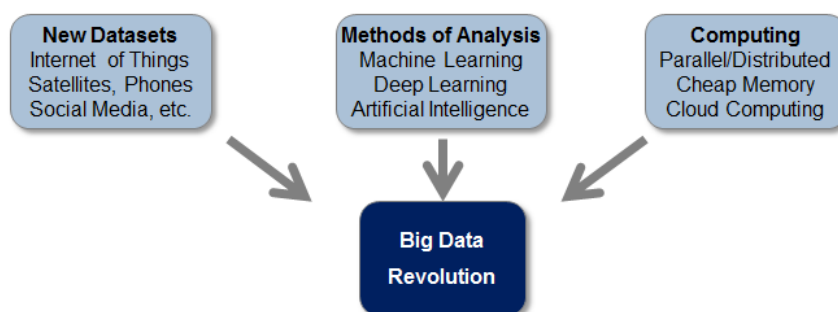


AI IN FINANCE

Course Description

The global finance industry is undergoing significant transformations. A major catalyst for these changes is the advancement of artificial intelligence, which is revolutionizing how we transact, invest, forecast, manage risks, and more.

In this two-day course, we will provide an overview of how AI and machine learning are being applied in finance. To give clear context to the key concepts, we will follow the steps of building a fully automated AI lending system. Rather than treating the technology as a black box, we will discuss the theoretical foundation at an intuitive level. We will also examine the unique challenges of financial machine learning, the importance of integrating domain knowledge into our business solutions, as well as the regulatory implications. Among the examples, we will explore how machine learning is being applied to investing, market making, and risk management.



Source: J.P.Morgan Macro QDS.

Pre-requisites

- Students of this course are expected to have taken an introductory course in finance (e.g., 15.401). In addition, basic knowledge of statistics (at the level of 15.060), including multivariate linear regressions, is required.
- Coding: Basic knowledge in programming is recommended. If you are new to coding, I would recommend the following [tutorial for beginners](#) before the class starts. In class, we will go over coding examples in Python.

Recommended Readings

L Lecture notes will be available on Canvas.

ISL James, Gareth, Daniela Witten, Trevor Hastie, and Robert Tibshirani. [An Introduction to Statistical Learning: with Applications in Python](#), Springer.

R Articles (available on Canvas). It is highly recommended to read R1-R7 before our lectures.

1. Artificial Intelligence in Finance. Bonnie Buchanan. 2019. *The Alan Turing Institute*.
2. Future of Finance – The CFO agenda for a radically different tomorrow. 2019. *KPMG*.
3. The Economic Potential of Generative AI. 2023. *McKinsey*.
4. [The End of Theory: The Data Deluge Makes the Scientific Method Obsolete](#). Chris Anderson. 2008. *Wired*.
5. [Big data: are we making a big mistake?](#) Tim Harford. 2014. *FT Magazine*.
6. [Why finance is deploying natural language processing?](#) Tracy Mayor. 2020. *MIT Sloan - Ideas Made to Matter*.
7. [Artificial Intelligence Won't Replace Financial Advisors](#). Danny Noonan. 2023. *Morningstar*.
8. Deep Learning for Mortgage Risk. Apaar Sadhwani, Kay Giesecke, and Justin Sirignano. 2020. *Journal of Financial Econometrics*, Vol. 19, No. 2, 313-368.
9. One pixel attack for fooling deep neural networks. Jiawei Su, Danilo Vargas, and Kouichi Sakurai. 2019. *IEEE Transactions on Evolutionary Computation*, Vol. 23, No. 5, 828-841.

Course Requirements and Grading

- Lectures: Eight 80-minute sessions, January 8, 9, 2025.
- Team project is due on January 24, 2025. It can be done in a team of 2-4 students.
- Grading: P/D/F

Contribution to Class Discussion	30%
Team project	70%

TA and Office Hour

- TA: The TA for this course is Giudi Perinelli. She can be reached at gperinel@mit.edu.
- The instructor is available by appointment. Contact me by email to schedule an appointment.

Contact Information

Instructor: Hui Chen
Office: E62-616
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Assistant: Jasae Hinds
Phone: 617-324-7023
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Conduct

Professional conduct is built upon the idea of mutual respect. Such conduct entails (but is not necessarily limited to):

- Attending classes. The lectures are required for a reason, and each class benefits from the attendance and contributions of all students.
- Arriving on time. Late arrivals are disruptive to both lectures and class discussion, and show disrespect to those who are on time.
- Participating in class. Minimizing disruptions to the class. All cell phones and pagers should be turned off during class.
- Being prepared for class. You should be ready to discuss any assigned readings and to answer any assigned questions for each day's class.
- Respect. You should act respectfully toward all class participants.

Class Schedule

Session	Topic	Readings
1	An ML revolution in finance Topics: FinTech revolution. How do data analytics add value? What are their limitations?	R
2	Let's build a lending robot (Part I) Topics: Regression vs. classification; logistic regression: estimation and forecasting; confusion matrix	ISL 3, 4.1-4.3
3	Let's build a lending robot (Part II) Topics: KNN; tree-based models	ISL 2, 8
4	Let's build a lending robot (Part III) Topics: Deep neural networks	ISL 10
5	Avoiding the big traps in financial ML Topics: Bias-variance trade-off; cross validation; regularization	ISL 5, 6
6	Teaching economics to the machines Topics: Economic loss function; domain knowledge-informed learning	R
7	Generative AI and finance Topics: Capabilities and use cases	R
8	Additional topics and class wrap-up Topics: Algorithm fragility, transparency, fairness	R