ACTUARIAL WATT

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Machine Learning Applications in Finance

Over the past few years the use of machine learning (ML) has continued to increase in the United Kingdom (UK) financial services sector. As with other technologies, ML can bring a range of benefits to consumers, firms, markets, and the wider economy.

Advancement in Financial Modelling

Financial modeling is a cornerstone of businesses worldwide. Understanding how a business's finances evolve and grow will allow the company to make smarter, data-driven decisions.

ESG and Climate-Focused Investment

Environmental criteria gauge how a company safeguards the environment. Social criteria examine how it manages relationships with employees, suppliers, customers, and communities. Governance measures a company's leadership, executive pay, audits, internal controls, and shareholder rights.

FINANCIAL INDEPENDENCE

NOTE FROM THE EDITOR

Welcome to the third edition of the Students' Actuarial Society's newsletter!

I'm thrilled to present this special issue, focused on some of the most exciting and impactful developments in the world of finance and actuarial science. As we embark on a new chapter, this edition delves into key topics that reflect the evolving landscape of our field:

1. **ESG, and Climate-Focused Investments**: A deep dive into how these principles are shaping the future of responsible investing.

2. **Machine Learning Applications in Finance**: Exploring the innovative ways machine learning is revolutionising financial analysis and decision-making.

3. **Advancements in Financial Modelling**: Highlighting cutting-edge approaches and their implications for actuarial practice.

These articles are designed to inspire both aspiring actuaries and seasoned professionals, offering valuable perspectives on critical issues and opportunities in our profession.

As always, we welcome your feedback and insights as we continue to foster a community of learning and growth.

Thank you for your continued support, and we look forward to an exciting year ahead!

Best regards,

Zarif

Sincerely,
Zarif Zulkiflee
Editor-in-Chief, Students' Actuarial Society
Current Affairs Director

ESG and Climate-Focused Investment

ZARIF ZULKIFLEE

What is ESG?

ESG stands for environmental, social, and governance factors outside the traditional financial metrics used to identify risks and rewards in investing. These factors encompass a broad range of considerations. For the environment, it includes conservation concerns such as climate change, biodiversity, greenhouse gas emissions, waste and pollution, resource depletion and sustainability, and deforestation. It also involves climate concerns like measuring, reporting, and adapting to climate risk.

The social aspect focuses on the treatment of people, covering issues like working conditions, employee relations and diversity, community health and safety, and conflict. Governance addresses company management, including topics like donations and political lobbying, corruption and disclosure, employee diversity and board structure, executive pay, and tax strategy.

Despite the misconception that ESG investments are less profitable, integrating ESG considerations leads to more thorough and better-informed investment decisions. Financial analysts and portfolio managers use tools to assess financial value, and incorporating environmental and climate change considerations helps them avoid losses from extreme weather events and long-term climate trends.

Socially Responsible Investing

ESG factors initially gained importance in excluding equities from investment portfolios based on moral and ethical values, often referred to as "sustainability investing" or "socially responsible investing" (SRI). This allows individuals to select investments based on both traditional financial metrics and ESG metrics aligned with their personal values. SRI funds range from expensive, high-fee options to more affordable alternatives.

There are several ways to create an SRI portfolio. Individuals can choose individual stocks and mutual funds that align with their interests or use robo-advisors, which employ algorithms to create sustainable investment portfolios suited to their risk tolerance and goals.

Various ESG implementation approaches exist, each with distinct methods and objectives:

- Exclusionary Screening: Removing companies that conflict with your values.
- Best-in-Class Selection: Prioritising investments in companies that score well on ESG metrics.
- Thematic Investing: Focusing on funds targeting specific ESG issues like clean energy or female leadership.
- Active Ownership: Engaging directly with companies on their ESG performance.
- Impact Investing: Investing in projects designed to fulfill ESG goals, such as electric cars, microfinance, or affordable housing.
- ESG Integration: Improving an investment's financial and risk performance by understanding how non-financial ESG issues affect a company's long-term success.

ESG Standards

Various organisations are working to formalise ESG standards in investing and disclosure processes. The goal is to create voluntary climate-related financial disclosures for companies and individuals, ensuring consistent, comparable, and reliable ESG information.

Some organisations focus on broad standards for impact reporting, emphasising transparency about corporate impacts on the economy, environment, and society. Others emphasise specific ESG concerns with material financial impacts. In September 2020, five leading ESG standard-setting organisations announced a comprehensive reporting system integrating sustainability and financial disclosures.

Incorporating ESG factors into investing can lead to more stable, profitable, and ethical practices. Companies prepared for future challenges like climate volatility are better positioned to withstand financial hazards. While consumers have long supported ethical investing, recent growth in ESG usage has been driven by corporate actors. Increasing pressure for transparency and disclosure from governments and consumers will likely continue to elevate the importance of ESG reporting in the financial world.

ZARIF ZULKIFLEE

Machine Learning Applications in Finance

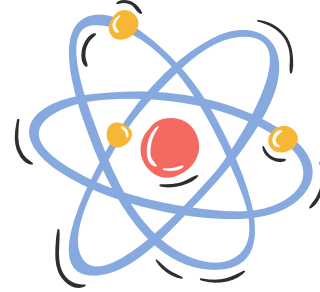## What is Machine Learning (In Finance)?

Machine learning in finance is now considered a key aspect of several financial services and applications, including managing assets, evaluating levels of risk, calculating credit scores, and even approving loans. Machine learning is a subset of data science that provides the ability to learn and improve from experience without being programmed. As an application of artificial intelligence, machine learning focuses on developing systems that can access pools of data, and the system automatically adjusts its parameters to improve experiences. Computer systems run operations in the background and produce outcomes automatically according to how it is trained.

Machine learning tends to be more accurate in drawing insights and making predictions when large volumes of data are fed into the system. For example, the financial services industry tends to encounter enormous volumes of data relating to daily transactions, bills, payments, vendors, and customers, which are perfect for machine learning. Nowadays, many leading fintech and financial services companies are incorporating machine learning into their operations, resulting in a better-streamlined process, reduced risks, and better-optimised portfolios.

Machine learning, a branch of artificial intelligence, leverages statistical models to make predictions and is widely applied in finance for tasks such as fraud detection, automated trading, and providing financial advisory services to investors. By analysing millions of data sets in a short time, machine learning enhances outcomes efficiently without requiring explicit programming.

How Machine Learning Used in Finance?

There are several ways in which machine learning and other tenets of artificial intelligence (AI) are being employed in the finance industry. Some of the applications of machine learning in finance include:

- **Algorithmic trading**

Algorithmic trading refers to the use of algorithms to make better trade decisions. Usually, traders build mathematical models that monitor business news and trade activities in real-time to detect any factors that can force security prices to rise or fall. The model comes with a predetermined set of instructions on various parameters such as timing, price, quantity, and other factors for placing trades without the trader's active involvement.

Unlike human traders, algorithmic trading can simultaneously analyse large volumes of data and make thousands of trades every day.

Machine learning makes fast trading decisions, which gives human traders an advantage over the market average.

Also, algorithmic trading does not make trading decisions based on emotions, which is a common limitation among human traders whose judgment may be affected by emotions or personal aspirations.

- **Fraud detection and prevention**

Fraud is a major problem for banking institutions and financial services companies, and it accounts for billions of dollars in losses each year. Usually, finance companies keep a large amount of their data stored online, and it increases the risk of a security breach. With increasing technological advancement, fraud in the financial industry is now considered a high threat to valuable data.

Fraud detection systems in the past were designed based on a set of rules, which could be easily bypassed by modern fraudsters. Therefore, most companies today leverage machine learning to flag and combat fraudulent financial transactions. Machine learning works by scanning through large data sets to detect unique activities or anomalies and flags them for further investigation by security teams.

It works by comparing a transaction against other data points such as the customer's account history, IP address, location, etc. to determine whether the flagged transaction is parallel to the behavior of the account holder. Then, depending on the nature of a transaction, the system can automatically decline a withdrawal or purchase until a human makes a decision.

Advancement in Financial Modelling

ZARIF ZULKIFLEE

The financial world is undergoing a seismic shift as AI financial modeling reshapes traditional practices. With 77% of financial institutions now using AI in their operations, this innovative approach is transforming how businesses forecast, analyse, and make decisions. AI-powered financial modeling combines cutting-edge machine learning techniques with vast amounts of market data to provide more accurate and adaptable insights than ever before.

This comprehensive guide explores the groundbreaking applications of AI in financial modeling. Readers will learn about the fundamentals of this technology, including data pipelines, vector databases, and embedding models. The article delves into real-world uses like cash flow forecasting, fraud detection, and scenario analysis. It also examines how AI enhances decision-making by processing complex data sources and generating predictive analytics.

By the end, finance professionals will have a clear understanding of how to leverage AI to improve their financial forecasts and stay ahead in a rapidly evolving industry.

Key components of AI financial models

The foundation of AI-powered financial modeling lies in its ability to analyse large datasets quickly and efficiently. These models utilise sophisticated algorithms to identify patterns, make predictions, and generate valuable insights from financial data. One of the primary advantages of AI in this context is its capacity to learn and improve over time, refining its algorithms and enhancing its predictive capabilities as it's exposed to more data.

AI financial models incorporate several essential components:

- **Data pipelines:** These systems automate the collection, cleaning, and preprocessing of financial data from various sources, ensuring a continuous flow of high-quality information for analysis.
- **Vector databases**: These specialised databases store and manage high-dimensional data, enabling efficient similarity searches and pattern recognition in complex financial datasets.
- **Embedding models**: These AI models transform raw financial data into dense vector representations, capturing intricate relationships and facilitating more accurate predictions.
- **Orchestration layer**: This component coordinates the various elements of the AI financial model, ensuring seamless integration and efficient operation.

Applications of AI in Financial Modeling

AI financial modeling has revolutionised the way financial institutions analyse data, make predictions, and inform decision-making. This innovative approach enhances the accuracy of financial forecasts, improves risk assessment, and provides deeper insights into market trends and opportunities.

Predictive analytics and forecasting have become essential tools in modern finance. AI-powered forecasting leverages advanced algorithms to sift through and analyse large data sets at unprecedented speeds. This capability allows businesses to predict future performance, set budgets, and establish goals with greater precision. According to research from IBM, 50% of companies using AI for forecasting reduced overall error by at least 20%, while 25% of companies saw a decrease of at least 50% [1]. These improvements in accuracy and efficiency have transformed financial planning across industries.

As AI continues to evolve, its role in shaping financial strategies and driving more informed decisions is set to expand further. The ability of AI to process complex data sources and generate real-time predictive analytics enhances decision-making processes across the financial sector. To explore how AI can transform your financial operations, join us on our free workshop to assess your AI and Digital Transformation needs and opportunities. By leveraging these advanced technologies, finance professionals can stay ahead in an ever-changing industry, making more informed decisions and delivering better outcomes for their clients.

Crossword Puzzle

Calculus Fun
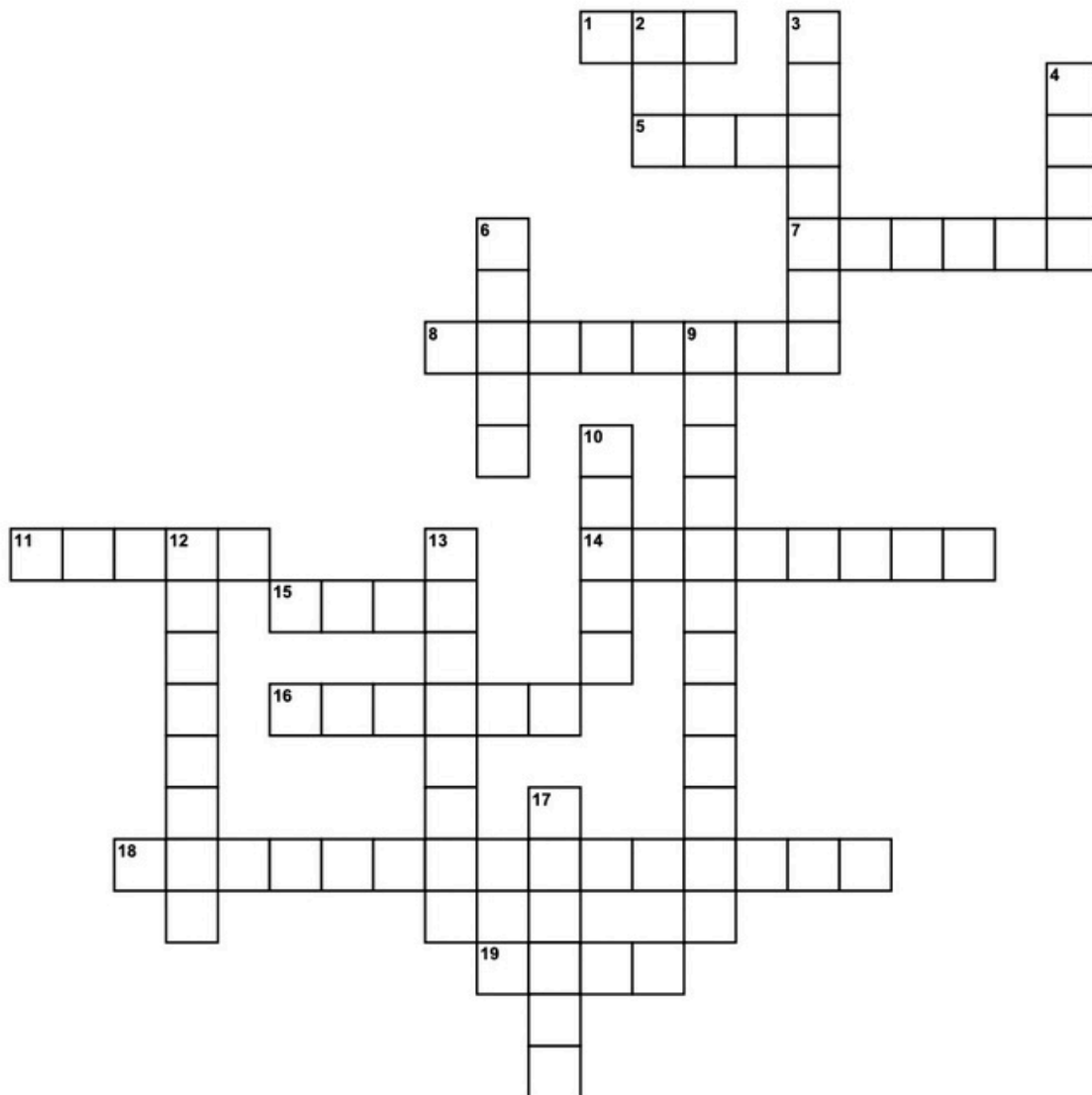
Across

[1] What type of function is f(-x)=-f(x)?
[5] What type of function is f(-x)=f(x)?
[7] The derivative of 4x^2.
[8] What does the c represent in a function?
[11] Which derivative tells us if the function is increasing or decreasing?
[14] The rate of change of a position with respect to time.
[15] Evaluate lim as x approaches 4 of 3x-7.
[16] Which derivative tells us if the function is concave up or down?
[18] A point where the graph has a tangent line and the concavity changes.
[19] Opposite over Hypotenuse

Down

[2] If a limit does not approach the same number from the left or right it _____?
[3] Opposite over Adjacent.
[4] The derivative of -cosx.
[6] Rise over Run.
[9] The second derivative of a position function.
[10] The derivative of 7x
[12] The derivative of secx.
[13] The first derivative of a position function.
[17] Adjacent over Hypotenuse.

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