1. AI For Finance

Learning Objectives

By the end of this chapter, readers will be able to know

1. Industry trend on AI applications for Finance
2. Chatbot and Conversational banking
3. Compliance in the Financial sector
4. Fraud detection and anti-money laundering
5. Risk assessment, Underwriting, and Skill management
6. Algorithmic trading
7. AIDR Framework & Challenges of Integrating AI in Finance

Prerequisites

Readers should know the following concept before starting this read.

1. Module 1 AI in the business overview.
2. Types of algorithms in machine learning/ deep learning & Steps of building an AI model.
3. AIDR framework.

1. Industry trend on AI applications for Finance

Today, many companies are trying to develop new solutions, services, and products to sell to financial institutions. The financial institutions themselves, creating some of these products to make a difference, improve services, and products using AI. Here are some examples of services and product areas being offered by various companies.

A. Investing
B. Banking
C. Trading

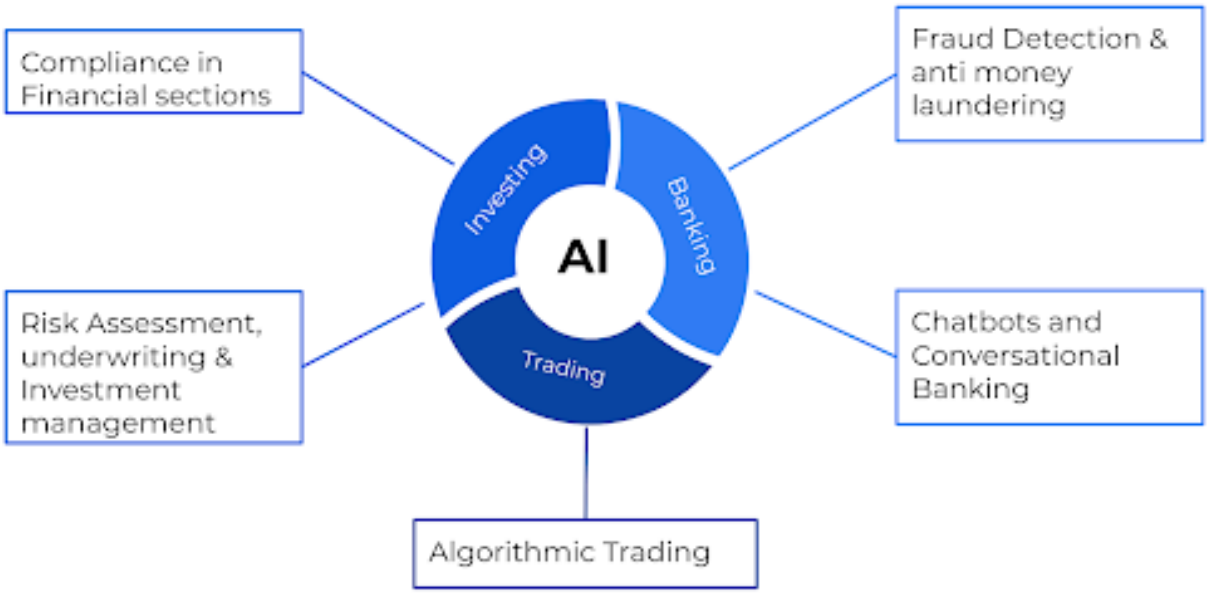

Figure 1: trending application areas of AI in Finance

A lot of predictions are related to the growth of AI for financial activities and financial projects. According to the *Finance service report*, there could be more than 48% CAGR through 2021. While talking about the trend of AI applications in finance industries, *IBM* is trying to develop products and services and propose the value by using AI for financial institutions. According to *McKinsey 2020*, many revenue increases in a business by the use of AI. From the overall global GDP perspective, various reports show the growing impact of AI on the banking industry.

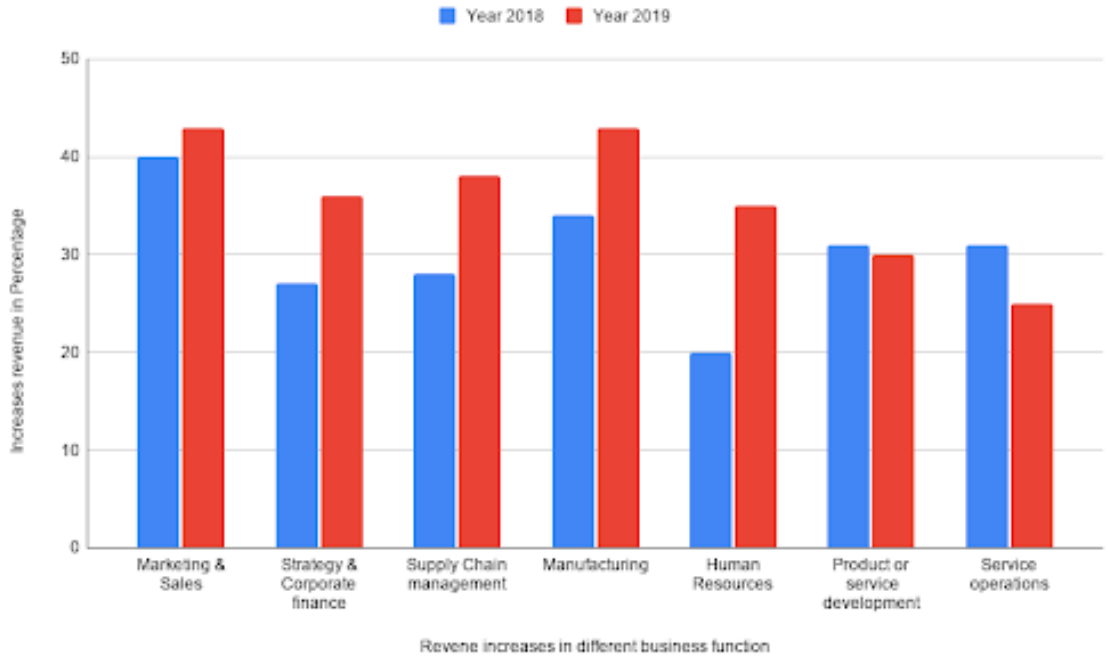

Figure 2: Revenue increases in a business by the use of AI

Also, we can see AI performing companies are different in the tools & technology sector. By 2020, it seems like a larger portion of organizations is adopting AI tools and technology. Here we see some companies still spending time cleaning and integrating data and not following the standard protocols to build AI tools.

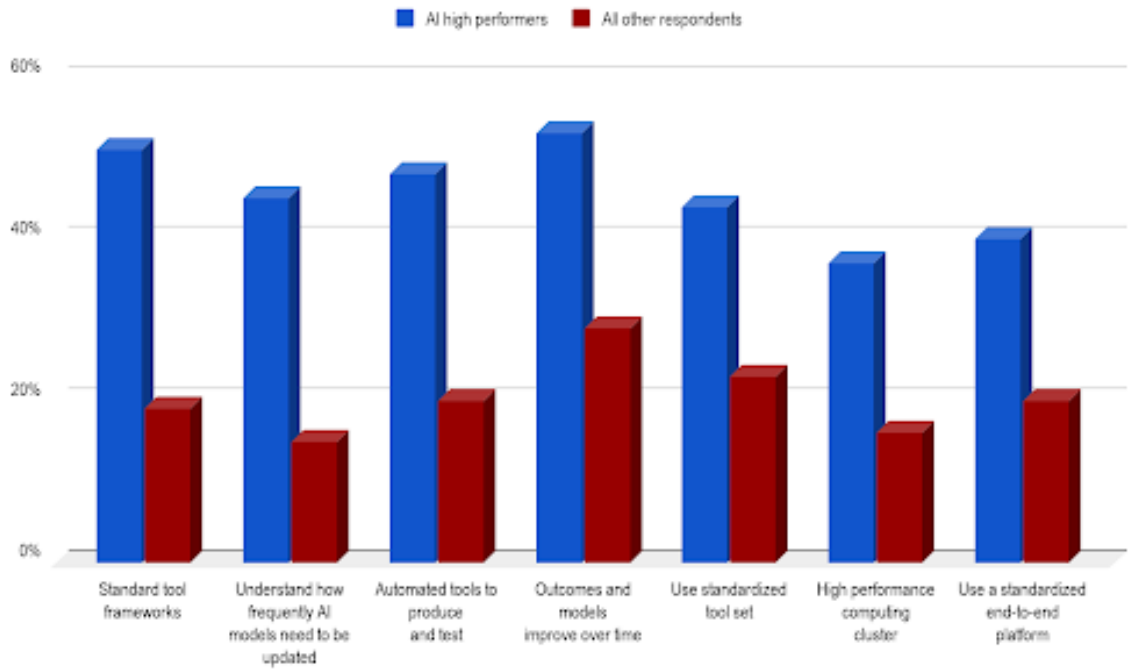

Figure 3: Comparison of high AI performer to other respondent

Accenture reports, adding AI in financial services will be more than 1 trillion dollars by 2035. Similarly, according to *Mckinsey's report* deploying the AI will result in trillions and trillions of impact. But overall, if you look at reports from many different organizations, you would see that many large firms predict that there's going to be at least 1 trillion dollars of impact in GDP by 2030.

Resources:

- *TRIM*: Assistance that helps to save money of users and connects to users account.
- *Scienaptic.ai* : provides an underwriting platform that gives banks and credit institutions more transparency while cutting losses.
- *Underwrite.ai* : analyzes thousands of data points from credit bureau sources to assess credit risk for consumer and small business loan applicants.
- *Datarobot* : provides machine learning software for data scientists, business analysts, soft ware engineers, executives and IT professionals.
- *More AI in Finance app*

2. Chatbot and Conversational banking

Chatbots and conversational banking are known as the top applications of AI in finance. Personal finance with the conversational interface is one of the most trending applications on how AI has been automating its interface with the banks. The screenshots here are from the *Mastercard system* provided by Kasisto. You can ask questions such as how much you spent on a particular service last month, and it will process your request. This allows users to get faster and interactive insights into their finance. Further more, the services can provide alerts, notifications, and offers in a non-intrusive fashion as the person asking the questions.

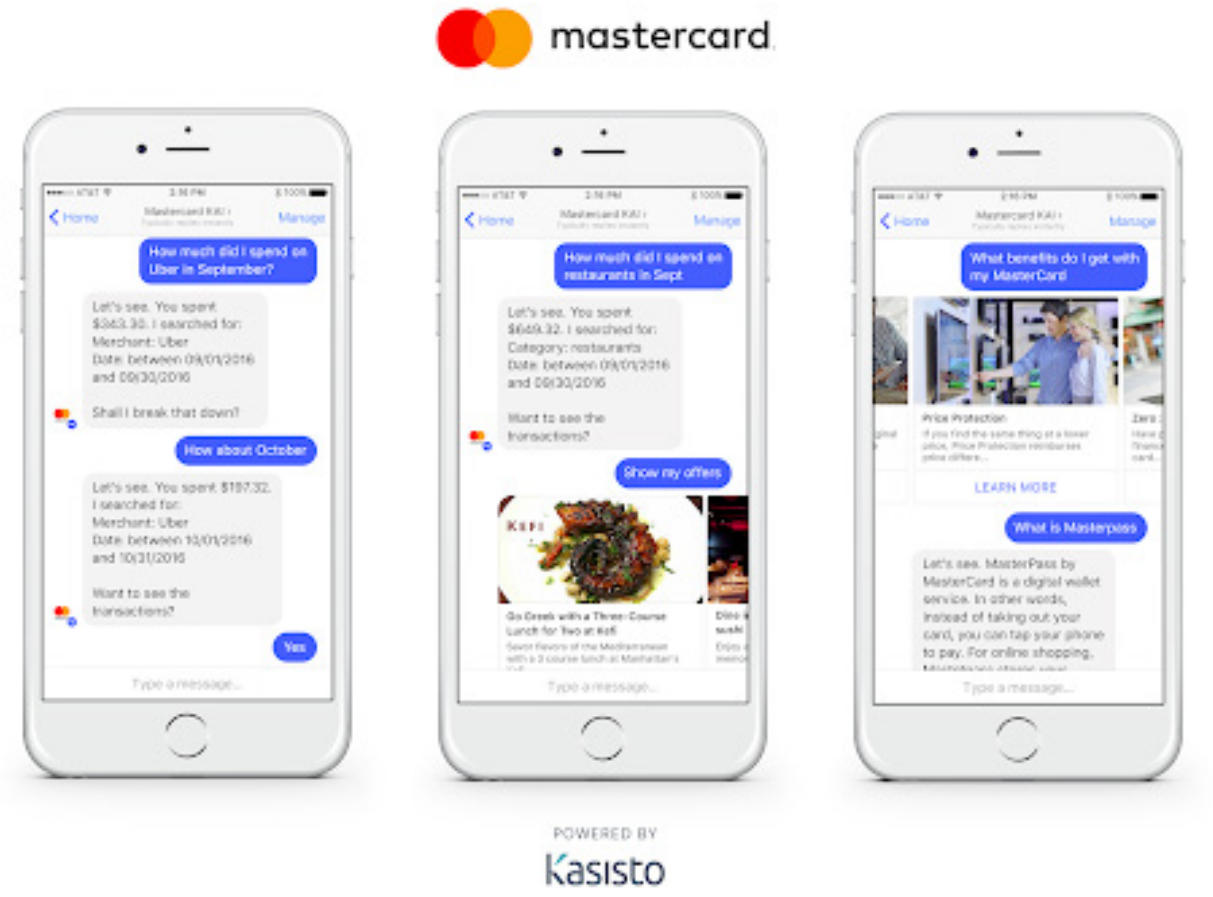

Figure 4: chatbot example by kasisto

Other systems can transfer money and help to save money as well. These agents can perform a wide range of operations without needing detailed personal information. Yet, they need specific access to your bank account. *BMO* is designed with artificial intelligence and natural language processing capabilities. Its banking chatbot for Facebook Messenger shares the financial information.

Similarly, *Digit* analyzes your spending and automatically saves the perfect amount everyday. It has state-of-the-art encryption to keep our data safe. Digit users have positive feedback and already save a billion of money in the bank.

Now, doing this through a seamless experience of doing a chat back and forth is quite useful. It allows humans too, or the end-users, to have a better overview of finance, personal finance side, where they could be interacting with the system on a more regular basis.

Conversational Interface

A conversational interface is a human-computer interaction system that allows humans to i nteract with a system or product using natural language in voice or text—for example, Apple Siri, Amazon Alexa, Google Home, etc. Conversational interfaces can broadly be categorized into general virtual agents and virtual agents with access to user-specific information.

Figure 3: Key point of General & personalized virtual agents

The general virtual agent doesn't have the answers to person-specific questions. Example asking how to report a loss card.
On the other hand, virtual agents with access to user-specific information are narrower and have broader use cases. It can answer the personal level queries like what is my balance and how much did I spend?

Meanwhile, even though the conversational interface has become more popular and seems to be getting more and more use cases among us, one thing to remember here is that the conversational interface has become more popular. We should be more careful and realize the potential limitations of how far the conversational systems can go when answering and understanding all sorts of questions.

3. Compliance in the Financial sector

The adoption of an AI system is accelerating across financial institutions. Some of the role of AI in regulatory compliance are;

i. Simplifying regulations for business leaders.
ii. Notifying stakeholders for regulatory change.
iii. Monitoring the organization's adherence to regulations.

i. Simplifying regulations for business leaders.

AI has the potential to process a large volume of data with consistent speed and accuracy. Thus transform towards regular compliance. It simplifies the regulation to assist the business leaders in understanding the compliance requirements efficiently.

ii. Notifying stakeholders for regulatory change.

The use of semantic web leads to the benefit to stakeholders. All the changes are in a machine-readable format and thus controlled by AI-driven tools.

iii. Monitoring the organization's adherence to regulations.

Instead of performing the periodic audit, the system continually monitors the business parameter that indicates compliance with regulations.

4. Fraud detection and anti-money laundering

Fraud detection is the set of activities to prevent money or property from pretenses.So, especially for the complaints problems or fraud detection, KYC or AML problems, you need to find one transaction, one lousy transaction, or one bad actor among thousands, thousands, and millions of interactions. And before, a lot of this used to be done in batches. But now, especially if you provide real-time interactions with customers, it's become more important to provide real-time services and products. But at the same time, be compliant in real-time, which creates its challenges on scalability and provides real-time decisions. And that's where AI started to shine because it can handle large volumes of data, making these decisions as the real-time data flows into the system. *Vectra* company has solved the critical problem as there is a traditional signature-based firewall that fails to detect abnormal behavior.

sources:

- *Anti Money Laundering* : A smart AML anomaly detection system for a London based global payments platform that wanted to identify suspicious activity across multiple payers and beneficiaries.

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5. Risk assessment, Underwriting, and Skill management

Systems that predict who should get a loan and how much loan is by the proper knowledge of financial related stuff. By managing all related financial information by lagging the risk, the AI system has played a crucial role. *Zest* company is actively working on providing transparency in the financial sector.

Robo advisors are one of the automated machines that help to reduce the risk. That is the risk of investment or related financial issues. Formally, Robo-advisors automates investment management based on our goals and tolerance for risk. There are different companies like ellevest, wealthfront, sochwab, sofi who have Robo advisors. They are known as one of the top companies that successfully managed the Robo advisor. You can also check other best Robo advisors with their primary function *here*. For more information, please visit the site's *financial advisor*.

6. Algorithmic trading

Algorithmic trading is the process of executing instructions from the computer for solving the problem. As the name, an algorithm is the set of computer programs, and the trade refers to generating profit at the same speed and frequency. Thus it can be a hot topic in the field of finance.

Algorithmic trading is also called automated trading or algo trading. For example, a human decides with emotion in manual trading. The timing constraints are optimized as humans can't work 24 hrs actively with the same energy level. Also, frequent backtest is not possible. But in algorithmic trading, the machine decides by analyzing the previous data, which didn't have any timing constraints. *Kavout* company follows algorithmic trading and quickly processes large amounts of unstructured data, generates signals, and identifies real-time financial market patterns.

Some of the strategies need to follow while becoming an algorithmic trader. They are; momentum, mean average, statistical arbitrage, sentiment basis, and market-making.

AIDR Framework

Alright! We already discussed the AIDR framework; Here, we will discuss the AIDR framework for AI in the financial sector. First, let's see with algorithm viability?

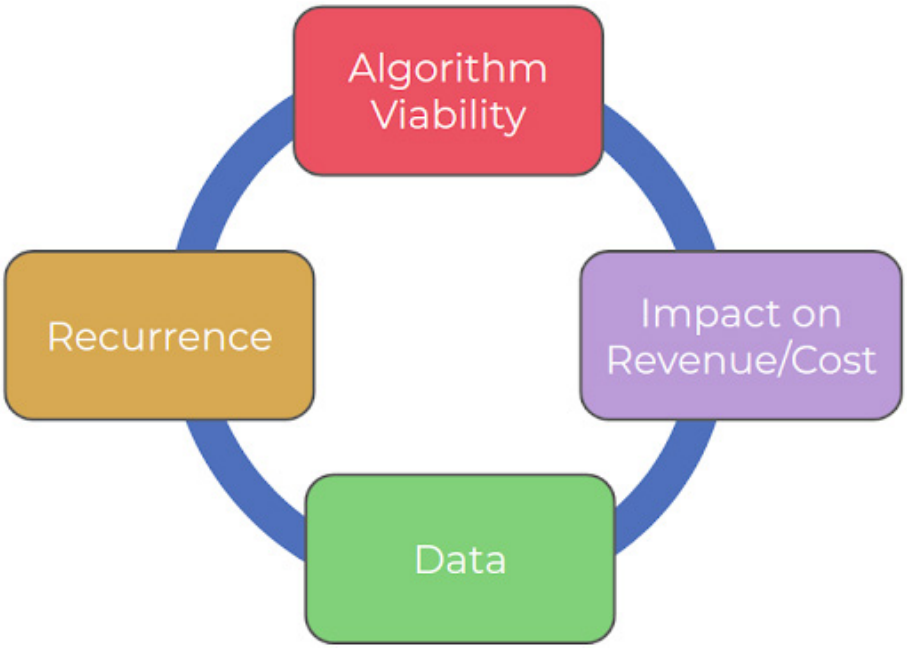

Figure 4: AIDR Framework

Suppose you want to build a machine that detects fraudulent activities on your company's site. Also, the machine capable of arresting that person & gives punishment. Then that's probably a little far-fetched, based on the state of the art research. But suppose you want to build the machine that would secure your monetary and privacy transaction away from a fraudulent source. Then you can secure your company's site with a strong firewall. Also, you can track the location and time of fraud occurs. In that case, it's probably likely that you will be successful rather than having a machine capable of arresting the hijacker and punishing them. It's probably a little far away. You need to be aware of the research that is happening daily or weekly where you know most of the art algorithms' state.

The second thing you need to understand or need to think about is the impact on the business world by the AI system you build. With the plan like, whether the system saves more money or not? Or is it going to increase the revenue for the business and so forth? For example, messenger bot, Robo-advisor answering the financial queries will create more impact than other high AI tech. So, one needs to think hard about how it impacts the ROI of the business or the key metrics of the businesses, as it increases sales or saves costs. So, this is all that the term I for impact and revenue cost is all about.

And D stands for data. There are several things to plan when you think about data for building AI models. First is, how much data do you have? Is it enough to solve the problem? In the fraud detection example discussed earlier, if we have more data, our model will learn more & become more accurate. We can collect the data from the system on which we are trying to build the AI solution. It can be the historical data of monetary transaction activities and so on.

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Challenges of Integrating AI in Finance

AI using the company can increase the potential efficiency and effectiveness of both their operation and compliance. Yet, AI possesses both benefits and challenges in the finance industry. According to the Financial services regulatory challenge report from KPMG,

- 80% of professionals are not confident of adding AI in governance.
- 92% of companies question the trust issues with the machine-level system.
- 20% of companies have a broad strategy to automate compliance.

A few of the challenges are quite prevalent across all financial institutions that need to be addressed to build an AI system.

So, for example, one of the biggest things is silos data. And within the banking world, different organizations and departments are not allowed to share data because of compliance reasons. But there are still many red tapes where the department cannot share the shareable data. So, data living in their different kinds of databases, in a silo way across different departments, is quite hurtful, makes it hard for any executive to implement AI. Because you cannot even access all the data required to train Machine Learning models, more data will make machine learning systems and AI systems quite powerful.

And then there's compliance complexity. Like, you know, you might be able to build a system but, is it fully compliant with all the regulations and so forth. And that leads to one of the problems called the explainability problem.

So, like, let's say you build a system that helps the loan officers decide if somebody should get a loan or not get a loan, or how much loan they should get?
And mostly, if you're using deep learning systems, then machine gives an output, and there's no easy way to explain the output; why the person got a loan or did not get a loan?

Many financial institutions particularly face the problem of explaining the decisions made by machines. One could explain the end customers' decision, who might have gotten happy because they got the loan of a certain amount or did not get it, was quite angry.
Even for internal purposes, they also need to understand why the machine made some distance to also fully and confidently say that it's compliant with the regulations.

The other issue that we've seen is that many financial institutions have an infrastructure that's quite old. There's a lot of work done right now across financial institutions, where they upgrade all of the infrastructures. And we think this is just a matter of time that they will all have a state of the art infrastructure of computing power to do a lot of this stuff.

And another thing that I've seen is there's a lot of departments, a lot of executives within the departments across a large company organization, where they are trying to address some of their own needs using AI. And you know, there might be an underwriting section that's trying to use an AI with XYZ tool, and there might be a customer service department that's trying to use an ABC tool, and so forth. What we've seen, especially in larger organizations, is the lack of a veryhigh-level all-encompassing AI strategy for the whole organization. And have a very long term plan and a view. A vision around how AI will make a difference within their organization and plan is implemented in AI projects and AI activities.

And last of all, one of the biggest challenges, for not just financial organizations at this point, but many organizations is the lack of AI talent. There are just not enough AI engineers, AI strategists, and AI consultants out there who could help with a lot of these initiatives within the large organizations. But, many organizations are starting to think through how to retrain their workforce on AI, how to hire more AI engineers, and so forth.

We have reached the end of this read on AI in finance and try to complete the fraud detection as an assignment!!

Resources:

- *Challenges & Some Use Cases*

Course/Book:

1. *Basic Finance Course*
2. *Machine Learning for Algorithmic Trading: Predictive models to extract signals from the market and alternative data*
3. *Hands-On Machine Learning for Algorithmic Trading*