Innovation and Application,
  – Robo-Advisors and AI Chatbots,
  – Investing Psychology and Behavioral Finance,
  – Event Studies in Finance,
  – Foundations of AI Investment Analysis in Python,
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  – Machine Learning for Investment Analysis with Scikit-Learn In Python,
  – Deep Learning for Investment Analysis with TensorFlow,
  – and Case Study on Artificial Intelligence for Investment Analysis
AI for Investment Analysis

Contact Information

戴敏育博士 (Min-Yuh Day, Ph.D.)
副教授 (Associate Professor)

淡江大学 資訊管理學系
Department of Information Management, Tamkang University

電話：02-26215656 #2846
傳真：02-26209737
研究室：B929
地址：25137 新北市淡水區英專路151號
Email：myday@mail.tku.edu.tw
網址：http://mail.tku.edu.tw/myday/