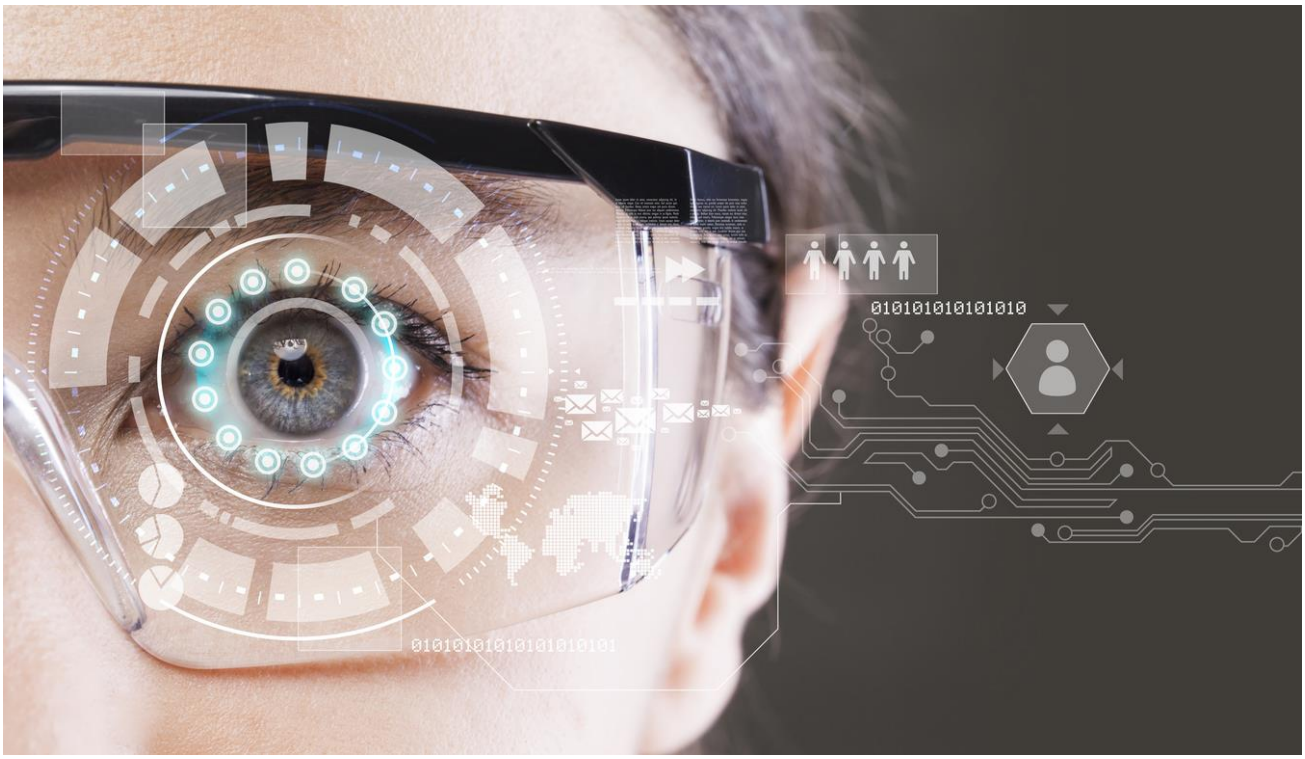
SAC Knowledge Hub

Date: 6th December 2017



Artificial Intelligence

Artificial Intelligence (“AI”) based applications have recently been gaining a lot of traction. In fact, many of our daily used applications incorporate AI in one form or another due to the unescapable benefits that it brings. However, there are also many challenges to be overcome before we can implement AI in a big way. In this paper, we explore what exactly is AI, how AI works, the applications and benefits of AI, as well as the challenges in implementing it, in particular in the context of the financial services industry.

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What is Artificial Intelligence ("AI")?

AI is fundamentally any technology that is designed to operate in a way that mimics how humans operate and behave. AI learns from experience (often from gathering a huge amount of data – can be in the form of images, numbers, movements, etc) and makes rational responses to the signal received. In essence, AI are like humans, they learn and adapt. By taking in information or data, processing and storing it, it "learns" to respond to situations. Just like a kid who touches a hot stove, the brain registers the pain and takes note not to repeat it again.

Why the Resurgence of AI?

The term AI has been around for 60 years but it has only recently started enjoying a major resurgence, thanks to mass connectivity, big data, high performance computing and algorithmic advancement which has accelerated AI's development and application.

The rise of the use of smart devices as well as embedded devices on everything from household products to industrial robots has enabled connectivity across an enormous array of passive tools. This seamless connectivity generates huge amounts of valuable data which is crucial but not previously available, to provide "training" to the machines. Before the immense amount of data can be used, it has to be stored somewhere viable and this is made available by the improvement of information technology infrastructure over the years which has substantially reduce the cost of data storage.

The availability of huge amounts of data which are in turn supported by seamless connectivity and the availability of low cost of data storage, has proven the feasibility of the scientific approaches of AI, in particular neural network (a computational model based on the structure and functions of biological neural networks) and deep learning (also known as Deep Neural Learning, a subset of machine learning in AI that has networks which are capable of learning unsupervised from data that is unstructured or unlabeled).

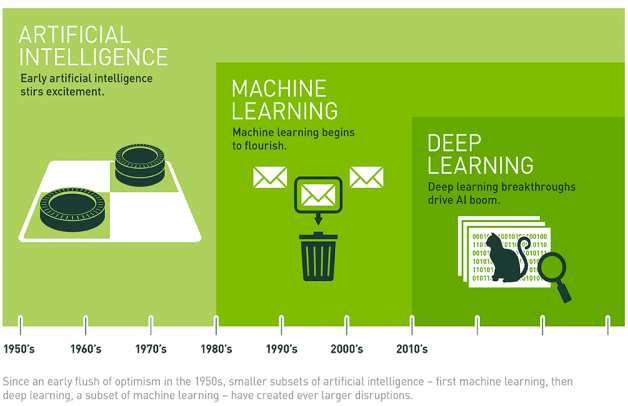
The Concept of AI

The basic concept of AI is to model machine learning on the human brain. A neural network is a pattern-recognition approach to learning that is modelled on the process of the human brain allowing a machine to learn via trial and error like children do. The idea of deploying AI on machines is to overcome the limitations of human intelligence: scalability, by transferring human intelligence to the machines. (Source: Analytics Vidya).

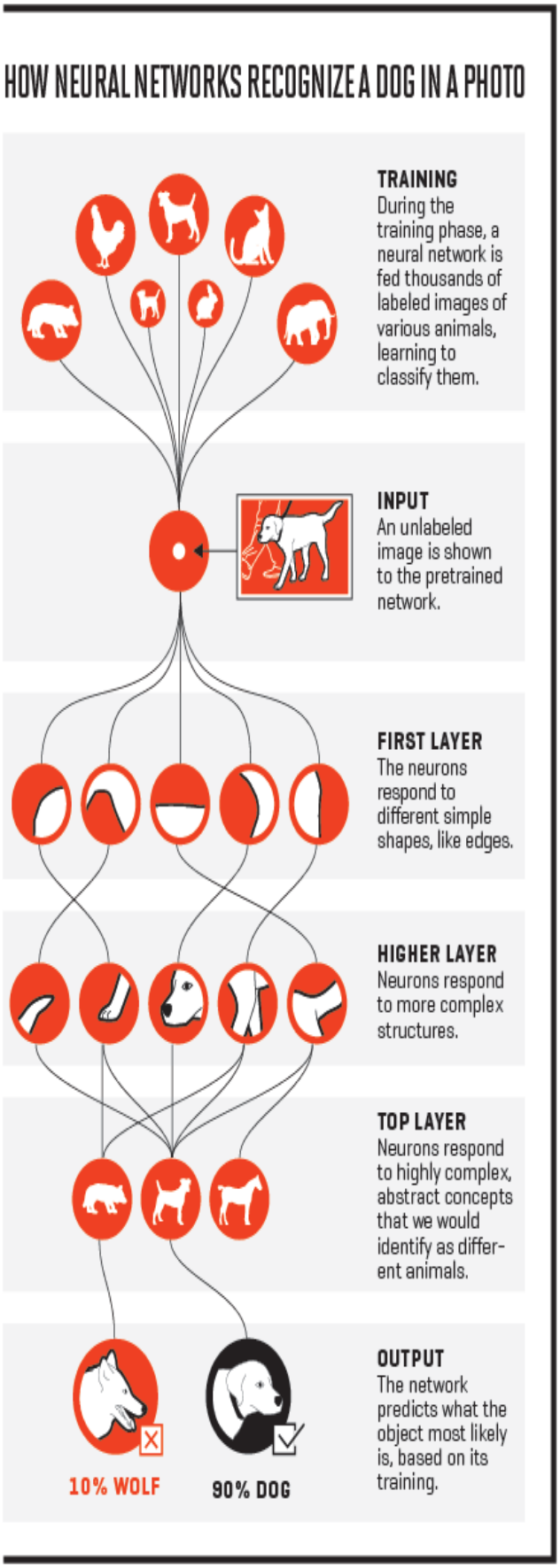
Machine learning is a category within the larger field of AI that is concerned with granting machines the ability to "learn". This is achieved by using algorithms that discover patterns and generate insights from the data they are exposed to, which can then be used for applications, forming decisions or predictions.

Deep learning is a subset of machine learning. It is the most advanced AI field, one that attempts to achieve the ultimate goal of having the machines learn and think as much like humans as possible. Deep learning is like the brain of a human - it requires a complex neural network architecture in order to make sense of patterns received, even with noise, missing details, and other possible sources of confusion.

The following image encapsulates the interrelationship of the three.



(*Source: Futurism*)



(*Source: Fortune*)

How does AI impact our lives?

It is inevitable - AI is everywhere in today's world and plays a role in many facets of our daily lives. Below are some examples of commonly used applications which make use of AI:

- **Virtual personal assistant** - Siri, Google and Cortana which are intelligent digital personal assistants on various platforms such as iOS, Android and Windows Mobile.
- **Smart home devices** - Many smart home devices now include the ability to learn our behavioral patterns to help us cut costs by adjusting the settings on appliances in an effort to increase convenience and save energy.
- **Shopping recommendations** - Amazon designed a neural network that can make the most suitable recommendations for its customers.
- **Image recognition** - Facebook uses a nine-layer deep neural network with more than 120 million parameters to automatically tag people in an uploaded photo.
- **Online customer support** - Many websites offer an online chat service but it may not be a live person on the other end of the line. In many cases, it is a rudimentary AI system which operates the service.
- **Security surveillance** - With supervised training exercises, security algorithms can take input from security cameras and determine whether there may be a threat: if it "sees" a warning sign, it will alert human security officers.
- **Music and movie recommendation services** - Pandora and Netflix recommend music and movies based on the interests that users have expressed in the past.
- **Smart Cars –** Two most recent examples are Google's self-driving car project and Tesla's "autopilot" feature. Earlier this year, the Washington Post reported on an algorithm developed by Google that could potentially let self-driving cars learn to drive in the same way that humans do through experience.

(*Source: Intel, Beebom*)

Aside from providing convenience to end consumers, AI also helps us in bigger ways as shown in the table below:

INDUSTRY	GOAL	DEEP LEARNING APPLICATION
Banking	Detect suspicious ATM activity on video footage from all branches	Process footage along with images from other available law enforcement data banks; extract images related to suspicious activities
Insurance	Compute automobile insurance claims costs directly from accident images submitted by policyholders	Establish heuristics for basic claims analysis; train claims system to analyze accident images and, based on heuristics, classify accidents by severity of damage and cost of damaged parts
Healthcare	Automatically identify potential abnormalities in CT scans, MRI scans, x-rays, and other diagnostic images	Deploy a deep learning system, trained to analyze and categorize large volumes of images; join the pool of diagnostic labs contributing images to the system for large-scale pattern recognition
Automobiles	Identify most appealing marketing attributes, such as stylishness, acceleration speed, and roominess	Build a database that incorporates auto sales data and assigns attributes to each model
Government	Detect and prevent cyberattacks	Create an autonomous system operating on multiple agency internet portals and gateways, one that monitors keystrokes, recognizes typing patterns linked to past intrusions, isolates potential intruders, and alerts human investigators

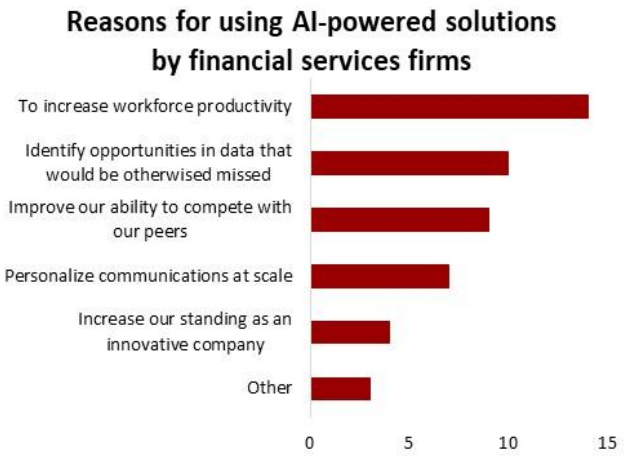
(Source: PWC Analysis)

Top 10 Companies Using AI

1. AIBrain – One of the leading AI companies. AIBrain primarily builds AI solutions for smartphones devices primarily. Their key area of expertise is robotics and digital personal assistant.
2. Anki – Anki is another company in the AI domain which has received funding of over $157.5m from the likes of JP Morgan and other ventures. The flagship robot of Anki – Cozmo – is one of the most emotionally intelligent robots while dealing with customers.
3. Banjo - Banjo has raised over $100 million worth of funding since inception. They use strong social media analytics from multiple social media platforms to identify events taking place around the globe.
4. iCarbonX - iCarbonX is an AI based startup in the healthcare sector. They provide individualized health analyses and prediction of health index through the use of advanced data mining and machine analysis technologies. iCarbonX is valued at more than US$1 billion.
5. Jibo - Jibo is the first robot in the world made to help families with their daily tasks. Also, it learns about the behavior and personality of families as it interacts with them.
6. Next IT - Next IT applies AI in the healthcare and finance industries with its focus mainly on natural language processing, chatbots and machine learning.
7. Prisma - Through the use of deep learning algorithms to recreate images as if they were painted, Prisma revoluationised the mobile application industry and is one of the most popular applications on iOS.
8. ReSnap - ReSnap uses AI and deep learning to select the best images from a large number of them to create a photobook for the user.
9. ViSenze - ViSenze is revolutionizing the e-commerce market by recommending visually similar products out of the several million products available in the market by using deep learning and computer vision. They recently raised $10.5 million to further develop their AI technology.
10. X.ai - X.ai's virtual assistant helps busy people schedule meetings without any human intervention. As soon as you copy a mail to the application, it uses natural language processing and machine learning to identify the most suitable time and place for your meeting.

AI & Its Relevance to the Financial Services Industry

In recent years, the financial services industry has been at the forefront of developing and adopting AI technology in their business operations. The following chart sets out reasons why companies in this industry have placed such importance in this advancement.



(Source: Analytics Vidya)

Five key applications in the financial services industry

1. **Anti-money laundering pattern detection** – Most banks around the globe have started AI-based software systems which are more robust in recognizing anti-money laundering patterns.

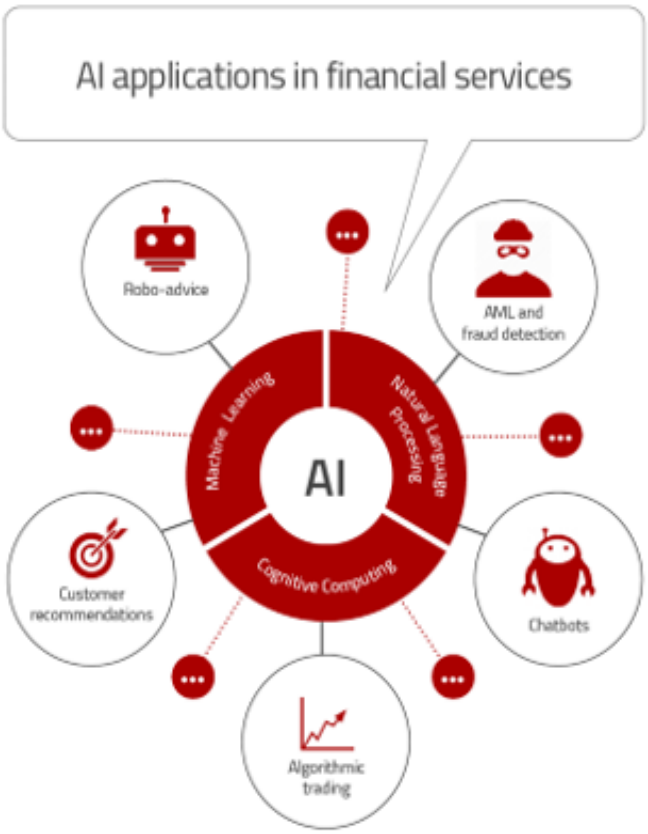
2. **Chat bots** - AI based automated chat systems which can communicate with humans without human intervention are now common place in many banking platforms. Through text recognition, the chat bots collect large amounts of data, increase the accuracy of their responses. Recently, the Bank of America announced plans to provide customers with a virtual assistant named "Erica" who would use AI to make suggestions over mobile phones to improve their financial affairs. Allo, released by Google is another generic realization of chat bots.

3. **Algorithmic trading** – Many hedge funds are now using AI to generate returns. These AI systems make investment decisions by analysing large amounts of data from the financial market. Reports claim that more than 70% of trading today is carried out by AI systems. As soon as the hedge funds identify trading opportunities based on pre-set parameters, they will perform high frequency trades using different strategies. Some hedge funds that are utilizing AI systems include Two Sigma, PDT Partners, DE Shaw, Winton Capital Management, Ketchum Trading, LLC, Citadel, Voleon, Vatic Labs, Cubist, Point72 and Man AHL.

4. **Fraud detection** – Fraud detection has been proven to be the most successful AI-based application in the financial industry. Starting from the early example of successful implementation of data analysis techniques in the banking industry is the FICO Falcon fraud assessment system, which is based on a neural network shell to deployment of sophisticated deep learning based artificial intelligence systems today.

5. **Customer recommendations -** Recommendation engines are the main users of AI in the financial services industry. It utilises historical data of users and offerings (e.g. credit card plans, investment strategies) from the bank to make appropriate recommendations to users, based on that particular user's preferences and past history.

(*Source: Analytics Vidya)*



(Source: Efma September 2017 The Financial Brand)

Challenges of AI in the financial services industry

The above applications are just a few common uses of AI in the financial services industry. In fact, there is no end to potential of AI based applications in the industry due to the massive amount of consumer data that the banks have. Social media sites which have much lesser consumer data than banks are already using AI seamlessly to anticipate and meet the needs of their users. Yet the financial institutions are still playing catch up.

Three main challenges of AI in the financial services industry

1. Who owns the data that is essential to AI?

- **Consumer privacy and consent.** Consumers have a right to know how, where and when their personal data is being used.

- **Business partners.** Partnering with other entities to collect, store and process data further complicates the data privacy issue. Data agreements are difficult to construct and interpret, and strict limitations on data usage can be difficult to enforce.

2. Who is responsible for AI decisions and actions?

- Finding out what an AI program has learnt and how this would affect its decisions is incredibly difficult. It is hence difficult to determine who is responsible for the decisions AI make. There are existing laws and regulations in some cases, but grey areas are increasing. The need to predict the complications which will emerge as the scope of AI driven automation expands will not be easy.

3. **What are AI's implications for cybersecurity?**

- Although AI has been useful in detecting cybersecurity attacks, AI is open to vulnerabilities too. Big and commingled data which is the basic info that AI needs in order to form new information creates a growing attack surface that increases the vulnerability to hackers. It provides hackers with a tool to land and expand data breaches. While AI helps to identify new identities, it may recreate identities that have been masked to comply with the data privacy policy. Commingling of data makes it difficult and costly to track the respective sources of the data, whether the data contains PII (personal identifiable information) and how these data can be used.

Other concerns include: (1) data security concerns will be further increased with the involvement of third party provider and banks are increasingly liable for data security measures and (2) AI may make decisions perceived to be biased.

(*Source: White & Case)*

Looking ahead

1. According to a survey done by the University of Oxford and Yale University, there is a 50% chance that AI will be able to perform all human tasks better than human in 45 years and all human jobs are expected to be automated within the next 120 years. Survey respondents predict that AI will be able to translate languages better than humans by 2024, write high school–level essays by 2026, drive trucks by 2027, work in retail by 2031, write books by 2049 and perform surgery by 2053.

2. Most recently, an AI developed by Google defeated the world's best player in Go, a complex strategy game.

3. In 2011, IBM's Watson AI famously won a game of Jeopardy! against the world's best players.

4. AIs have been beating world champions in chess since 1997, when IBM's Deep Blue defeated Garry Kasparov.

5. The development of self-driving cars. Transportation innovators like Uber's Travis Kalanick and Tesla's Elon Musk have predicted that automated vehicles will disrupt the industry over the course of the next 20 years.

6. Newsweek reported several ways AI will transform health care, such as AI software that understands a person's genetic makeup being able to diagnose illnesses. Researchers are now beginning to understand the ways in which automation can interact with the human body, and the impact AI will be significant.

(*Source: Newsweek)*

Many have argued that many jobs will be replaced by machines and hence unemployment rate will reach unprecedented levels. The reality is that AI is here to stay. The challenges of implementing AI are real but the benefits are great. Benefits include increased speed and efficiency, reduced labor and resource costs, reduced human error, the ability to tailor products and services, improve customer experience as well as security. Few, if any, can afford to ignore AI, especially the financial services industry who must proceed into the field of AI with care and possibly the need of government intervention.

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