

Introduction to Finance

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MGM237

Lecture 10



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MGM237 AI & Finance

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Chapter

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AI & Finance



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AI & Finance

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AI Foundations

AI Definition

Artificial Intelligence (AI) refers to the ability of computers to perform tasks that typically require human intelligence, such as learning, reasoning, and pattern recognition. In finance, AI processes vast amounts of data to enhance decision-making.

Real-World Impact

Banks, stock markets, and investment firms increasingly rely on AI to stay competitive. AI-driven tools help in trading, portfolio management, credit scoring, fraud detection, and customer service, making finance more efficient and accessible.

Role in Finance

AI is transforming finance by enabling faster, more accurate decisions. It analyzes complex financial data, identifies trends, and provides insights that humans may miss, leading to improved risk management and investment strategies.

Learning Goals

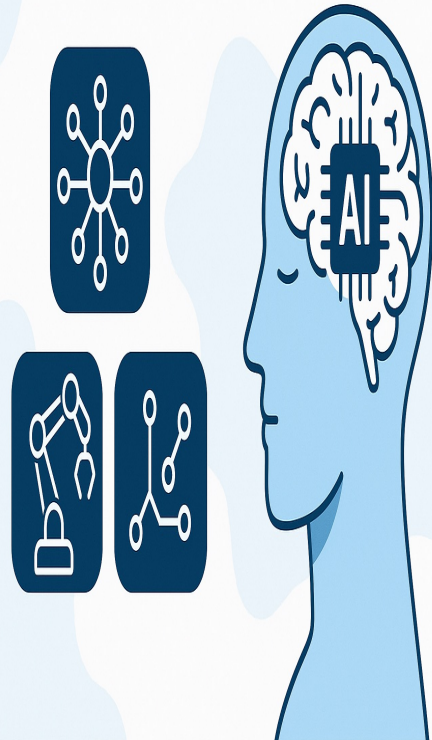
This lecture aims to provide a foundational understanding of AI and its applications in finance. Students will learn key concepts, practical examples, and the ethical considerations surrounding AI in the financial industry.

Objectives Summary

By the end of this lecture, students will understand the basics of AI and Machine Learning, recognize their applications in finance, identify common AI tools, analyze case studies, and discuss the risks, ethics, and regulations associated with AI in finance.



What is Artificial Intelligence?



AI Capabilities

AI enables computers to perform tasks like thinking, learning, problem-solving, pattern recognition, and prediction. It processes large datasets at high speed to provide actionable insights, making it invaluable in data-intensive fields like finance.

AI in Financial Decisions

In finance, AI helps banks, investors, and companies make better decisions by analyzing vast amounts of financial data. It identifies trends, assesses risks, and provides predictions that can inform investment strategies and credit assessments.

AI vs. Human Intelligence

While AI does not think like humans, it excels at processing and analyzing large volumes of data quickly and accurately. This complements human expertise, allowing for more informed and efficient decision-making in complex financial environments.

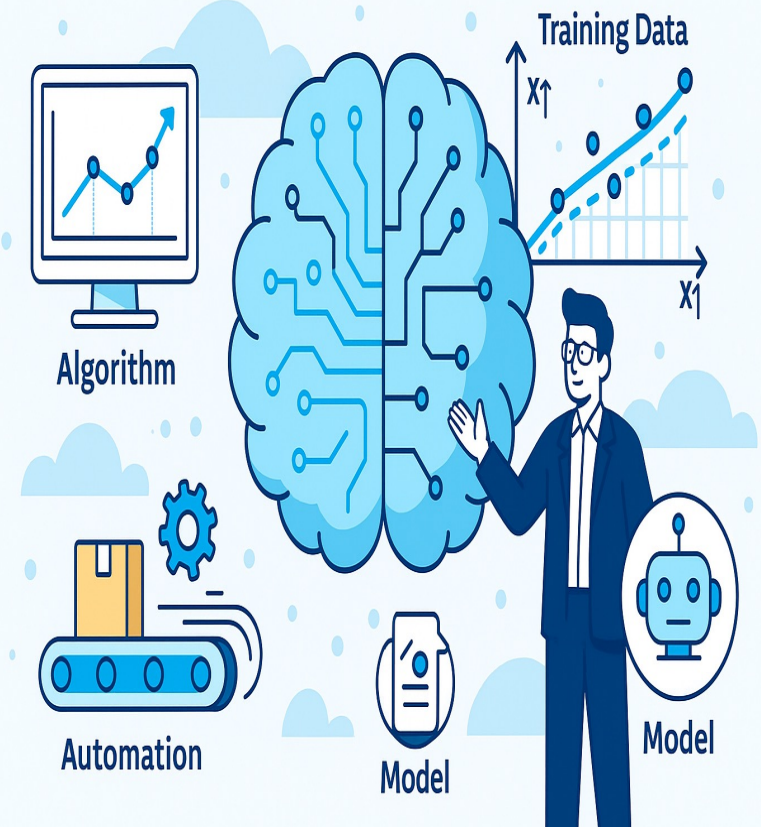
ML Definition

Machine Learning (ML) is a subset of AI where computers learn from data rather than being programmed with fixed rules. ML algorithms analyze historical data to identify patterns and make predictions or decisions based on that learning.

ML in Finance

In finance, ML models can analyze past loan data to predict whether a new customer will repay a loan. This enables banks to make more accurate lending decisions, reducing risk and improving overall financial stability.

Machine Learning Explained



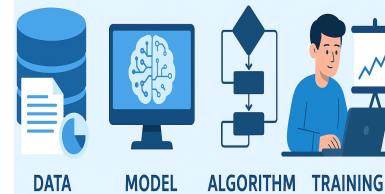
Data

Data is the foundation of AI, including numbers, texts, prices, customer information, and financial transactions. High-quality, relevant data is essential for training effective AI models.

Model

The model is the trained program that results from the learning process. It uses the patterns identified in the data to make decisions or predictions in real-world scenarios.

Four AI Building Blocks



Algorithm

An algorithm is a set of mathematical rules that tells the computer how to solve a problem. It processes the data and enables the AI model to learn and make predictions.

Training

Training involves using historical data to teach the model. This process helps the model recognize patterns and improve its accuracy over time, ensuring it performs well in various financial contexts.

01 Data Volume

The financial sector generates massive amounts of data daily, such as stock prices, customer transactions, loans, and payments. AI can process this data efficiently, providing valuable insights that humans alone cannot.

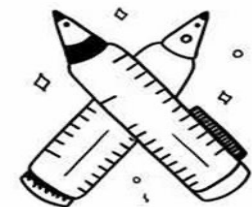


02 Speed and Accuracy

AI works 24/7 without fatigue, analyzing complex financial data quickly and accurately. This enables banks and financial institutions to make faster, more informed decisions, improving overall performance.

03 Competitive Advantage

By leveraging AI, financial institutions can gain a competitive edge. AI-driven tools enhance risk management, optimize trading strategies, and improve customer service, leading to better outcomes for both businesses and clients.





Traditional Finance

In traditional finance, human analysts read reports, study numbers, and make financial decisions. This process is time-consuming and prone to human error, limiting the speed and scale of decision-making.

AI-Based Finance

AI-based finance uses computer models to analyze large datasets and provide suggestions or signals. While humans still make the final decision, AI acts as a powerful supporting tool, enhancing accuracy and efficiency.

Prediction Definition

Prediction involves estimating future events based on past data. In finance, this includes forecasting stock prices, company profits, customer demand, and loan default risk.

AI Prediction

AI models can make thousands of predictions in a short time, analyzing vast amounts of data to identify trends and patterns. This helps businesses plan better and manage financial risks effectively.

Impact on Finance

Accurate predictions enable financial institutions to optimize investment strategies, allocate resources efficiently, and mitigate potential losses, leading to improved financial stability and performance.





Classification Definition

Classification involves sorting data into different groups based on specific criteria. In finance, this includes categorizing customers as low or high risk and transactions as normal or fraudulent.



AI Classification Models

AI classification models analyze data to identify patterns and make accurate classifications. These models help banks and financial institutions make fast and informed decisions in areas like lending and fraud prevention.



Practical Applications

By using AI for classification, financial institutions can improve risk management, reduce fraud, and enhance customer service. This leads to more efficient operations and better overall financial performance.

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Finance Applications

1

Overview

AI is used in various areas of finance, including trading, portfolio management, credit scoring, fraud detection, customer service, and financial forecasting. These applications demonstrate the widespread impact of AI in the financial industry.



2

Sector Benefits

Each sector benefits from AI in different ways, such as improved decision-making, enhanced risk management, increased efficiency, and better customer experiences. AI is becoming an essential tool for modern financial institutions.

Market Analysis

AI systems analyze market prices, trading volumes, news, and economic indicators in real-time. They detect patterns that humans may miss, providing valuable insights for traders.



Trading Signals

Based on identified patterns, AI sends buy or sell signals to traders. In high-frequency trading, computers execute thousands of trades in milliseconds, leveraging AI for rapid decision-making.



Risk and Challenges

While AI-based trading offers significant advantages, it also carries risks, especially during sudden market crises. Proper risk management and oversight are crucial to mitigate potential issues.

Portfolio Management

AI helps investors choose the best mix of assets based on their risk tolerance and financial goals. It analyzes market trends and adjusts portfolios accordingly to optimize returns.

Robo-Advisors

Robo-advisors are online platforms that use AI to manage investments automatically. They offer low fees and easy access, making investing more accessible to small investors.



Benefits

AI-driven portfolio management and robo-advisors provide personalized investment strategies, reduce costs, and improve overall investment performance. They democratize access to professional-grade investment services.

Human Oversight

While AI handles much of the analysis and decision-making, human advisors still play a crucial role in providing personalized advice and ensuring that investment strategies align with clients' long-term goals.



AI FORECASTING & RESEARCH

Data Analysis

AI reads company reports, financial news, and social media posts to measure market sentiment. It analyzes vast amounts of data to identify trends and patterns that can inform financial forecasts.

Forecasting

AI helps forecast company earnings, stock prices, and future market trends. This provides valuable insights for investors and analysts, enabling them to make more informed decisions.

Efficiency

By automating the analysis of large datasets, AI saves analysts a significant amount of time and effort. This allows them to focus on strategic decision-making and other high-value tasks.

Risk Identification

AI helps banks and companies estimate different types of risk, such as market risk, credit risk, and liquidity risk. It analyzes historical data and market conditions to identify potential risks.



Scenario Analysis

AI runs many what-if scenarios to test how the company will perform under different crisis situations. This improves financial safety and stability by enabling proactive risk management.

Traditional vs. AI Scoring

Traditional credit scoring relies on limited data such as income and credit history. AI-based credit scoring can use a wider range of data, including payment behavior, job history, and spending patterns.



Improved Accuracy

By incorporating more data points, AI models can make more accurate and sometimes fairer lending decisions. This helps banks approve more good borrowers while reducing risky loans.



Inclusive Lending

AI-based credit scoring can expand access to credit for individuals with thin credit files or unconventional financial histories, promoting financial inclusion and economic growth.



AI Fraud Detection



Real-Time Monitoring

AI systems monitor financial transactions in real-time, analyzing patterns and identifying unusual behavior that may indicate fraud. This enables immediate action to prevent losses.

Fraud Reduction

By detecting and blocking fraudulent transactions, AI significantly reduces losses for banks and customers. It improves overall security and trust in financial systems.

Continuous Learning

AI models continuously learn from new data and adapt to evolving fraud tactics. This ensures that fraud detection remains effective even as criminals develop new methods.



Chatbots

Chatbots are AI programs that communicate with customers through text or voice. They can answer common questions, provide account information, and assist with basic transactions.

Customer Benefits

Chatbots work 24/7, reducing waiting times and improving customer satisfaction. They handle routine inquiries efficiently, allowing human employees to focus on more complex issues.

Efficiency

By automating repetitive tasks, AI enables back-office staff to focus on more strategic activities, improving overall efficiency and productivity.

2

Compliance

AI ensures compliance with regulatory requirements by accurately processing and reporting data. This reduces the risk of errors and non-compliance, enhancing regulatory confidence.

3

Scalability

AI-powered automation can easily scale to handle increasing volumes of data and transactions, supporting the growth and expansion of financial institutions.

4

AI automates routine back-office tasks such as document review and data entry. This reduces human errors, speeds up work, and lowers operating costs for financial institutions.

1

BANKS vs FINTECH AI RACE



Traditional Banks

Traditional banks use AI to improve their existing systems and services. They leverage AI to enhance customer experience, optimize operations, and stay competitive in the rapidly evolving financial landscape.

Fintech Companies

Fintech companies build their services on AI from the ground up. They focus on innovation and agility, leveraging AI to create new financial products and services that disrupt traditional banking models.

Competition and Collaboration

The competition between banks and fintechs drives innovation and improvement in financial services. It also encourages collaboration, where banks and fintechs partner to leverage each other's strengths and deliver better value to customers.

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Tools & Platforms

Bloomberg Terminal

Bloomberg Terminal uses AI to analyze market news and price movements. It provides traders with real-time insights and predictive analytics, helping them make informed trading decisions.

Refinitiv Eikon

Refinitiv Eikon leverages AI to process vast amounts of financial data, offering comprehensive market analysis and research tools. It helps analysts and traders stay ahead of market trends.

Kensho

Kensho, by S&P Global, uses AI to study market events and economic scenarios. It provides in-depth analysis and predictions, enhancing the decision-making process for financial professionals.



Betterment

Betterment is a popular robo-advisor platform that uses AI to build and manage investment portfolios. It offers personalized investment strategies based on clients' goals and risk tolerance.



Wealthfront

Wealthfront automatically constructs and rebalances investment portfolios using AI. It provides low-cost investment management services, making investing accessible to a broader audience.

Vanguard Digital Advisor

Vanguard combines AI with human advisors to offer digital advisory services. This hybrid approach leverages the strengths of both AI and human expertise to provide comprehensive investment advice.

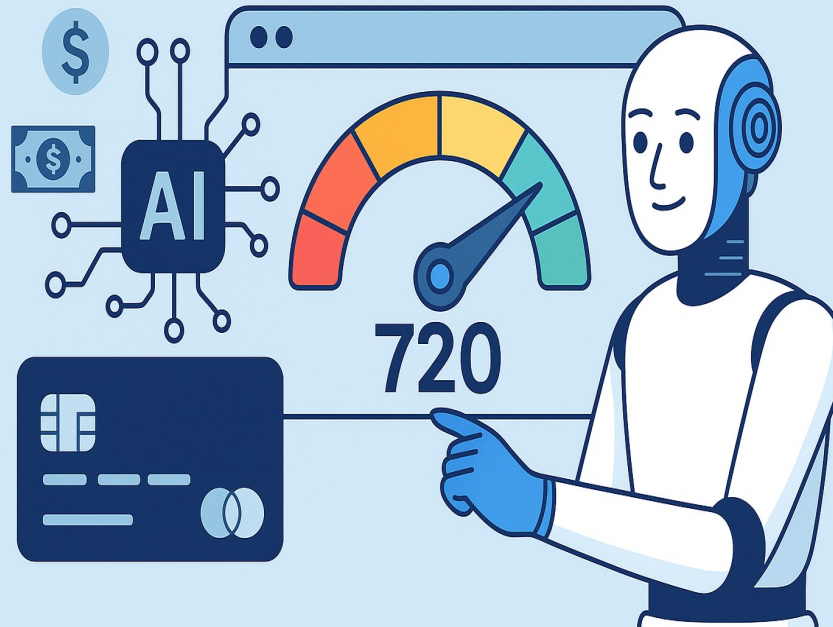
Benefits

Robo-advisors offer low fees, easy access, and personalized investment strategies. They democratize investment services, making professional-grade portfolio management available to small investors.

FICO

FICO is the traditional credit scoring system used worldwide. It assesses credit risk based on historical data and credit history, providing a standardized measure of creditworthiness.

AI Credit & Scoring Tools



Upstart and Zest AI

Upstart and Zest AI use Machine Learning to improve credit decisions. They analyze a wider range of data points, leading to more accurate and inclusive lending decisions while maintaining risk levels.



Mastercard Decision Intelligence

Mastercard Decision Intelligence uses AI to score the risk of each transaction in real-time. It analyzes transaction data to detect and prevent fraud, ensuring secure payment processing.



Visa Advanced Authorization

Visa Advanced Authorization leverages AI to assess transaction risk and authorize payments. It continuously learns from past fraud cases to improve its detection capabilities and reduce false positives.



Feedzai

Feedzai is a powerful fraud detection platform that uses AI to fight fraud and money laundering. It analyzes complex data patterns to identify and block fraudulent activities effectively.

1



2



3



4

Google Cloud AI

Google Cloud AI provides robust tools for Machine Learning, text analysis, speech recognition, and image processing. Banks use it to build scalable AI models for various financial applications.

Microsoft Azure AI

Microsoft Azure AI offers a comprehensive suite of AI services that enable banks to develop and deploy intelligent applications. It supports Machine Learning, data analytics, and cognitive services.

Amazon Web Services AI

AWS AI provides powerful AI and Machine Learning capabilities that help banks build scalable and efficient financial solutions. It supports a wide range of applications, from fraud detection to customer service.

Benefits

Cloud AI platforms enable banks to leverage advanced AI technologies at a lower cost. They provide scalable infrastructure, allowing banks to expand globally and stay competitive in the digital age.

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Case Studies

Background

SmartInvest Bank targeted millennials with small savings who were not using traditional financial advisors. They launched an AI-based robo-advisor application to address this gap.

Implementation

Customers answered simple questions about their goals and risk tolerance. The AI system suggested diversified investment portfolios and rebalanced them monthly.

Results

After one year, investment accounts increased by 40%, and customer satisfaction among youth significantly improved. The robo-advisor successfully engaged a previously underserved segment.

1

Integration

SmartInvest integrated KYC APIs, Monte-Carlo risk engines, and mobile UI in six months. Cloud hosting scaled onboarding during marketing blitz, ensuring smooth operations.

2

Explainability

The platform provided transparent portfolio logic and explainability reports to meet regulatory compliance. This ensured trust and transparency with customers.

3

Lessons Learned

Starting with a narrow segment, iterating on feedback loops, and embedding education content were key strategies that contributed to the success of the robo-advisor.

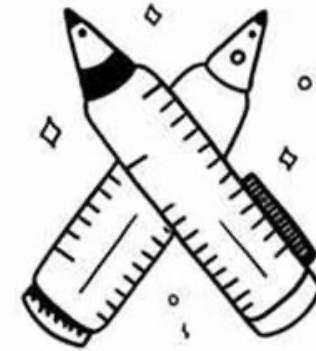
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Future Growth

The success positioned SmartInvest to expand its services and capture more market share by leveraging AI-driven convenience and personalized investment strategies.

01 Cross-Sell Success

Cross-selling of mortgage and pension products increased by 18% as customer trust grew. The robo-advisor effectively engaged customers and expanded their financial services usage.

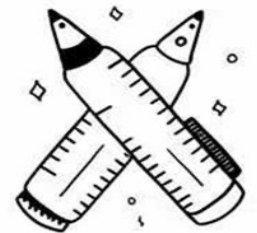


02 Regulatory Praise

Regulatory audits praised the transparent portfolio logic and compliance of the robo-advisor. This ensured that the platform met all regulatory requirements while delivering value to customers.

03 Market Positioning

The case proved that incumbents could rejuvenate brand relevance by combining AI convenience with human advice, making them more competitive in a rapidly evolving financial landscape.



Background

BrightLoan serves thin-file borrowers rejected by legacy scorecards. Their ML model ingests education, employment history, and cash-flow data to improve lending decisions.



Implementation

The model used gradient-boosted trees to capture non-linear repayment signals. Continuous retraining with bank-streamed performance data kept the model fresh and accurate.



Results

Approval rates increased by 20% while default rates remained stable. Partner banks gained new profitable segments and fulfilled inclusion mandates without compromising underwriting standards.



1



2



3



4

Model Architecture

BrightLoan's model used gradient-boosted trees to capture complex repayment signals. SHAP values justified decisions to regulators, ensuring transparency and fairness.

Continuous Learning

The model continuously retrained with real-time performance data from partner banks. This ensured it remained accurate and effective in a dynamic financial environment.

Fairness Testing

The platform conducted regular fairness testing to ensure that lending decisions were unbiased and inclusive. This helped expand access to credit for underserved communities.

Regulatory Compliance

BrightLoan's model met all regulatory requirements for fairness and transparency. This positioned the company for long-term success and scalability.

Increased Loan Size

The average loan size increased by 15% as customer confidence grew. The platform effectively balanced risk and opportunity, leading to higher customer satisfaction.



Cost Reduction

Acquisition costs fell by 30% due to automated pre-qualification emails. This made the lending process more efficient and cost-effective for the company.



Revenue Potential

The success positioned BrightLoan to license its engine to additional banks, creating a scalable SaaS revenue stream and expanding its market reach.

Background

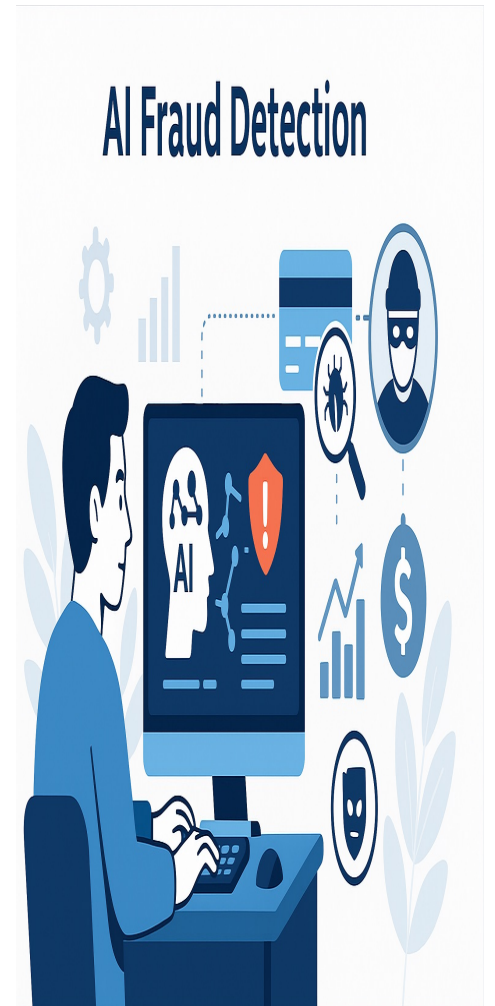
SecurePay Cards faced increasing e-commerce fraud. Traditional rule-based systems were unable to keep up with evolving criminal tactics. The company adopted real-time AI to address this challenge.

Implementation

The AI platform analyzed velocity, device, merchant, and geo signals in real-time. It auto-triggered step-up authentication for high-risk cases, reducing fraud effectively.

Results

Fraud losses decreased by 30% within one year, and customer trust significantly improved. The platform effectively protected customers and reduced operational costs.



Real-Time Scoring

SecurePay's AI scored every authorization within 50ms, ensuring real-time fraud detection. This rapid response time minimized potential losses.

Scalable Infrastructure

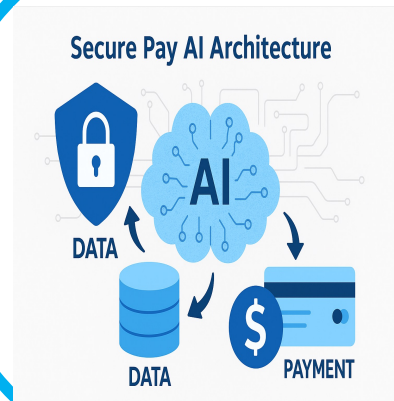
The elastic GPU infrastructure scaled during peak shopping seasons without latency spikes. This ensured smooth operations and high performance.

Feedback Loops

The platform used feedback loops from confirmed fraud cases to continuously improve the model. This ensured it remained effective against evolving fraud tactics.

Regulatory Compliance

The platform met all regulatory requirements for fraud detection and data security. This positioned SecurePay as a leader in secure payment processing.





Reduced False Positives

The false-positive ratio dropped by 18%, reducing customer friction and call-center load. This improved overall customer experience and satisfaction.



Market Differentiation

Media coverage of proactive fraud prevention boosted card acquisition by 12%. The platform effectively differentiated SecurePay in a competitive market.



Revenue Growth

The success positioned SecurePay to expand its services and capture more market share by leveraging AI-driven security and customer trust.

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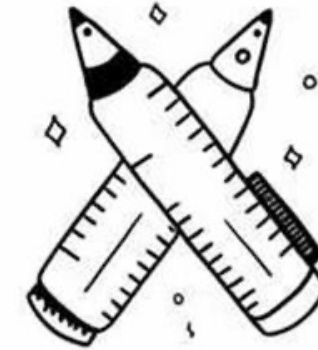
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Risks & Ethics

Data Importance

AI performance depends entirely on data quality. Incorrect, incomplete, or biased data leads to inaccurate results. Ensuring high-quality data is crucial for reliable AI models.



02 Data Validation

Financial institutions must implement robust data validation processes to ensure accuracy and relevance. This includes monitoring data sources and conducting regular audits.

03 Crisis Preparedness

Models trained before financial crises may fail during new crises. Regular updates and scenario testing are essential to ensure AI models remain effective in changing market conditions.



1

Model Risk

Model risk occurs when a weak or incorrect model is used for decision-making. This can lead to inaccurate predictions and poor financial outcomes.



2

Overfitting

Overfitting happens when a model learns details that only fit old data and fails in new scenarios. Regular testing with new data and stress scenarios is crucial to avoid this issue.

Bias in Data

AI models may learn human bias from historical data, leading to unfair treatment in lending and financial services. Identifying and mitigating bias is essential for ethical AI.

Inclusive Lending

AI can promote financial inclusion by expanding access to credit for underserved communities. However, this must be done without compromising fairness and ethical standards.

Fairness Testing

Financial institutions must conduct fairness testing to ensure that AI models treat all customers equally. This includes analyzing outcomes across different demographic groups.

Regulatory Compliance

Ensuring fairness and avoiding bias is not only an ethical imperative but also a regulatory requirement. Financial institutions must comply with all relevant laws and guidelines.



Regulatory Oversight

Financial regulators control how AI is used in banks. Laws focus on data protection, transparency, and consumer rights to ensure that AI applications are safe and fair.

Explainability

Banks must explain important AI decisions to regulators and customers. Black-box models that cannot be explained create serious regulatory challenges and must be avoided.

Compliance Strategies

Implementing robust governance frameworks, conducting regular audits, and ensuring transparency are key strategies for achieving regulatory compliance in AI applications.

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Future & Wrap-up

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Future AI Finance Trends

Personalized Advice

Future finance will increasingly rely on personalized financial advice. AI will analyze individual data to provide tailored investment strategies and financial planning.

Real-Time Risk Analysis

AI will enable real-time risk analysis, allowing financial institutions to respond quickly to market changes and emerging risks. This will enhance overall financial stability.



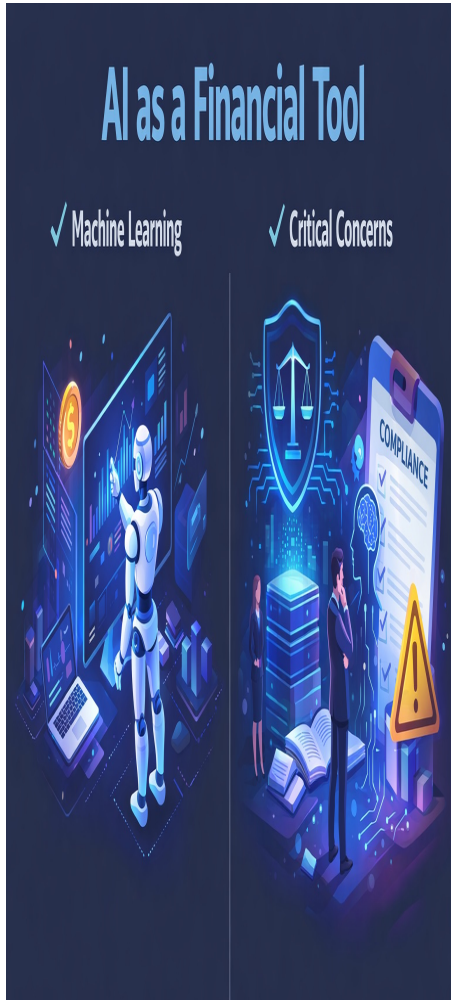
Future AI Finance Trends

Explainable AI

Explainable AI will become crucial for regulatory compliance and customer trust. Financial institutions will need to ensure that AI decisions are transparent and understandable.

Human-AI Collaboration

The future of finance will involve stronger cooperation between humans and intelligent systems. AI will augment human expertise, leading to better decision-making and improved outcomes.



AI as a Financial Tool

AI is a powerful financial tool that supports prediction, classification, and automation. It enhances decision-making, improves efficiency, and reduces costs in various financial applications.

Machine Learning

Machine Learning is a key component of AI that enables computers to learn from data. It is used in trading, portfolios, loans, fraud detection, and customer service to improve outcomes.

Critical Concerns

Data quality, ethics, and regulation remain critical concerns in AI applications. Financial institutions must address these issues to ensure trustworthy and compliant use of AI.

AI Improvements

Students reflect on how AI could improve banking or investment apps they use. They consider specific features or services that could benefit from AI integration.



Potential Risks

Students identify potential risks or concerns related to AI in finance. They think critically about the ethical and regulatory implications of AI applications.



Future Implications

The reflection activity encourages students to think about the future of AI in finance and its broader implications for the industry and society.





Thank You