# A GUIDE TO AI & ML FOR BUSINESS LEADERS

***Introduction***

As technology continues to evolve and human beings strive to bridge the gap between computer science, machines, and themselves, the quest to improve the world we live in has become a constant endeavor.

Even as far back as 1950, after British mathematician Alan Turing created the Enigma machine to help break Nazi encryption during World War II and subsequently wrote the paper *Computer Machinery and Intelligence*[1]*,* the fundamental question "Can machines think?" has been regularly revisited. This question has formed the basis of what is now commonly known as artificial intelligence[2] [AI] and it was in 1956, in Dartmouth College, where the term itself was first coined.[3]

At its essence, AI is "the theory and development of computer programs that are able to do tasks and solve problems that usually require human intelligence."[4] Though the keyword here is 'intelligence', an understanding of what constitutes intelligence has been fiercely debated. In fact, the acknowledgement of what factors human intelligence actually consists of (reasoning, learning, problem solving, perception, linguistic intelligence, among many other elements) has become intrinsically linked with advancements in AI itself.

Within these debates, researchers and experts have tried to narrow down the definition of AI to consist not only of what 'intelligence' means but how it can be achieved. Thus, a closer definition states AI as "…one of the branches of computer engineering that deals with the development of smart and self-operating machines. [It] aims to make machines intelligent like humans, artificially, or to simulate intelligence in a machine [through] the ability of a system to correctly interpret presented data and learn from that data."[5]

This definition provides context, which can be built upon and is why terms and words such as 'simulated intelligence', 'data', and 'learning' have become the backbone of AI theory.

***Evolution***

If the 1950s and 1960s saw the seeds of AI take some sort of shape in the form of algorithm development, the 1970s / early 1980s seemed to witness an "AI Winter"[6] where a lack of funding and supposed interest took AI research "underground."[7] However, this period did give rise to 'expert systems', which relied on two components: "a knowledge base" and "an inference engine."[8] The first is an "organized collection of facts about the system's domain," while an inference engine "interprets and evaluates the facts in the knowledge base in order to provide an answer."[9] With these components in place, tasks such as "classification, diagnosis, monitoring, design, scheduling, and planning for specialized endeavors,"[10] could be more easily undertaken.

***Branches of AI***

Post the mid-1980s and up to the present, AI has seen the rise of many other (and newer) sub-fields, topics and theories. The most well-known include the following:

**Machine Learning (ML)** is an "algorithm which 'learns' or adjusts itself based on the data that it processes."[11] The key here is the finding of "hidden patterns or insights from data"[12] and, over time, learning and increasing intelligence.

Commercial and popular products which use ML include home assistants such as Microsoft's Cortana, Google Assistant/Home, Apple's Siri, and Amazon's Alexa. To underline the earlier definition of ML, the more users interact with these products the more they learn. This enables these products to further their learning as well as help provide more informed decisions to users; everything from planning routines and schedules to suggesting entertainment preferences and bookings, among many others.

The other popular space where ML is used extensively is social media. The complex and ever-changing algorithms of Facebook and YouTube (among others) ensure that user preferences are constantly tweaked and reconfirmed through advanced ML, which helps keep users within the social media eco-system for as long as possible.

ML is also one of the major tools driving Google's powerful Search algorithm, which is actually "a combination of various algorithms that serve different purposes and combine [to] uplift the overall search experience."[13] This also serves as the basis of the company's vision to leverage AI in "exciting new ways, solving problems for our users, our customers, and the world."[14]

**Deep Learning**: Seen as a more complex subset of ML, Deep learning "describes algorithms that analyze data with a logic structure similar to how a human would draw conclusions…. both through supervised and unsupervised learning."[15] By closely (or as close as is possible to) mimicking the human brain, such applications use "a layered structure of algorithms called an artificial neural network (ANN),"[16] which can extend well beyond the scope of ML.

Examples of Deep learning in practice include self-driving vehicle technology, aircraft flight navigation technology, industry automation and medical inventions.[17]

**Cognitive Computing:** Closer to resembling human thoughts, reasoning, and learning, cognitive computing moves a step away from traditional AI to mimic human behavior, emotions and reactions. An example of this would be "natural language processing (NLP) for cognitive computing, which goes beyond simple voice recognition (which is already in use) [and] includes [the ability] to sense an individual's mood (stress, anger, happiness, frustration, excitement) and modify responses accordingly."[18]

**Computer / Machine Vision:** To better understand the 'human' world, computer vision is a branch within AI (which uses ML) that attempts to process and contextualize visual information. In order to resemble human understanding, computer vision must "automatically understand not only what objects in an image are and where they are located but also be able to clearly categorize, understand their relationships and place within a particular context of the scene."[19]

These branches are by no means exhaustive and many of them have their own sub-fields depending on various classification methodologies. Apart from real-life applications within

industries and functions, which will be discussed later, there are also further fields, which are worth mentioning. These include:

**Robotics:** Basically the creation (design and manufacturing) of robots to undertake a series of tasks. These can be either automatic or semi-automatic (related to the term robotic process automation or RPA) and can be used for both long, laborious and repetitive tasks (for example, assembly lines within manufacturing) and more complex tasks, depending on the algorithms, level of ML and other aspects of AI that have been put in place.

**Fuzzy Logic:** To create more human-like conditions for machines to work within, fuzzy logic aims to bridge the gap between binaries or absolutes (0 and 1) and degrees and variations of human reasoning. This is why fuzzy logic is often known as "artificial general intelligence."[20]

**Natural Language Processing (NLP):** As mentioned earlier, NLP aims to learn, mimic and build on human communication, essentially, natural language, to "analyze, understand and derive information from the text form of data."[21]

***AI in Practice***

Though some of the ways AI can be used have already been mentioned, there are some specific examples of its uses within certain industries and functions.

**Manufacturing, Logistics & Supply Chains**

Some of the industries, which have adopted and benefited from AI and related technologies include manufacturing and logistics. In fact, a recent McKinsey survey[22] reported that the most significant benefits from adopting AI came from manufacturing. Owing to this, the 2020 MHI Annual Industry Report[23] expects 60% of businesses to use AI technology in their warehouses within the next six years.

This may be due to the ease with which repetitive tasks can be managed across a factory floor or warehouse with either RPA or cobots – collaborative robots trained to manage and work alongside humans. These cobots can "lift heavy parts and hold them in place while human workers secure them and are also able to locate and retrieve items in large warehouses."[24]

Another area of benefit lies in the checking of damaged products within a warehouse. By leveraging computer (machine) vision, businesses can more quickly and easily locate damaged goods – by type and extent of damage – and ensure timely and relevant action is taking before sending out.

On the factory floor, machines can be kept in smooth and regular working order with the use of predictive maintenance.[25] "By analyzing real-time data collected from IoT sensors in machines [and] ML-powered analytics tools, technicians can spot patterns and take preemptive action well before machine failure occurs.

**Retail**

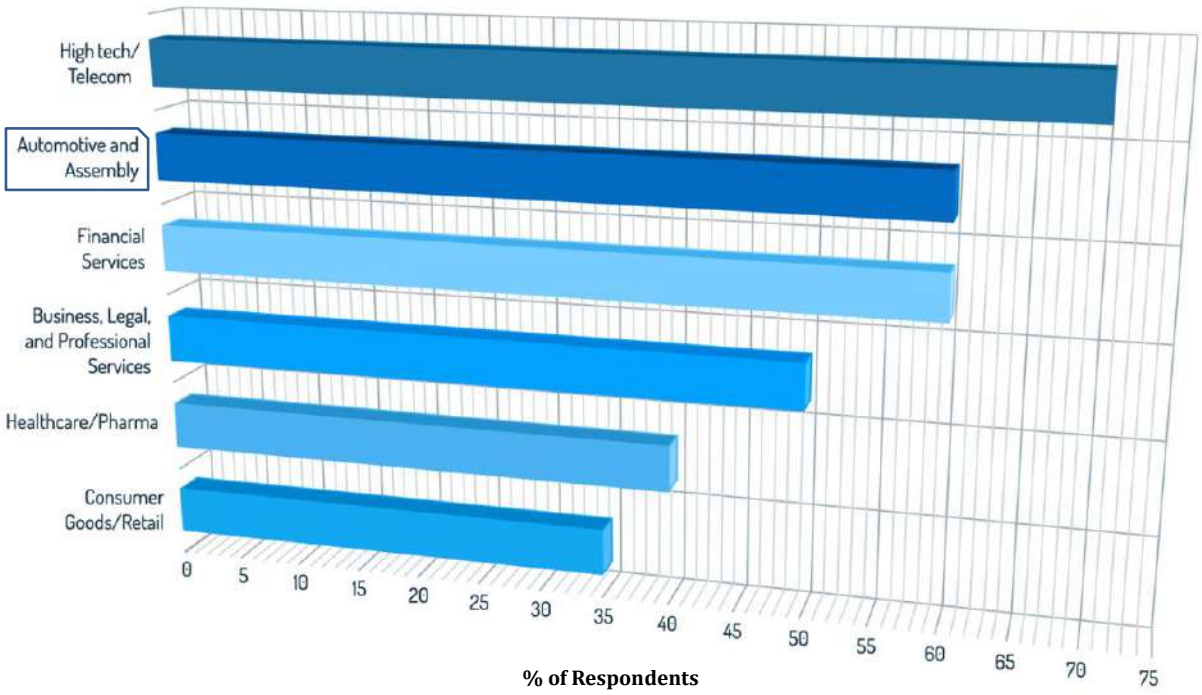
Within retail, advancements in AI have played a significant role in better understanding customer behavior and preferences, translating customer data into actionable insights and providing more memorable retail experiences – both physical and digital.

At a basic level, AI and ML can crunch millions of customer data points and analyze these results across channels, platforms and applications. Retailers can then use these trends – "past purchases, online & in-store visits, preferred price range, brands, etc., – and understand what customers may shop for in the future and plan their [future] campaigns [and marketing strategies] accordingly."[26]

For more advanced, personalized and seamless customer experiences, AI can provide hassle-free, omni-channel, BOPIS (buy online, pick up in store) options tailored to suit each specific customer's requirement. From understanding customer habits and spending, to tastes and where (and how) they (and their products) should be reached (and dropped), AI can help transform the retail experience into "everywhere commerce."[27]

**Automotive**

## AI Adoption by Industry, 2020




Source: McKinsey & Company, 2020 | Chart: 2021 AI Index Report

AI can provide valuable benefits for players within the automotive ecosystem. With smart factories and advanced supply chains, robotics and RPA can save time, labor efforts and increase efficiencies. In fact, a recent Capgemini survey pronounced the automotive sector as the most bullish industry with regard to smart factories by "making larger investments and setting higher targets for its digital manufacturing operations than any other sector."[28]

For car companies and dealers, ML can be an invaluable tool in selling more vehicles. By gaining better insights into customers through their past transactions, spending patterns and decisions and buying preferences, businesses can be well positioned to act and promote specific deals and sales.

With vehicle safety and security being paramount, a combination of IoT & sensor technology and predictive analytics, underpinned by advanced AI, can help car companies and dealers drastically increase vehicle and driver safety. Additionally, pre-emptive alerts and warning notifications within dashboard-style, touch-screen interfaces can also be built-in to reduce possible problematic situations.

Finally, no discussion about AI in the automotive industry can be complete without mentioning self-driving vehicles. Granted, there have been giant strides within this area with more progress occurring over the last decades than ever before; more money being spent and more corporations jumping on the bandwagon. However, the fact remains that there is still a lot of work to be done to fully navigate the requirements of an autonomous self driving car, specifically in terms of bridging the gap between humans and AI. As has been highlighted, "…for a car to drive like a human, researchers have to create AI on par with one. [Unfortunately] researchers and academics in the field will tell you that's something [they] haven't got a clue how to do."[29]

***Functions***

**Sales & Marketing**

Sales and marketing functions have undergone tremendous evolution over the past decade with advanced technologies leading to the creation of digital marketing. Further, the ability to manage and analyze large amounts of data has led to a greater ease of customer profiling, enabling more personalized and tailor-made selling and promotions. AI and ML have also enabled marketers to move closer to customers. From chatbots and real-time virtual assistants to predictive analytics and 360° profiles, sales and marketing functions can now leverage advanced tools and platforms to ensure they are closely attuned to their customers' needs and desires.

**HR**

Within HR, AI can help undertake repetitive tasks like "resume screening, selecting the most appropriate resumes, scheduling interviews, and answering common questions,"[30] at speed, thus, saving staff time and resources within talent acquisition. Similar efforts can be made to onboard new joiners, perform administrative tasks and support employee productivity by

analyzing and suggesting appropriate training and development programs and quickly providing insights about feedback assessments.

**Operations**

Across businesses, CIOs can leverage the power of AI to optimize operations. They can "uniquely understand and engage customers, automate business processes and improve productivity and revenue while reducing operational expenses."[31] Added to this is the adoption of AI within business intelligence (BI) to provide insights into everything from customers and clients, to internal processes and strategy.

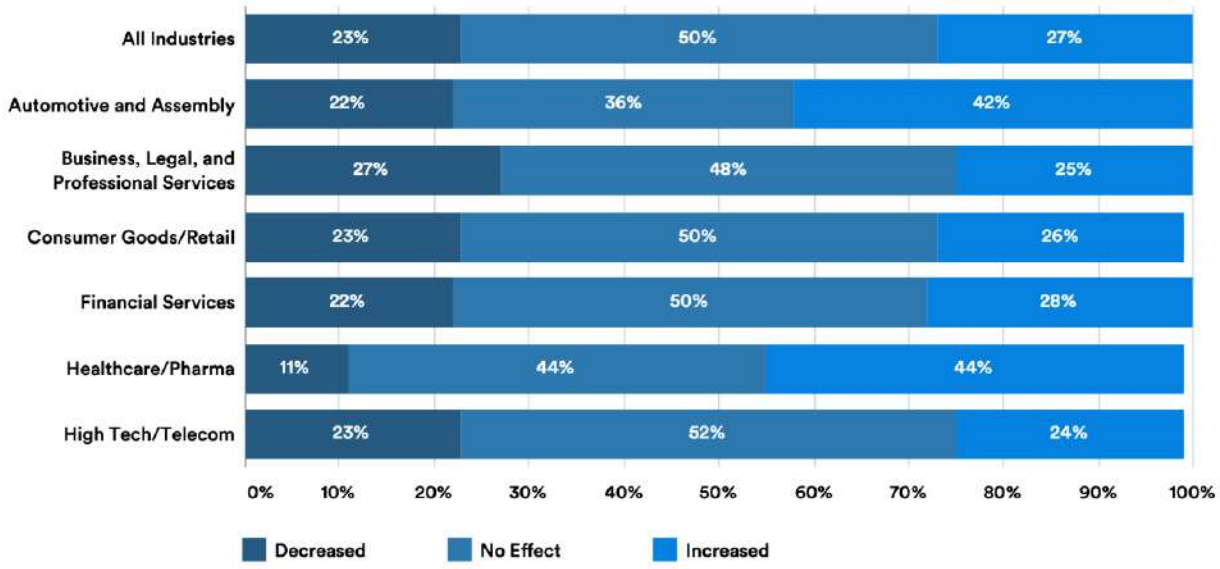
With more data being captured and analyzed, senior leaders can "explore [this] data and find entirely new ways to deploy existing assets that have the potential to significantly impact the company's bottom line."[32]

Further, businesses could also consider something in-between simple process optimization and entering a new industry. In this regard, "a truly data-driven service offering may be the competitive edge that pushes [a] company to the top of the market."[33]

***Conclusion***

**The future and challenges of AI for businesses and leaders**

## Changes in AI Investment Amid the Covid-19 Pandemic




Source: McKinsey & Company, 2020 | Chart: 2021 AI Index Report

As the world continues to recover from the Covid-19 pandemic, businesses have had to face harsh new realities across all sectors. From reviewing existing business models and physical locations to remote working and staff layoffs, such dramatic changes in the business landscape have yet to been fully comprehended.

Though businesses across geographies and markets have all been hit hard, it is apparent that those, which have adopted a clear line towards digital transformation, have fared better. As noted, the "catalyst was the disruption to 'business as usual' and the gaps exposed in digital transformation initiatives where human capital and existing resources, and processes could not scale to meet increasing demands introduced by the pandemic. It became immediately clear that digital intelligence and automation were suddenly the only solutions that [could] perform urgent jobs at scale."[34]

Here, business leadership is crucial both in terms of steering the ship with a level head while ensuring the least amount of disruption despite an unsure global future and outlook.

For those business leaders who have a sound grasp of the potential of AI and related technologies or who have already implemented some of these elements, the future looks bright. In fact, it is clear that "the decisions business leaders make today *vis-a-vis* tech deployment will impact their company's trajectory in the long haul. Leaders who apply learnings from these consistent analytics to embed AI and analytics into their enterprise's fabric will have the upper hand in tapping unexplored horizons."[35]

The need of the hour for business leaders is AI adoption, possibly at scale. However, this must be brought about only after a detailed understanding of its use, potential and implications within the business. As a recent McKinsey study has revealed, "While most [business executives] acknowledge the need to rethink business models for digitization efforts, [they] don't see a similar understanding around the use of AI. It's a major impediment to getting real value from a technology that's already providing significant returns for some companies."[36] This understanding is crucial in getting *it right* for leaders and McKinsey goes further by providing five key steps[37] that can be taken to make this happen.

If there are lessons to be learnt for businesses from the ongoing pandemic they are that the ability to adapt, be flexible and show resilience are fundamental not for simply survival but growth as well. These traits across businesses and their leaders need to be carefully underpinned by innovative uses of AI technologies, which can "not only improve existing processes but also create novel ways of working."[38]

The future may look uncertain but there is hope in the form of AI. It is now up to businesses and leaders to unleash its potential to help overcome today's unprecedented challenges.

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