

**MIS4321**

**Computational Finance and  
Algorithmic Trading**

Fall 2025

Lecture #1

# Contact Information

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- **Office hours:** Monday 13:00 -15:00 PM  
Wednesday 13:00 -14:00 PM

# Text Books and References

1. Algorithmic trading and quantitative strategies, by Raja Velu, Maxence Hardy, and Daniel Nehren, Boca Raton, FL, Chapman and Hall, 2020, CRC Financial Mathematics.
2. Learn Algorithmic Trading, by Sebastien Donadio, Sourav Ghosh, Birmingham (UK), 2019, Packt Publishing.

# Grading

<u>Assesments</u>	<u>Number</u>	<u>Percentage</u>
<u>Participation*</u>	14 <u>weeks</u>	(10% of <u>midterm</u> and 10% of final <u>exam</u> )
<u>Midterm Exam</u>	1	50 %
<u>Final Exam</u>	1	50 %

\*Participation will be measured by lecture attendance.

**If you miss more than 4 classes, you can't take your final exam!**

# Course Format

- Lecture files and documents will be posted shortly after (or before) the lecture on **CLOUD (Bulut) system**.

(The cloud link will be shared with you, soon)

- Check **Bulut system** page of the course **every day!**

# Course Outline

- This course covers the algorithmic trading strategies, backtesting, financial data processing, statistical learning, time series analysis for forecasting, performance analysis of forecasting algorithms, risk management, practical implementation of event and strategy based trading algorithms.

# Course Schedule

Week	Topics
1	What Is Algorithmic Trading?
2	Fundamentals of Algorithmic Trading
3	Trading Strategies
4	Evaluating Trading Strategies and Backtesting
5	Financial Data Storage
6	Processing Financial Data
7	Application Tools and General Review
8	<b>Midterm Exam</b>
9	Statistical Learning
10	Forecasting
11	Implementation of Arbitrage Strategies
12	Implementation of Rebalancing Strategies
13	Event-Driven Trading Engine Implementation
14	Trading Strategy Implementation
15	General Review



# Introduction

**Algorithmic Trading** is a method of executing trades using **automated pre-programmed trading instructions**.

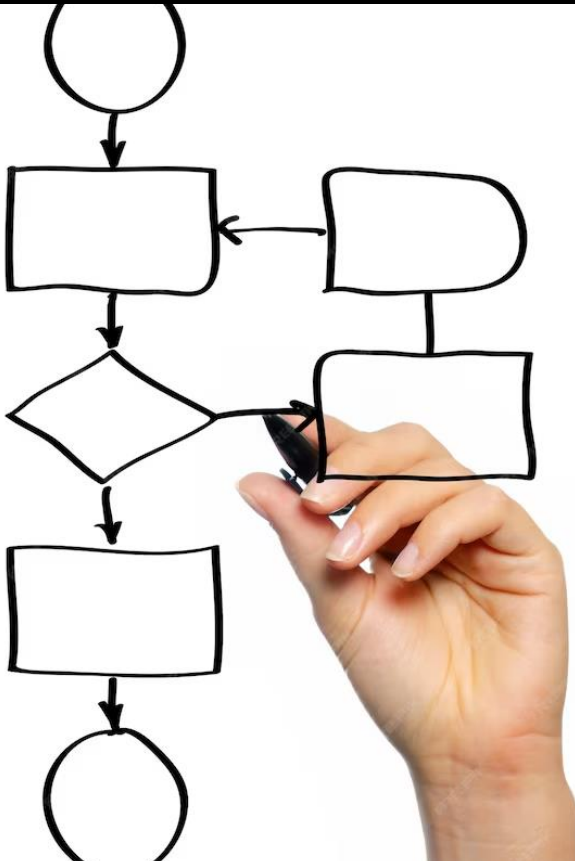
It has revolutionized the way financial markets operate, allowing for **faster and more precise trading decisions**.



# What are Algorithms?

An **algorithm** is a set of rules to be followed in calculations or other problem-solving operations.

In trading, algorithms are used to **analyze large amounts of data** and make trading decisions based on that analysis. They can be used to identify patterns, execute trades, and manage risk.





# Types of Algorithmic Trading

There are several types of **algorithmic trading** strategies, including **trend-following**, **mean reversion**, and **statistical arbitrage**.

**Trend-following strategies** aim to identify and follow trends in the market, while **mean reversion** strategies look for opportunities to **buy low and sell high**.

**Statistical arbitrage** strategies use statistical models to identify **mispricings in the market**.

# Advantages of Algorithmic Trading

Algorithmic trading offers several advantages over traditional trading methods, including **speed**, **accuracy**, and **consistency**.

Algorithms can analyze vast amounts of data **in real-time**, making trading decisions **faster and more precise**.

They are also not subject to human emotions or biases, **ensuring consistency in trading decisions**.



# Challenges of Algorithmic Trading

While algorithmic trading has many benefits, there are also several challenges to be aware of. These include **data quality**, **overfitting**, and **market volatility**.

Algorithms rely on high-quality data to make accurate predictions, and **overfitting** can occur when an algorithm is too closely tailored to historical data. **Market volatility** can also lead to unexpected results.





# Regulation of Algorithmic Trading

As algorithmic trading has become more prevalent (widespread), regulators have taken notice and introduced new rules and guidelines.

The goal is to ensure that algorithms are used in a **responsible and transparent manner**, and that they do **not pose a risk to financial stability**.

Regulators also aim to **prevent market abuse and protect investors**.



# Future of Algorithmic Trading

The future of **algorithmic trading** looks bright, with continued improvements in technology and data analysis.

However, there are also concerns about the **impact of algorithms on the job market and the potential for unintended consequences.**

As the industry continues to evolve, it will be important to strike a **balance between innovation and responsibility.**



# Next week

- Fundamentals of Algorithmic Trading