## **FIN7030 Al and Trading**

## 📌 Introduction

This module will introduce the modern practices in finance of using algorithms to extract computer-age statistical inference. The purpose of this course is not to introduce students to the vast array of machine learning algorithms. The goal is to introduce the emerging field of [Financial Machine Learning (FML)](https://jfds.pm-research.com/). as a complement to traditional financial research techniques.

This course presents machine learning as a non-linear extension of various topics in quantitative economics, such as financial econometrics and dynamic programming, emphasising novel algorithmic representations of data, regularisation, and techniques for controlling the bias-variance tradeoff, leading to improved out-of-sample forecasting.

*Context is king* in computer-age statistical inference, and financial datasets used to solve modern investment problems offer unique challenges beyond many *plug-and-play* data science algorithms.

Efron and Hastie (2016) explain the challenges of computer-age statistical inference as follows:

Broadly speaking, algorithms are what statisticians do while inference says why they do them. An energetic brand of the statistical enterprise has ﬂourished in the new century, data science, emphasizing algorithmic thinking rather than its inferential justiﬁcation.

The era of "Big Data" has provided a backdrop for the rapid expansion of immense computer-based processing algorithms, for instance, random forest for prediction. The importance of inferential arguments supporting ML applications has emerged as an exciting (yet underdeveloped) field. This is particularly true for financial research questions where the complexity of the **data story** [[1]](#fn1) results in notoriously noise covariance matrices. A small percentage of information these matrices contain is *signal*, which is systemically suppressed by arbitrage forces. This course will introduce best practice techniques in financial data science, which can help illicit economically meaningful *signals* and answer recent financial research questions.

## 📣 Module Coordinator

Your module coordinator is Barry Quinn ([b.quinn@qub.ac.uk](mailto:b.quinn@qub.ac.uk)). Office hours just make an appointment.

## 🔎 Module Contents

| Topics |
| --- |
| Why study financial machine learning? |
| High-performance cloud computing in finance |
| Denoising |
| Distance metrics |
| Optimal clustering |
| Algorithms and statistical inference |
| Causal Inference and Machine Learning |

[Module Details](https://canvas.qub.ac.uk/courses/25555/pages/home)

## ⭐ What are my learning outcomes?

Upon successful completion of the module, you will be able to:

# Learning Outcomes

* Understanding of the application of algorithms and machine learning to finance
* Introduction to financial machine learning to \* explain\* modern phenomena in finance.
* Understand how credible theory is needed to build successful algorithmic trading and investment strategies
  + and how we can use ML to make better financial theories.

[[1]](#r1).Or, more formally the data-generating process which underpins the sample

## 🏅 How will my skills be enhanced?

This module will help you to develop the following skills:

* + We are introducing using algorithms to research contemporary finance problems.
  + We are introducing cloud computing for finance.
  + Learn to combine R+python in an agile, durable and credible way.
  + We are using state-of-the-art cloud computing solutions (Rstudio Workbench and Connect).
  + Develop independent problem-solving techniques.
  + Learn the properties of algorithms through Monte Carlo simulations:

Fake it before you make it

## ✅ How will the module be assessed?

Assessment of this module will comprise:

|  |  |  |
| --- | --- | --- |
| **Assessment Type** | **Weight (%)** | **Description** |
| Assignment | 30 | AI Project- The students use statistical and critical reasoning to evaluate the use of LLMs to produce financial research. |
| Computer Practical | 70 | Computer-based exam |

📚 Self-Study

* Interactive tutorials on Q-RaP
* Sessions on developing a growth mindset to improve your empirical grit

## 📝 Additional Guidance

* Weekly coding clinics
* Open digital door policy

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