Artificial Intelligence

FOR ALL

Transforming Every Aspect of Our Life

UTPAL CHAKRABORTY

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by

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Dedicated to

Birendranath Chakraborty (Father)

Sikha Chakraborty (Mother)

Suchhanda Chakraborty (Wife)

Panchali Chakraborty Gupta (Sister)

Arup Gupta (Brother in law)

Arnab Chakraborty (Son)

Avighna Gupta (Nephew)

My entire family, who inspires me in every walk of my life.

About the Author

Utpal Chakraborty is an eminent Data Scientist, AI researcher, Author and Strategist having more than two decades of industry experience, including working as a Principal Architect in L&T Infotech, IBM, Capgemini and other MNCs in his past assignments. At the moment he is the **Head of Artificial Intelligence at YES BANK**. Utpal is a well-known speaker and writer on Artificial Intelligence, RPA, IoT, Agile & Lean speaking at conferences around the world. His recent research on machine learning titled "Layered Approximation for Deep Neural Networks" has been appreciated in different conferences, institutions and universities. He has also demonstrated few completely out-of-the-box hybridized Agile & Lean implementations in different industries which have been recognized and appreciated by Agile & Lean communities worldwide.

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Preface

Artificial Intelligence is a landmark in the history of our technological innovations that have happened from time to time in the past. If you look at it from a positive angle, AI is a blessing for the humanity because it has got huge potential to solve many of the unsolved problems which we have been trying to solve for ages. For example, the way AI is revolutionizing healthcare & medicine, space science, reusable energy, autonomous vehicles and many more is commendable. So, undoubtedly AI is the future technology; it is already solving many of the problems and going to solve many more in the future.

We are currently living in the golden era of technological innovations-technologies like AI, Big Data & Analytics, IoT, BlockChain and other technologies in the FinTech space are transforming every industry. So, like any other golden era in the past, this time also it's not only just AI but many other groundbreaking innovations that have happened at the same time, complementing one another to bring about this great transformation. We can see the enormous scope for innovations, possibilities and hopes for a bigger change in coming years that probably had never happened in the past.

Why this era of AI and Cognitive is so important because –If we go back to our history, Industrial Revolution has given the "Mechanical Power" to the machines, the power to do repetitive things in a much larger scale, faster and with more efficiency than a normal human can do. IT revolution in the 70's and '80s has given "Computational Ability" to the machines, ability to process repetitive computational tasks in a much faster and efficient way. But this time, Artificial Intelligence has given the "Cognitive Ability" to the machines. Cognitive skills includethe ability to learn, analyze, reason and apply those learnings. So, machines and tools we are using are becoming more and more intelligent, and we as a human,always inclines to interact with intelligent machines. So, this time it's much more exciting, and that's the reason every industry has a huge focus on AI today.

Applications of AI are not just restricted to in one domain today or field, but it's proliferating every industry- banking & finance, healthcare & medicine, retail, manufacturing are major investors in AI.

If we talk about banking and finance, it is going through a revolutionary transformation using many new disruptive technologies. AI is one such technology which has received the highest traction not only in the FinTech world but also among other businesses, and many enterprises have been able to leverage it as a competitive advantage.

While AI undoubtedly has numerous advantages but turning AI initiatives into a real ROI enhancer is not that straight forward for enterprises and needs a clear vision, strategy, roadmap and a comprehensive execution plan. All those above holds for any new initiative for that matter but what makes AI initiatives unique are the challenges associated with many of its evolving capabilities like Computer Vision, Speech, Text processing, Translations etc. and the varied range of AI providers starting from the product giants to the small and dynamic startups with varied level of their maturities in terms of those core capabilities. Also, different technologies under the umbrella of AI are evolving at a very rapid pace and benchmarking such capabilities has become challenging.

Book "Artificial Intelligence for All" tries to bring together implementation experiences from different domains and industries in a simplified manner. Hope the readers will enjoy the book!

Errata

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Chapter 1

Super Powers of AI – The Leaders and the Contenders

Russian President, Vladimir Putin, stated that AI is the future and whoever becomes a leader in AI will become the ruler of the world. Chinese President, Xi Jinping, declared that *China wants to be the world leader in AI by 2030*. The US White House Administration voiced that *America has been the global leader in AI, and the Trump administration will ensure our great nation remains the global leader in AI*. Similarly, National Strategy for Artificial Intelligence, India, published by NITI Aayog, indicates its vision as *AI-for-All in India*. These statements clearly indicate that the race for the supremacy in the field of Artificial Intelligence has already taken a great momentum, and AI has managed to influence even mainstream politics and the world leaders in a great way.

On the other hand, many experts across the globe are already in a big hurry to proclaim which country will be the AI superpower and who is already ahead in the race. Some of them even persuasively claim themselves to be an AI superpower just by building a simulated bubble to attract the extra attention from the world and some investors.

Keeping aside all those hidden agendas, and before even jumping to some conclusion, we should first consider the prerequisites to be a mere contender in this race. Because it's not going to be a wholesome competition, especially when we have contenders who will not shy away from attempting any possible means, whether ethical or unethical, to be ahead of the competition. A few countries are already leading in this race; and, at the same time, there are strong contenders who have huge potential to be in the list of leaders in the near future.

Before taking this debate further, we also need to define the parameters to measure the supremacy and the factors influencing the same. Is it how much dollars are generated in a country by utilizing AI or what are all the core problems that are solved for humanity by uplifting the quality of life of the citizens of a nation? Also, the priorities to be addressed are country and region specific.

For example, predicting what movie or what ad a user will like using AI may not be something so compelling when it comes to a developing country like India; rather, if AI can address some of the core areas like healthcare and medicine, agriculture, food, water, education, urbanization, and so on, it will be much more compelling. The success of AI, in this case, will be measured in much higher terms. To understand this, let's take a step back and discuss the factors that can essentially fuel contenders to become leaders.

Technically, there are five major prerequisites that are essential for an AI ecosystem to flourish in a country, but there could be many others that can largely contribute to its advancement and implementation.

AI Research

AI is essentially an evolving field, and many of the AI technologies are maturing and getting better off with research and evolution, which is happening in terms of a better approach to tackle some of its technical limitations. There may not have been another groundbreaking breakthrough after **Deep Learning** (**DL**) in the last couple of years, but there have been many improvements—there were small and medium innovations in terms of how deep learning and other AI technologies can be applied effectively in many different areas; all those are essentially due to continuous researches happening in the field. So, an ecosystem embracing AI research is very essential for a country to progress in the field of AI, whether such researches are to

be carried out in academia, within R&D cells of AI companies, or in collaboration with the government.

Usable Data

Usable data comes from the real-world physical services that have been digitized so far. This means that researchers have to use the many physical services that have been digitized in the country and the data from those services that has been collected, stored, and made available for AI companies, to feed and enrich their AI models.

Wealth of AI Engineers and Data Scientists

For traditional software engineers to become AI affluent, special skills are needed in the areas of machine learning, deep learning, NLP, and so on. AI researchers coming from a data science background need even higher skills and background to carry out research in the different areas of AI. An adequate pool of such AI engineers and AI researchers is essential for AI to grow in a country. The more your tech colleges and universities produce these skilled resources, the more your chances to be a leader in the race.

Support from Government and Awareness Among Citizens

The government of a country plays a major role in democratizing a rising technology like AI. Backing from the government and their support is crucial, whether it be to build infrastructure for AI, frame policies that support AI to grow, encourage enterprises in the adoption of AI, or whatever other form it could be.

Funding and VC Ecosystem

Proper funding and a mature **Venture Capitalist** (**VC**) ecosystem is vital for AI startups and other AI initiatives to grow in a country. Sometimes, it's not just funding the AI startups, but essentially guiding them through their journey, and believing in and being a part of their vision is very important, which can only be expected from a mature VC ecosystem. Despite having all other AI ingredients, most of the developing countries—like India and its young entrepreneurs

and startups—are essentially struggling in this particular space.

I will try to list down a few of the leaders and some of the strong contenders here; however, the order in which the contenders have been listed in this article, and the length of the text written for each, has no significance on their capabilities and position in the race.

USA

Undoubtedly, the U.S.A is ahead in the race, both in terms of AI research and some of the large-scale AI implementations. US has got most of the best AI researchers of the world—most of the tech and AI giants are based there. Some of the AI applications used globally are again US products. US has huge data available for AI to flourish as most of the physical services there are already digitized. US has the best universities and talents, best AI labs, and the best funding ecosystem so far. But, there is a twist in the story—unlike other technologies, in the case of AI, a few countries are not far behind US; in fact, there is a possibility US may be left behind in the future.

Canada

Canada is well ahead in AI research—it has got the finest AI researchers and universities. Canadian universities produce some of the best AI researchers every year. Also, talented professionals from all over the world land there to research on different areas of AI and translate their ideas into implementable solutions. Unfortunately, Canadian talents are very academic and research-oriented, and there is an actual shortage of real entrepreneurs who can take AI beyond the classes and the labs and onto the road. This is probably the reason that, despite having most of the talented AI professionals in the world, they still have not been able to produce best AI products or AI companies. It seems that the Canadian government has now realized this fact and is currently focusing on AI implementation and exploring how to generate revenue out of it. Also, recent imposition of immigration restrictions in US have essentially become a blessing for Canada and a few other AI contenders to attract more and more talents from across the globe.

China

China has emerged itself from a copycat to a unique form of inimitable entrepreneurism. The word copycat may sound a bit

offensive, but trust me, the word in this particular context of the article has a great significance, which we will discuss in the next few paragraphs. Personally, I have got a great regard for China and Chinese entrepreneurs—it is especially worth noting how it has incredibly transformed itself in the past few decades. We all have a great lesson to learn from them. Essentially, they have gorgeously demonstrated the fact that you can begin with as a copycat and with hard work and dedication, you can become an innovator. It is not true that you need a great, out-of-the-box, unique innovative concept or a product to be a successful entrepreneur, which is what many of our young Indian entrepreneurs sometimes wrongly assume. You can essentially transform your ordinary concept into a unique innovative product by adding factors like operational excellence, better usability taking into consideration your user needs; and the same can come out as a great product—that's what happened for many of the Chinese successful products you see today.

Two decades ago, China started with what we call a straight copycat and built a replica of Google, Amazon, Facebook, WhatsApp, and so on. It was the Chinese version of such products that suited the Chinese market and users. Soon, they realized that if they can provide the best of the breed, world-class services to their users and customers with an addition of regional flavor on top of it, it works much better than a generic global product. That's probably one element of the secret recipe of China's unique form of entrepreneurism.

Imagine you are capable of copying a market-proven product, and you have the capability to do innovation on top of it; you will always have an advantage over your competitors. China's formula of entrepreneurism, innovation, and value creation lies on the fact that there is a huge competition among the Chinese entrepreneurs in every domain, and the only way to stand out among these competitors is to take your product to a level at which it is far better and inimitable. Many Chinese entrepreneurs have already proved their excellence in execution, product quality, speed of bringing products in the market, and better utilization of data in decision making in the business. In terms of excellence in execution and product quality, they have been consistently excelling and have reached a stage today that is not only far superior to their competitors within and outside China, but also inimitable and not replicable.

That's the reason the Chinese and its neighboring markets embrace these products. We all know that any entrepreneurial journey starts

with a great vision and an aggressive execution plan to achieve milestones to chase the vision. But, we often forget the fact that any execution plan needs continuous modernization and monitoring to make it relevant as per the demand of the situation and the dynamics of the market. Chinese entrepreneurs know how to survive in such a highly competitive environment, where the only way of survival is not just to win, but to abolish all other competitors so that they can't come back again someday.

Also, an advantage the Chinese economy and the Chinese market carries, which again holds true even for India, is that these two countries have a huge domestic test-ground and user base to try and test any new concepts or products. The affinity of the market is so huge that it can absorb any product or service within that you need not have to even think of any other markets at least in the initial stages.

Another reason China is essentially leading in AI is because it has been able to transform itself into a Cashless, CardLess, Mobile-Only economy. This helped in collecting huge useable data, which became incredibly useful for AI companies and other researchers to accelerate their AI development.

China is focusing hugely on AI research as well. In the last 3-4 years, the highest number of AI research papers and patents have been filled by Chinese companies and researchers. The reason China is paving its way towards AI superpower is because of the following reasons.

Firstly, China has a huge amount of usable data, which is basically fuel for AI. Chinese companies, along with the Chinese Govt., has been able to digitize many of their services used by the citizens, because of which China has complete length, breadth, and depth of data, which is fundamental for AI to grow. China is the first truly mobile-first country and the Chinese market and Govt. embraced these transformations. Secondly, China has a powerful Venture Capitalist enterprise ecosystem. Huge fund is flowing to Chinese markets and investors are ready to invest on Chinese companies and startups. The third reason is that the Chinese entrepreneurs are hardworking, have a huge hunger for success, and compete with a true gladiator type do-or-die approach. The fourth reason is the huge support from the Government democratizing AI.

The protectionist nature of the Chinese Govt. provides domestic startups a space to settle down and grow to a level until it becomes ready to compete with the big global players in their early incubation period. Also, Chinese education is more about road learning, i.e., practical approach of learning and implementing. The Chinese government and authorities are fully convinced by the fact that AI is the future; hence, building their infrastructure to be "future AI ready", like a new city, is planed near Beijing, which is designed for autonomous vehicles. Similarly, it is building highways with sensors for autonomous vehicles as the lighting conditions in the road affects the autonomous vehicles the most, which can be substantiated by sensors along the highways to avoid any kind of accidents.

It is also important to mention one major disadvantage of Chinese AI products—they have not been so successful in expanding beyond China. Moreover, the language becomes a roadblock for Chinese entrepreneurs when it comes to globalizing their products. So, probably China is doing very good in the Chinese market, but not great when it comes to expanding the business globally, which is very essential in today's world. Also, Chinese products, whatever it could be, have a bad reputation on the quality front.

UK and Europe, Japan, Russia

Although having the potential and most of the ingredients for AI, UK and Europe, Japan, and Russia have yet not been able to leverage those fully to come top in the list. They have a huge usable data, but they have lots of restrictions around it. So, companies probably have not been able to utilize it to the fullest. Moreover, despite having some of the brilliant AI researchers and AI professionals, they don't have the kind of tenacious and hardworking entrepreneurs, at least in AI space. The VC ecosystem in UK and Europe is not that strong and mature. So, the governments and the union need to do a lot of work to be ahead in the race. Similarly, Japan and Russia—although having great potential— need aggressive execution. Certainly, they are strong contenders, provided they work on the aspects mentioned above.

India

India has a huge number of IT professionals, ranging from highly skilled to moderate skilled, who are already working in different

top global companies and playing key roles developing global products or managing global operations. They understand such products, they have a fair understanding of business models, and many of them have already jumped into the startup world in India, building their own products. Most of these startups are developing AI products in many different domains, starting from known areas like banking and finance, healthcare, manufacturing, retail, and so on to uncommon domains like agriculture, fisheries, marine resources, water management, alternative medicines, Ayurveda, and safety and empowerment of women, to name a few.

AI revolution in India has already started in a big way, touching across almost all the areas that you can imagine, and the world will see the actual results of the same in the coming few years.

Also, the National Strategy for Artificial Intelligence, India, published by NITI Aayog in 2018, is an exhaustive plan and roadmap with a slogan of *AI-for-All in India*, which shows how seriously Aayog (commission) as well as government has taken AI, and how they are trying to integrate it with every aspect of our country and its citizens. This is a landmark and stepping stone for a developing country's great ambition to integrate technology as a main stream in its transformation journey, which I believe no country has thought through in that diversified a manner.

This strategy clearly shows how our Aayog and our government have been able to identify the core areas that are very specific to Indian conditions, where AI can play a crucial role and uplift the economy and hence all other sectors. It has given equal importance to the government, private, and public sectors while fabricating such a strategy; so, you can imagine the depth of thought process, expertise, seriousness, and a die-hearted effort that has gone into it to make AI Indianized.

AI will bring huge opportunities and boost the Indian economy with an estimated annual growth rate of 1.3 percent, and, in a decade's time, an addition of extra one trillion USD is just humongous. As per experts, India provides the perfect playground for enterprises and institutions globally to develop AI solutions, which can be easily implemented in the rest of the developing and emerging economies, and the *Solved in India* mission is in perfect sync with **Artificial Intelligence as a Service** (**AIaaS**).

In healthcare, the Tata Memorial Hospital has started working on the *Cancer Heat Map* that can minimize cancer woes with the adoption of AI techniques. The *Digital Pathology* and another project under discussion, namely the **Imaging Biobank**, for cancer will help with detecting the disease accurately and precisely in a very early stage. Indian startup, **Forus Health**, which has developed a portable device named **3Nethra**, can screen for common eye problems as well as complicated conditions like diabetic retinopathy. The Indian government has been making a series of large-scale interventions to address India's healthcare challenges, transformation of 1.5 lakh 'Health and Wellness Centers', developing district hospitals to cater to long-term care for non-communicable diseases, **Ayushman Bharat Mission**, and promoting e-Health, where AI has started playing a crucial role for its success.

In agriculture, in the last couple of years, approximately 50 Indian agricultural AI technology-based startups, AgTechs, raised more than USD 500 million. Indian startup, Intello Labs, for example, uses an image-recognition software to monitor crops and predict farm yields. Aibono uses agri-data science and AI to provide solutions to stabilize crop yields. Trithi Robotics uses a drone technology to allow farmers to monitor crops in real time and provide precise analysis of their soil, just to name a few.

Also, solutions such as crop health monitoring, providing real time action advisories to farmers, and using image classification tools combined with remote and local sensed data bring a revolutionary change in the utilization and efficiency of farm machinery in Indian farming. AI-powered applications for Soil Care, AI app for Sowing, App for Herbicide Optimization, and AI app for Precision Farming are being implemented in many states in India.

In education, Indian startups, along with Central and State governments, have already revolutionized rural and other education systems using adaptive learning tools for customized learning and intelligent and interactive tutoring systems. An example, Andhra Pradesh government is predicting school dropouts using AI and taking measures to reduce it. AI tools have been used to automate rationalization of teachers and development of customized professional courses for identification and fulfillment of knowledge and skill gaps by couple of state governments and other educational bodies.

In the area of smart cities and smart living, a huge investment has been initiated for building smart parks and public facilities, smart homes, AI-driven service delivery (such as predictive service delivery on the basis of citizen data, rationalization of administrative personnel on the basis of predicted service demand and migration trend analysis, and AI-based grievance redressed through chat-bots and smart assistants), crowd management, intelligent safety systems, preventing cyber-attacks, and many more.

In transportation and smart mobility, the Indian Government has great attention on implementation of AI to address issues related to mobility and transportation, specifically challenges we encounter in India on a daily basis.

Some of the challenging areas mentioned are congestion and road accidents, high number of traffic deaths, lack of public transportation infrastructure, and so on.

AI-aided smart technologies like Assisted Vehicle, Greenfield Infrastructure, Autonomous Trucking, Intelligent Transportation Systems, Travel Route and Flow Optimization, and Community Based Parking will be used to address many of these challenging areas.

But the most important areas that will take India to the forefront in the AI race is the **National AI Marketplace** (**NAIM**) and **Data Marketplace**. Some initial effort on these two areas has already been started, but the day these two initiatives come to a good shape, no one can stop India to be top in the list of AI Superpowers.

Many of the recent happenings in India on the AI front brought about by Indian startups in collaboration with Tech Giants, and in association with premier Tech Institutes and the government, have not got that media hype globally, but trust me, there are many brilliant things happening in this country and the whole world will see the results in the coming few years.

Although late, but the entrepreneurial mind set of the younger generation in India has already set to fire. With their risk-taking capabilities, the desire to do something new, the compassion to do something for the country and the country men, and to show the world that *It can very much happen in India*, our new generation is becoming a blessing for the technological revolution in India.

India has a magnitude of IT professionals who have been a part of the IT journey from the then most legacy systems of 80's till the latest technologies of 20's. Many of them are data scientists and AI engineers and a huge mass has already skilled themselves into data science. Producing more and more data scientists in India is very easy compared to any other country as our engineers are already growing up in an IT environment, so turning them into decent data scientists is only a matter of few months. Secondly, any technical training, be it AI, is very cheap and easily accessible in India. We have numerous forums to mentor our young entrepreneurs and aspiring AI professionals. Many of our premier educational institutes provide the latest curriculum in data science and AI. So, India, in fact, has a conducive environment for AI to flourish better than any other country in the world. India is already an IT powerhouse and, in other words, an IT Superpower, and it has got tremendous potential to come top in the race of AI Superpowers.

Chapter 2

AI – The Core Fabric for NextGen Banking

In the current decade, the world has achieved an enormous amount of technological advancement and skyrocketing progress in mass Digitization, Data Science, and FinTech. In fact, we are currently living in the golden era of AI and FinTech. With the advent of fast computing speed and low-cost storage for the enormous amount of data that is available for everyone, Artificial Intelligence has become paramount in our daily lives. Things are changing at a soaring pace in every sector, and the banking and finance sector is on the brink of a positive and widespread technological transformation, owing to the enormous power and potential of these cognitive technologies. Technology powered by AI and Machine Learning has seeped deep into the fiber of our modern existence and with its firm foundations in the BFSI sector.

It is only a matter of a couple more years when AI will virtually become inevitable for every single business serving those consumers who would like to eat, sleep, and breathe digital in every single aspect of their lives. Like other sectors, it is hitting the BFSI sector with a great puff, not just because of the immense hype, but because of the real benefits it can provide to the financial institutions. With

the increasing competition and cost pressure in the financial sector, banks and other financial institutions are left with no other option but to continuously focus on technological advances and innovations to be ahead of the competition, and that's where a groundbreaking technology like AI can play the role of a savior. As per the recent market research, the banking and financial services industry has become one of the major investors in AI and is expected to feature a rapid growth rate in the coming years.

On the one hand, AI has already taken great momentum and proved its ability in many areas of BFSI; on the other hand, there are newer applications of AI in BFSI popping up every other day on the internet and media, claiming promising results in each implementation. This is in continuation of my first article on the same topic, *How Artificial Intelligence is Transforming BFSI*, and I will try to touch upon a few more areas in this and the subsequent articles.

In the areas of fraud detection, the complexities of the financial crimes have grown exponentially with the increased digital footprint of financial enterprises. Hence, automating financial crime detection has become crucial for responding to such undue events in a timely, efficient, and cost-effective manner while minimizing the risk of damage that can happen out of those. Some of the AI and machine learning solutions prevalent in this area are Fraud detection within high volume transactions linked to primarily detecting credit card fraudulent transactions using intelligent machine learning algorithms. Fighting Money Laundering and Terrorist Funding to identify the sources and destinations of the illegitimate wealth entering into the legitimate financial systems. Automated Credit Card fraud detection is a classic case of machine learning or deep learning models are used for better accuracy.

The conventional, rule-based approaches are getting ineffective as the fraud practices are continuously evolving with newer and innovative methods, where the rules coded earlier may not be relevant and fail to detect in the newer context. Machine learning is self-learning and a self-adaptive approach, where no rules are defined; rather, the models learn from past instances and evidence and can easily distinguish between the usual and unusual transactions. In many cases, a combination of rule-based and machine learning approach is also applied to create a comprehensive solution.

Financial crimes are varied in nature and intricacies, but one proven solution to apprehend almost all such crimes is to build innovative AI machine learning solutions that will not only address the current problems, but will also address the future scenarios where the crime technique may become more sophisticated.

Smart text and speech analytics solutions like customer email analytics using **Natural Language Processing** (**NLP**) and machine learning techniques to automatically identify emails of different categories, for instance escalation emails, follow-up emails, or emails seeking information, and present them in the form of a dashboard with clearly identified categories—such solutions are rapidly gaining traction in BFSI, especially in the email helpdesk. Similarly, speech analytics and processing solutions using NLP and deep learning are being increasingly used for monitoring and improvement of customer care interaction quality, and real-time conversational assistance and guidance to agents during a live interaction with the customers.

Other applications of text processing and **Natural Language Generation** (**NLG**), along with other analytics and reporting tools, to automate the generation of different type of statements and reports, which may include banking and credit card statements, financial reports generation, and the numerous reporting activities that each department of a bank or financial institution does on a day-to-day basis.

Similarly, automating unstructured document processing using cognitive technologies has a huge scope in the document-intensive departments of banks and any enterprises for that matter. There are many products available in this area, but the reality today is none of them are universal and generic enough to deal with all types of complexities involved in different kinds of documents. Any loan processing unit or insurance claim settlement department can be hugely benefitted by this kind of solution, not only from a cost-saving perspective, but also bringing efficiency and reducing turnaround time for such prolonged processing.

Providing banking and financial services to the customers through a variety of digital channels like social media and others in the form of chatbots and virtual assistants has become a necessity in the banking and finance industry as it has been forecasted that conversational banking will take over all other forms, and customers would love to avail the same banking experience over multiple digital channels of their choice and ease.

Advanced analytics and predictions have numerous use cases in banking and finance. Some common areas are social media analytics to see how a product or service will be perceived by customers before even actual launch, customer segmentation, and recommendation of right product at right time with highly efficient targeted marketing campaigns, customer lifecycle analytics, and prediction for improving and sustaining relationships with valuable customers; therefore, generating higher profitability and a long-term relationship, which also helps banks in strategizing the retention plan accordingly and gaining competitive edge.

In the area of smart KYC and building customer 360-degree profile, there are various intelligent cognitive solutions entering into this space; but, of course, the competition will be equally tough for solution providers, and only the cutting products or solutions will be able to survive in the market.

Similarly, AI-based authentication systems like multi-factored voice identification, along with face recognition with liveliness detection, would be one of the strongest means for authenticating users for any financial transactional activities. Although there are regulatory challenges for such implementation in some of the countries, it's going to be the de-facto in the near future.

Coming to payments, AI is already transforming the entire payments landscape, and soon will act as a channel for payments by itself. Intelligent payment methods will be embedded within the customer journey—a paradigm shift to the non-intervention way of payment and fulfillment of the transaction. Similarly, cognitive technologies will play a crucial role in smoothing and making cross-border transactions cost effective and frictionless.

In recent times, intelligent identity management and smart security monitoring solutions have gained popularity. Most of these solutions are built on computer vision and speech-based techniques linked with vigilance cameras and sensors that can detect unauthorized intrusion, criminals carrying any kind of weapons, violent activities inside bank ATMs, branches, and lockers. These AI-powered systems can generate real-time alerts and notifications; thus, they can prevent any untoward incidents. On a similar line, facial stress analysis for detecting ATM frauds or applications of similar nature is gaining rapid popularity in banks in some countries.

Chapter 3

How an AI Framework can be a Game-Changer in Your AI Journey

Some organizations have already been into their AI journey, while many are yet to embark on or have just started, and are probably in a very nascent stage. The typical challenges that every organization encounters while stepping into their AI journey are more or less similar at a broader level, so the solutions to overcome those are also somewhat similar. We will not discuss the challenges in this article; rather, we will focus on how an AI Framework, or you may call it an AI Platform, can help overcome many of those challenges. The term **Framework** may sound a bit heavyweight, but in reality, an AI framework can be as light as only a couple of components, capabilities, and libraries loosely integrated to start with. But this will create a huge difference in terms of the flexibility and agility you will attain while building your AI applications.

Why is an AI framework worthwhile?

In reality, AI is an evolving field. Many of the AI capabilities are still maturing, and you will realize that some amount of experimentation or R&D is indispensable while developing most of your AI solutions. Also, if you are leveraging AI capabilities from external providers for building your applications, you will also find the flexibility to experiment with different capabilities from different providers for the best results. Secondly, a framework boosts rapid development because the developers can concentrate on the functionalities of the use case and need not have to ground up everything from the scratch every time, which saves a lot of time and effort. And most importantly, a framework is always PoC friendly; proof of concepts can be developed quickly within the framework and showcased to the stakeholders for further perusal and confidence building. Also, a framework will provide you with the power to try and test alternative approaches quickly and **Fail Fast**.

Speaking broadly, an AI framework consists of five main layers, starting with a Data Integration layer. All AI applications need some kind of integration with the input data sources from your enterprise applications. So, it is essential that your AI framework has the capability to integrate with different data sources or it is capable of sitting on top of a data platform for seamless data exchange. The data platform can be a Big Data platform or a Data Lake, which probably is widely used nowadays in an enterprise environment. If you already have a data platform that can process and offer data in a format that can be directly consumable by your AI applications, then nothing like it. But, in most cases, you may not be lucky enough and will end up doing the heavy lifting of transforming your data to an AI-injectable format within your AI framework. There are some data platforms available in the market today; they use machine learning and other data processing techniques and can provide data in an abstract layer, wherein your machine learning algorithms and AI applications can directly consume it as input.

The core of the framework is an **AI ecosystem**, where all your AI, ML, and NLP capabilities or **AI Assets** will reside, and you will have the option to pick and choose the best of the breed capabilities for building your AI, ML applications. These AI capabilities can be versatile, like

cognitive text processing, speech, computer vision, cognitive search, advanced analytics services, machine learning capabilities, and so on. AI ecosystem may also consist of NLP engines and capabilities or even cognitive OCRs and automation capabilities such as RPA/iRPA. These AI capabilities or AI assets can be from external providers as well as capabilities developed in-house that comprises the core of the framework.

Around the core AI and ML assets, you may build custom capabilities that can either be specific to your domain or specific to the group of use cases. The capabilities or components a level above the granular services helps rapid use case development just by connecting the components instead of doing ground-up from the algorithm or asset library level. Examples can be your cognitive knowledgebase search engine, NLP processing engines of a specific use, or even any other analytics engines for that matter, or the components powered by Fuzzy Logics or other ML custom classifiers reside.

Also, the framework should be able to connect to the different hosting applications or channels to host your AI applications or solutions. The channels or hosting applications can be any of your enterprise applications and mobile apps or social media channels, such as Facebook, WhatsApp, Skype, Emailing systems, and so on. Hosting channels can even be virtual assistants such as Alexa, Google Home, Siri, or any other voice-enabled devices or applications and apps in your partner ecosystem. This layer essentially acts as a middleware with a variety of connectors to hook your AI solutions to different hosting channels.

It is also advisable to have a Framework Management layer, wherein features such as setup and configuration, monitoring of different services, monitoring, and reporting can be embedded. This layer essentially will become the foundation of your framework and will be responsible for providing support to different services of various AI applications running on top of it. In many cases, some of the infrastructure-related stuff can also be controlled and configured in this layer. As security is one of the key elements of any framework, it should also be accounted for while designing a sustainable AI framework. Security features can be ranging from your data security, securing AI applications, security aspects of integration points and interfaces—all can be configured and managed at the framework level in the management module.

At an advanced stage, as your framework matures, you should also think of **Templatized Use Cases** and solutions built into the framework or custom wizards for building solutions. This topmost layer ideally should contain different template applications that can be dragged and dropped into your workbench, and the application with minimalistic features and algorithms should be ready just by dragging and dropping. For example, if you want to build a recommendation engine of some kind, or a solution on credit risk assessment or even a Chatbot, you should be able to just drag and drop your template recommendation engine or Chatbot in the workbench and the recommendation engine or the Chatbot in its simplistic form is just ready with minimal features or MVP. The minimalistic algorithm required for the use case, along with interfacing with the input data sources and hooking with my hosting channels, will be ready.

So, the groundwork and the heavy lifting that we normally do for building every application is now just a click away. This can reduce up to 60 percent of the time and effort that we spent just to build the skeleton of any application. Once this is automated with your framework, your developer can concentrate on the rest of the things like adding more features, fine-tuning for better accuracy and all types of optimizations and polishing, which are anyway beyond the scope of automation in an enterprise environment.

Other essential elements of the AI framework are **domain vocabulary** or metadata and a **feedback learning** process. As AI, machine learning algorithms need domain-specific information to perform better, so maintaining a domain vocabulary is desirable. Similarly, any AI application will fail in certain scenarios and may throw those into an exception queue where, in most cases, it will aspect human intervention although some automation is possible in some of those scenarios nowadays. In whichever case, integrating the feedback learning process within your AI applications through your framework will essentially increase the accuracy of your AI applications over the period of time, and you can reduce those exceptional scenarios significantly.

Another benefit of the framework approach is that it will also help standardization and consolidation of the AI applications in your AI landscape, which is essential when the number of AI applications grow in your organization.

Bringing your framework up to this stage may be a bit time consuming, and you may not be able to justify it to your management and other stakeholders easily. But the beauty of this approach is that the development of your framework and your AI solutions can go in parallel. So, essentially, you can deliver some of your AI solutions while your framework development is actually on. The framework, once it's ready, even in its very basic form, can improve your development efficiency and reduce the timeline to a great extent. It can really bring the agility in your AI application development lifecycle.

Chapter 4

Artificial Neural Networks

The credit for the immense hype that Artificial Intelligence has created in the last couple of years mostly goes to the advancements that happened in the area of Artificial Neural Network and their successful implementations in different fields like healthcare and medicine, banking and finance, manufacturing and retail, and many more. Although Artificial Neural Network as a concept is not new and has been prevalent since 70's, the real implementation has only been possible over the last couple of years due to various reasons.

Artificial Neural Network, which is essentially inspired by biological neural superstructure of the human brain, has many similarities if we believe that human brain functions in the way our findings have been put forward by the researchers. Artificial neural networks have demonstrated amazing capabilities in many cases and outperformed human brains in couple of instances, such as *ImageNet Challenge* where an AI algorithm can recognize different images better than humans, play complex games better than humans such as Google DeepMind's AlphaGo **and** IBM's Deep Blue, detect cancer better than a doctor, and many more. But, at the same time, Artificial Neural Networks also have serious limitations. Even before going into those limitations, let's first discuss how human brain works that we know so far.

There are so many things about the human brain that we don't know, but of course there are a few things that we do know. The most

complex and advanced biological system that exists in the world is the human brain, which has immense capabilities compared to its size. If you believe, God be the creator of this universe, then this piece probably is the most sophisticated part of his creation.

The nervous system is the central part of the human body, which transmits signals back and forth to different parts of the body that helps coordination of our voluntary and involuntary movements. At a cellular level, the nervous system consists of a special type of cell called **neuron**. Arguably, there are nearly 100 billion neurons in the human brain, and they are connected to each other through a wire-like structure called Synapse, which acts like a pathway for electrical signals to travel from one neuron to the other.

As per the information available, the protein synthesis occurs at the nucleus of the biological neuron called Soma, considered to be the center of human cognition. The signal emitted by the neurons are believed to be partly electrical and partly chemical, which is a by product of the phenomena that happens due to the protein synthesis inside it.

Now, to cut short, human neurons receive the inputs to be processed from the outside world through our five senses, that is, ear, eye, nose, skin, and tongue. Of course, the inputs received through these organs are encoded into electrical signals before being sent to the neurons to be processed. Interestingly, the biological neurons work on a threshold-based principle. This means, whenever the input signal received by a neuron after its chemical synthesis crosses a particular threshold limit, it fires the signal to the next neuron. The next neuron then takes this signal as its input and does the same process, which continues through millions of subsequent layers of neurons to arrive at a conclusion on the piece of information that has been processed. Wow, isn't it amazing?

Have we ever even realized that such complex processing happens inside our brain even when we just try to differentiate between a cat and a dog in our daily life? This is just an example, but the human brain has many beauties, and you will be amazed as you try to explore more and more about it.

If we draw an analogy between the internet and the human brain, and if we consider a neuron in our brain as a web page in the internet; a human at any age has around 100 billion neurons in the brain, but the internet has 10 times more—around 1 trillion web pages. Of

course, the internet is a much bigger entity than a tiny human brain. But, let's now compare the complexities of both in terms of number of connections, or you can consider it as a number of hyperlinks. The internet has over 100 trillion hyperlinks and an adult's brain has around 300 trillion, which is 3 times that of the internet; and, amazingly a child's brain has 10 times the number of connections in the entire internet, i.e., 1000 trillion connections.

Scientists have revealed that a child's brain at a very early stage, from zero to one year, used to have around 100 billion neurons, and only a few million connections. But these connections exponentially multiply during the development stage of the brain till the age of 6 years at the rate of around 1000 (thousand) connections per second. That's how a child learns, and the learning process is essentially through building more and more connections among the neurons.

So, when you teach something to your child, or when he or she learns new things by observing some events or incidents, in the process, millions of new connections are established immediately among the neurons in your child's brain. Most of these connections, at the learning stage, are believed to remain intact and are not erasable throughout lifetime. That's probably the reason we are always told not to teach the wrong things to our children as it will be very difficult to alter or erase it at a later stage. That's my personal view!

An interesting fact about the human brain is that it's constantly changing, constantly evolving and establishing millions and billions of new connections, redefining existing connections, and removing irrelevant connections among the neurons across different parts of our brain. This is the process of how a human brain learns new things, adds experience to those learnings, and draws conclusion on the incidents about our life.

But what about imagination? How we can imagine something that we have never seen or experienced? How can we relate our experience from one incident to a completely new situation which we have never experienced in our life? How will you explain these amazing capabilities of our brain? How about love, affection, empathy, and our feelings for others? Can those be mimicked inside a semiconductor? Probably yes, but not anytime soon.

Back again to Artificial Neural Networks; they have got numerous advantages, but they also have many limitations. These limitations can be broadly classified into two categories:

- Scientific or Mathematical limitations
- General limitations

Scientific or mathematical limitations include issues with **Piecewise Linear Curve**, **Flat Activations**, **End-To-End-Learning**, **Learning Many Orthogonal Functions**, and **Universal Approximation Theorem**, which are beyond the scope of this article. But there are other general limitations too like the requirement of a huge relevant dataset for training deep neural networks; requirement of a huge computational power for training; and substantial time requirement for training such models, which you probably all are aware of. Again, hyper-parameter tuning for the deep learning models is sometimes a tedious process, although some automation of such activities is now available but still needs maturity.

To overcome the preceding mentioned limitations, researchers have also suggested few alternatives such as Geoffrey Hinton's Neuron Capsules, Yann LeCun's Energy-based models, and Zhi-Hua Zhou's Deep gcForest, but all those are yet to hit the market in a big way.

But, more than all of the above, Artificial Neural Network, and for that matter, the AI itself, is lagging the most important and the most aspired capability that is called General Intelligence, which is far beyond what we have achieved with AI till now—the Narrow Intelligence. Let's understand what exactly does that mean.

An AI system can be far better than a human in performing some activity it is made for, but it doesn't have the awareness of what it is performing. Also, it can't bring in the experience from some other context to the current context or related experiences. A human brain can do this very well, as well as many more amazing things, which is referred to as **General Intelligence**.

Good news is that scientists at the Karolinska Institute, known as the (Royal) Caroline Institute of Sweden, in a paper titled *An organic electronic biomimetic neuron enables auto-regulated neuro-modulation*, have claimed to build a fully-functional neuron by using organic bioelectronics. This artificial neuron contains no living parts, but it's capable of mimicking the functions of a human neuron cell and communicate in the same way as our human neurons do.

As an AI professional and researcher, I strongly believe that we will surely be able to reach to a stage where our machines will have General Intelligence, not necessarily as capable as the human brain. Trust me, that day, we will be able to address many unsolved issues for humanity with AI, and that will be truly an era of **Man and Machine Partnership** for humanity.

Chapter 5

The Next Wave of Automation will Transform our Living Experience

Imagine coming to a home that automatically unlocks the doors for you, the coffee brewing, your favorite music on, a favorable fragrance uplifting your mood, temperature and light settings just as you like them, your dinner is laid out on the table, the rooms already vacuumed without been instructed, your lovely plants watered, and laundry done and dusted in your absence. It's not a dream; it's almost a reality. Autonomous homes are the future as much as autonomous vehicles, which are going to hit the automobile market in just a few years from now, and there is no denying that.

All of this and so much more can be achieved via smart home platforms that are becoming more and more intelligent. How is that possible, one might ask. The answer lies in the effective and functional

integration of **Artificial Intelligence** (**AI**) and **Internet of Things** (**IoT**). With its intelligent learning abilities, AI can successfully go through huge volumes of data transmitted by IoT devices and offer meaningful insights to come up with the most feasible adjustments that could highly upgrade the user's living experience. Autonomous homes run by AI can learn the patterns of behavior of users and automatically adjust the settings based on the moods, choice, habits, and routines of the inhabitants. Living in an autonomous home is like living with a friendly robot with a fully functional mind of its own.

Break free from the sickening monotony of the daily chores and let your autonomous home take charge

How many times have you felt that the unending list of daily chores is getting on your nerves? Have you ever wished that you could find a replacement that is reliable, efficient, and intelligent? Autonomous homes will be there to minimize human effort by making devices and appliances all the more intelligent using AI and IoT.

From Smart garages and cars to automated gardening, smart homes have your household chores sorted. You can be anywhere in the world and still operate your garage door without even lifting a finger. So, no more getting out in the rain to open up those huge and rusty garage doors; the smart garage will do it for you. Plus, it can even keep a log of the people who accessed your garage and monitor any suspicious activity. And the next time you are out of the city or your friend wants to use your garage, a few taps and job done.

In an autonomous home system, a home cleaning robot could be easily optimized to use smart technologies to customize their cleaning operations based on different room surfaces and making adjustments for new items or furniture. Moreover, these can be programmed to work out a time and energy effective vacuuming routine based on an intelligent movement pattern that can be closely customized for each living unit. Not only this, cleaner robots working on AI can work out a schedule that doesn't interrupt user activities or working hours, hence causing minimum hassle. Plus, if you have a particular

cleaning pattern, like twice a week at around 5pm, it could also be picked up by the intelligent cleaner robot so that it could begin its work when cleaning is due.

Similarly, with AI-integrated thermostat systems, users can preheat or cool their rooms before arrival or regulate the temperature of different house units via accessing the Wi-Fi-integrated thermostat controls remotely. Furthermore, the thermostat solutions can even predict the optimum room temperature based on the weather conditions and adjust it accordingly. And, if the users prefer a varied temperature setting during active hours and sleeping times, the smart thermostat unit can record that data and use it efficiently. All of which is essentially the embodiment of IoT integrated with AI.

Autonomous homes keeping a close Vigil for infallible security

Home security is a grave concern and requires utmost vigilance to avoid mishaps. But with AI and IoT integrated in your smart home for optimum security, you can sleep in peace. Through a facial recognition algorithm, an AI-powered system builds a catalogue of known individuals through your social media connections and home visits, which helps it to understand between family members, guests, and visitors. Through this technique, there will be a substantial reduction in false alarms. Moreover, these self-monitored security systems, coupled with motion detectors, sensors, and security cameras, will easily assess a potential break-in and even call for emergency services. This eliminates the need for human monitoring.

Efficient care systems for senior citizens

With a growing population of elderly people in almost all countries, family members have an added responsibility to look after them. But having a 24/7 physical presence is highly impossible. Do not fret; your autonomous home has you covered. With its intelligent learning technology and demand forecasting features, the autonomous homes regulate temperature, humidity, oxygen supply, and even connect housing units to medical care facilities so that the elders are never left unattended. Plus, with acute sensors installed in the elderly's room,

house members can be immediately notified if there are no signs of movement alongside or any element of concern placing an automatic emergency call.

Automated child care facilities

Similarly, smart homes can offer to look after your baby in the best way possible. Visual emotion detectors and mood sensors can tell if your child is happy, sad, or looks confused, and tell other smart home devices to put on a movie, turn up the lights, or check the locks. And from the moment your baby starts crying, smart systems respond by slowly turning its light on and playing a soothing lullaby. The child's parents and caretakers are then sent a notification on their smartphones.

High grade energy optimization

In today's world, energy conservation is of utmost importance to protect the fast depleting natural resources. And, we, as humans, are to be blamed for the sheer wastage of valuable energy sources. However, smart homes can contribute to a greener and energy saving housing unit by effectively controlling the light, temperature, pressure sensors, and managing the water and gas supplies. That means, you don't always have to look out for running taps, unattended gas tops, and electrical devices that your kids will never learn to switch off. Your AI-powered home automation system will take care of it.

Autonomous homes transforming your living experience

An ideal smart home fit for the 21st century combines digital technology and intelligent machine learning to provide the highest level of comfort and effortless living experience based on demand forecasting and routine habits. AI systems can flawlessly learn your mood and preferences, as well as analyze your interaction with home objects. With such knowledge, it can customize your home better than yourself. This is because it takes in account both your physical bodily requirements, your habits, and personalized choices to come up with

the best plan of action that is both time and energy conserving. All you have to do is sit and relax while the smart AI systems will keep your house up and running every single day without fail. Isn't it amazing!

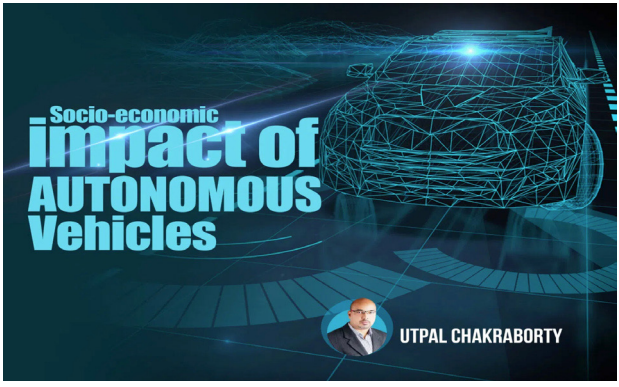
Opportunities, business prospects

Knowing the fact and its business prospects, the big players such as Google, Amazon, Apple, Samsung, and many others have already developed their smart home automation platforms. Although these platforms provide a lot many features, there are many opportunities to take the living experience to the ideal state. All these platforms mostly act as a smart Hub, which can connect to all smart devices and appliances of your home and act as a command center that can accept command through an app or voice command to control your devices. The opportunities still lie in the areas where the platform can be made intelligent enough to know your preferences, understand your mood, can do optimization of its own, can do demand forecasting, take care of its own maintenance, can take care billing and subscription of its own, and many more. The intelligent platform can simply take complete charge of your home. Also, considering the heterogeneity and diversity of our homes and living conditions across different geographies and other socio-economic factors, a single universal product will not be sufficient, and neither will a single business model fit into all types of needs. Rather, there's going to be many different products and different business models at different scales that will coexist, catering to the diverse need and huge opportunities. So, undoubtedly, it's going to be the next big wave of automation across the globe.

Chapter 6

Self-Driving Cars – Socio Economic Impact of Autonomous Vehicles

Autonomous vehicles are undoubtedly the future. But when will they actually grace our roads and gain a permanent place in our lives?



Autonomous vehicles and the dawn of a whole new lifestyle –

Imagine riding in an autonomous car to your office and all you have to do is sit back and relax. You can read the newspapers or scroll through your smartphone and enjoy a little snack on the way. Or better still, just take those extra minutes of power nap with absolutely no one to disturb you, not even your driver. Autonomous cars can easily double as your personal mobile leisure rooms where you can have the comfort of enjoying a hassle-free and uplifting driving experience.

Road congestion and traffic jams would be a thing of the past as the driverless cars would be spot on in choosing the shortest, quick, cost, and energy-effective route to your desired location while avoiding any traffic jams and road accidents on the way. The powerful sensory system and driving priority guidelines would even allow these vehicles to prepare for any contingencies in advance and avoid obstacles based on communication with other autonomous vehicles and efficient information processing and exchange. And that's not even all. After enjoying a smooth and fatigue-free car experience, you don't even have to worry the slightest bit about parking. The autonomous vehicles would find a cozy spot nearby and their self-aware technology would counter any possible theft attempts.

To sum up, it wouldn't be wrong to say that autonomous vehicles are undoubtedly the future. These fully automated cars are an astounding wonder that can totally change the way we perceive our lives, especially in terms of transportation and commutation. From mobile retail stores to on-the-move restaurants and gyms, autonomous cars can promise all that and so much more.

But when will they actually grace our roads and gain a permanent place in our lives. This would obviously depend on our preparedness to accept this mind-blowing automobile transformation and the ability to efficiently utilize such top-grade technology without compromising human independence and safety concerns.

Autonomous vehicle manufacturers have promised a blissful and a highly innovative future for the driverless autonomous cars. There has been a lot of speculation regarding the impact of the fully automated cars on the automotive industry worldwide and how these driverless cars can practically transform the world into a futuristic and digitized entity.

According to forecasters, autonomous vehicles can bring forth an altogether new era of economic and technological advancement. Although fully autonomous vehicles are still in the testing stage, they are surely going to grace the roadways in less than a decade.

Thus, in order to gather a more profound perspective on the advent and possible commercialization of autonomous vehicles and how they make a phenomenal use of IoT, AI, and other cutting edge technologies, it is important that we have a closer look at its impact on different life sectors.

Positively reshaping people's lives:

The positive effect of autonomous vehicles swarming the cities is highly undeniable. The biggest anticipated advantage is that the AV's embedded with high grade AI could prove to be extremely successful in reducing the rate of road accidents and resultant fatalistic casualties. Considering that millions die each year due to motor vehicle accidents, eliminating such occurrences is obviously going to be a remarkable achievement.

Secondly, these autonomous vehicles could sharply reduce the stress, exhaustion, and physical strain caused by long hours of driving for commutation purposes. With driverless cars ready at their disposal, people could cover long distances quickly and in a cost-effective manner. And all that extra time that could be saved from driving from one place to another can be put to a greater productive use.

Moreover, autonomous vehicles' ready availability can solve the proximity issues when it comes to making housing arrangements as traveling to work, marketplace, or recreational centers would be absolutely hassle free.

Thirdly, for disabled people or physically challenged patients, autonomous vehicles could turn out to be a blessing in disguise. These driverless cars are specifically designed to accommodate wheelchairs and can easily locate a safe and secure boarding location for ill passengers. Furthermore, autonomous vehicles will be equipped with braille buttons to help visually impaired passengers commute easily and independently.

Lastly, having an abundant supply of autonomous vehicles can also result in a drastic decline towards buying and maintaining self-owned cars. With easy, cheap, convenient, and quick transportation options offered by autonomous vehicles, very few people in urban settlements would bother to invest in an expensive personal car. But that being said, human-operated cars are there to stay, especially in small cities and rural areas, particularly in the developing countries, until enough capital is available to fund mass production of autonomous vehicles in a very cheaper cost.

Transforming the economy worldwide

To begin with, autonomous vehicles are bound to speed up day-to-day mobility. This in turn will allow the people to invest their time in doing productive business activities that will boost the economy to a great extent. Reduction in traffic and traffic management resources will translate to a great optimization of cost, time, and efficiency.

Although there will be a good deal of job displacements and possible unemployment as a short-term implication, in the long run, the situation will take a flip in the positive direction.

Also, the car insurance companies will undergo a major change as they would then be in charge of product liabilities instead of driver liabilities. Alternatively, vehicles manufacturers will require insurance for their vehicle safety.

A decrease in the product prices is also expected due to reduced cost of transportation. Driverless, fully automated cars will help to cut down the high labor costs required for distributing goods across.

Feasible infrastructure for autonomous vehicles

Autonomous vehicles offer a giant leap into the future. And, in order to exhaust their full capacity and efficiency, it is important to make amends in the infrastructure of the urban settlements. A major impact of the driverless cars on the city's infrastructure would be a drastic reduction in parking and garages, both on and off streets. This is because the autonomous vehicles would be always on the go and

would provide ride-sharing services as a means to optimize mobility. As a result, a lot of parking spaces can then be alternatively used to build offices, outlets, or even recreational hubs.

Autonomous vehicles use extremely efficient and advanced integrated AI technology, which allows them to use narrow road spaces and accounts for their excellent maneuverings. This would automatically make the roads all the more feasible for pedestrians and ensure more frequent, safe, and secure walks.

Lastly, in order to fully get prepared to enter into the realm of autonomous vehicles, the infrastructure of the cities needs to adapt to a highly-digitized upgrade. Smart roads with roadside sensors, machine readable signs, and radar reflective land markings are a dire need to allow for a safe, accurate, and accident-free ride.

Moreover, roads with their traffic signals replaced with machine-adapted protocols can help the autonomous vehicles to accurately process driving priorities. On road, telematics is also a sound option to allow the driverless vehicles to share descriptive driving information and prepare for possible contingencies in advance.

Autonomous Vehicles – A threat to human employment?

It would obviously be foolish to ignore the fact that the transition to driverless cars would in fact be a painful one with millions of drivers losing their part-time or even full-time jobs. The most affected would be truck drivers and fork lifters as they account for a large number of employees in the driving sectors. Chauffeurs and Uber drivers are also not far behind from losing their jobs due to the massive advancement in the autonomous vehicle industry.

But, in order to counter this massive unemployment threat, there is a dire need to re-skill human drivers and provide them with sufficient knowledge to make a smooth transition into a digitized automotive environment. Experts have speculated that if people are trained for jobs that include maintenance, repair, and safety of autonomous vehicles, then there could be an appreciable rise in the employment rate and productivity.

Furthermore, based on recent analysis, autonomous vehicles would bring about a boom in the digitally focused jobs, including fleet

management, software development for integrated automobiles, smart infrastructure building, super-high-speed connectivity and telecommunications, and so on.

That being said, it could practically take years before people are fully equipped with new skills to take up their new job roles in an automated and futuristic world. And even then, people with low educational background and limited automated skills will face a sharp blow from autonomous cars that are much more safe, efficient, smart, cost and energy effective, and reliable than any experienced human driver.

Pitfalls of large-scale production and usage of autonomous cars

As discussed earlier, autonomous vehicles would be largely to blame for unemployment risks involved with human drivers and transport services.

Not only this, owing to the utmost accuracy of driverless vehicles, they are unlikely to cross a red light or run over the speeding limit. As a result, governments would lose billions collected each year in terms of traffic fines and speeding charges.

Moreover, even a slight technical or digital glitch in the autonomous vehicle can result in a full-blown accident, which would be much more intense and riskier than any regular road accident. And in any such incidents it may be difficult for the police and regulatory authorities to take charge of the situation.

Another possible disadvantage of autonomous vehicles is that they might be prone to improper functioning in rough weather conditions and would be unable to read human-based road signs and directions.

Furthermore, like any other digital technology, autonomous vehicles would be under a serious threat from the hackers who could crack into the car's system and administer human controlled accidents or even pose a widespread security threat by using these driverless cars for terrorist attacks and so on.

And while the fully automated vehicles promise to upgrade the quality of life for the people, it would make the infrastructure all the more unfeasible for human drivers, and thus threaten their survival in a highly-digitized environment.

Chapter 7

How Artificial Intelligence is Transforming the BFSI Sector

As the entire business world is heading toward a revolutionary transformation from an era of **Digitization** to an era of **Cognification**, we must confess that our banks and financial institutions worldwide are the ones that have recognized the potentials of Artificial Intelligence at a very early stage and adopted it in their transformation journey.

Using Artificial Intelligence to redefine their products, processes, and strategies is the main consideration for most of the forefront banks and financial institutions today. This includes predictive and cognitive capabilities enabled through cutting-edge technologies such as Machine Learning, Deep Learning, and Natural Language Processing.

One of the main reasons behind the same is that, essentially, banks are in a data intensive business, so they can't avoid Artificial Intelligence, which is again a technology that can provide intelligent predictions and recommendations by processing multiple data sources of huge volume in a very efficient way.

Secondly, banks have access to financial details of their customers and know them far more intimately than probably any other business. With AI, they can make highly relevant recommendations about financial products and services to their customers by leveraging such details.

Also, as AI applications have the capabilities of automating many repetitive manual tasks, there is always an angle of optimization of time and effort, and hence the cost. But the most important angle is the efficiency and robustness that it brings on the table, which is remarkable and not possible to achieve manually.

There are many areas of the Financial Industry where Artificial Intelligence and Machine Learning have already created its footprint, but there are still many areas that are untouched and will be the core focus in the coming years.

The financial services industry can be broadly classified into three major segments where AI has become the need of the day today. They are Capital Market, Consumer Banking, and Insurance, which almost covers the majority of the sector.

Robo Advisors, High Frequency Trading, Risk Management, Anti-Money Laundering, Cyber Security, Fraud Detection, Intelligent Predictions, and Recommendations are a few areas where AI applications have always been linked to. But, in reality, there are many more areas in the financial industry where AI has been already playing a crucial role that many of us are probably not much aware of, like many embedded AI algorithms within enterprise applications to bring the intelligence and smartness in those enterprise applications.

Artificial Intelligence has the ability to process enormous amount of data very quickly, which is far more data than ever processed in the past by human or any conventional computer program. And that's going to improve the financial institutions to provide better services that they provide to their customers. In wealth management, they will be able to provide much better, more targeted, and efficient advices to their customers.

Risk and credit assessment is an area where machine learning and deep learning is playing the role of a game changer, and the insurance industry has adopted it largely. They are finding it very compelling, primarily because AI is simply changing their business entirely.

Smart wallet is another area of interest for the banks all over the world. The banks have started providing smart wallets to its customers. These AI-enabled smart wallets will look at customer's spending habits, and it will learn from his/her behavior to provide smart advice and recommendations for future spending. It will encourage savings and responsible spending in the form of predictive alerts and recommendations. Similarly, AI can detect if a customer is likely to switch their products or services; this early signal will help banks to offer him/her a more suitable product which may help retaining the customer.

Artificial Intelligence has the ability to process enormous amount of data very quickly, which is far more data than ever processed in the past by human or any conventional computer programs.

Now, coming to the Risk assessment, Credit assessment, and Regulatory areas, today, if you want to apply for a loan, in a conventional way, then a home loan or a personal loan takes couple of weeks or may be even more to clear all kinds of credit checks before approving such loans. With Artificial Intelligence, the processing lead time will come down to an hour or two maximum. This is because of AI's capability to do credit assessment in a much faster and better way by interrogating various customer data sources.

We are already experiencing the change in the interface the banks are having with their customers. They are increasingly changing those to Chatbots, Robots, and Humanoids as their first line of interfaces with their customers to enhance service experiences. We are seeing similar trends in banks in India too.

Also, there are lots of AI applications coming up into areas like Anti-Money Laundering and Regulations because it's very easy for an AI system to analyze a lot of data at its fingertips and determine the patterns to better identify frauds, money laundering, and criminal activities quickly and highlight those to the bank authorities well in advance so that immediate actions can be taken to arrest those activities.

Other areas of AI booming in the financial sector are using facial stress analysis to automatically detect ATM frauds. AI financial advisers, called **Robo-Advisers**, of different variances work proactively for its customers, providing intelligence 24×7.

Chapter 8

AI Now is a Race Among Startups and Tech Giants

The world of technology is moving at a fast pace. A decade ago, it was not so easy to start a new IT company. A new company required a huge amount of initial investment to set up. It was not so easy for startups to develop their ideas and bring them into the world without a huge investment. The technology market has rapidly changed within a decade. In the last 5 years, hardware and infrastructure costs have gone down in the market. With the invention of cloud computing, there is no need to invest on infrastructure as everything can be processed and stored on the internet.

The software's are now open source and are readily available everywhere. The market is getting more focused on Artificial Intelligence and cognitive computing. The cost for making software's based on Artificial Intelligence is getting cheaper and the software solutions are readily available in shorter amount of time due to adoption of rapid development methodologies. And with the huge flexibilities provided by all cloud providers, things have now become much cheaper and easier.

As Artificial Intelligence is on the rise in the market, the customers always have high expectations from those products that are based

on AI. Although Artificial Intelligence offers a variety of solutions, most of the times, they are unable to serve every aspect of a complete business requirement. So, many of the IT service companies have taken a strategy to pick and choose the best of the breed available AI solutions and build custom solutions, combining those to serve a larger business use case, which is otherwise not possible with a single available solution.

With efficient software being developed everywhere, startup companies are challenging the tech giants. Startups are young and have young blood in them. They encourage innovative minds to bring out new ideas in the world. Startups provide flexibilities to its employees to do R&D and come up with innovative solutions, which creates a buzz in the IT industry.

Startups follow a lean culture where things happen fast. Startups don't go with unnecessary processes, which make things slower and can throw them out of the race. Startups realized very well that only the innovative solutions that will create buzz in the industry will be the differentiator for them. On the other hand, big giants follow a code, and they want to target things that are huge in numbers. Startup companies follow a different procedure compared to IT giants.

Companies like Microsoft, IBM, Google, or many other companies that are big giants, are now really competing with the startups in the AI space than competing among themselves, which used to be the case for Non-AI areas earlier. Big IT companies always face a problem against startups because of their lucrative business models. They don't want to compromise their highly profitable business as they don't want to bring such a change in the market which may go against their long-term business goal. But startups are always looking to push new ideas in the market through which they will get noticed.

Although the startups have limited funds and resources, they have effectively used their Artificial Intelligence Intellectual Property and Innovation, and this has started a battle between the big giants and the startups. Companies related to Artificial Intelligence raised a lot of funding. In 2015, the funding was raised by up to 1.2 billion dollars.

Here are some of the famous latest startups that are competing with IT giants.

Darktrace

This is a security startup from Cambridge started by few graduates. This software uses machine learning algorithms to detect cybercrime and catch cyber criminals. They have raised 825 million dollars for their startup.

Benevolent AI

This startup was founded in 2013 and is focused on Artificial Intelligence and machine learning. Their product can easily interrogate the data by using propriety algorithms and provide meaningful insights in the field of health and drug development. This is one of the best-funded AI startup, as they have managed to get 72 million dollars for their investment.

Diffblue

Diffblue has designed an AI software to test and spot bugs in a software. In other words, they have designed a program that designs or improves other computer programs. They have raised 22 million dollars for their startup.

To stay consistent in the market, big giants are now buying up the startups with their money power, realizing the fact that products offered by many of the startups are really superior and innovative. Tech giants Apple, Microsoft, and Google are spending a lot of money to buy startups.

Google has purchased the Deep Mind startup for a record fee of 400 million dollars. Microsoft has bought SwiftKey and Apple has bought Vocal IQ.

Artificial Intelligence is now playing a big role for startups in the market to compete against the big tech firms. With this trend, many brilliant scholars from the field of Artificial Intelligence from different premier technological institutes and universities with their technical expertise and creativity have started creating their own startups and their far superior AI products.

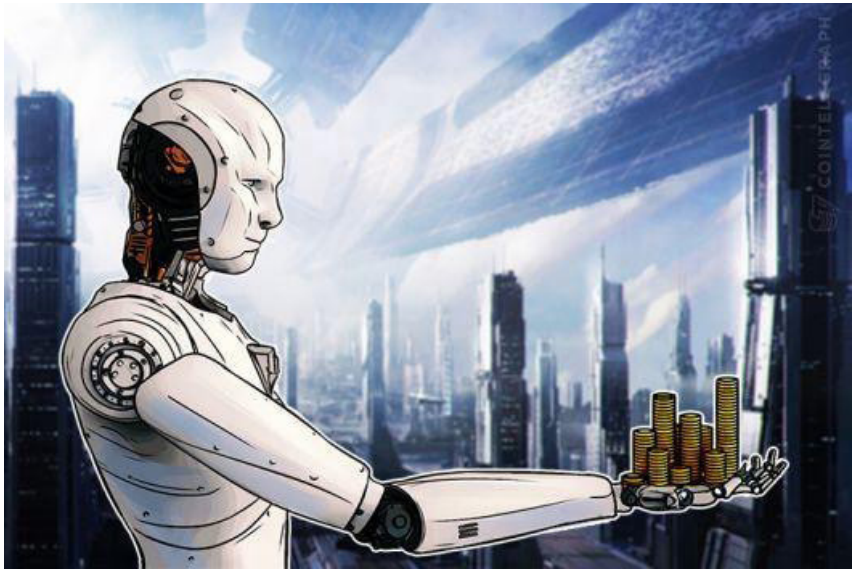
Small to big IT Service companies are also in the race of Artificial Intelligence; they are trying to push Artificial Intelligence as software service as a differentiator and value add to their clients. Each of these company is claiming that they have got their out-of-the-box AI solutions, which could prove to be a game changer for their customers in different sectors they are serving.

But to keep pace with this big competition in the AI market, any company, small or big, startup or age old, **out-of-the-box** IPs and solutions are going to play a crucial role, and innovation is going to be the key differentiator, unlike all conventional methods which used to have worked well in the past.

Chapter 9

AI in the top of priorities for CIOs and CTOs

Artificial Intelligence (**AI**) Winter Is Over– CIOs and CTOs is ready to put AI at the top of their strategies.



In the historic overview of Artificial Intelligence, AI Winter is referred to as a period of decreased funding and interest in the research of Artificial Intelligence. The term was given birth as an analogy to the idea of a nuclear winter. Since then, it has continued a roller coaster sort of a journey that includes disappointment, criticism, funding cuts, renewed interest years, and so on.

Artificial Intelligence is a hot topic today among all industries, whether it's IT, Banking & Finance, Manufacturing, Healthcare and Life Sciences, Retail, Customer Service, Education, Transportation, or any other. It has become the top priority for **Chief Technology Officer** (**CTO**) and **Chief Information Officer** (**CIO**) of any organization. It has paved its way in and is solving many business problems in all the major industries.

According to a research conducted by Forbes, till 2035, AI would double the economic growth rates in almost over 20 countries. It will also bring a significant increment of almost 40% in labor productivity in the coming years. This highly developing new demand of AI has a noteworthy involvement in financial institutions, especially for those financial institutions' own financial functions.

There are reasons that are playing a vital role in the acceleration of the use of Artificial Intelligence; big distribution of computing powers, reduction in the cost of data storage, and hype around open source frameworks are some of them, although there are many more.

In recent years, Artificial Intelligence has been proved crucial for the banking industry. The organizations that are working in this sector need to be equal to their competition in order to increase their stability as an evolving firm. Several amazing Artificial Intelligence applications are working in the banking sector that carry a high possibility to bring a radical change in the banks' financial functions. Some of them are:

- AML pattern detection
- Chatbots
- Algorithmic trading
- Fraud detection
- Customer recommendations

In the 1900s, a whole row of workers would stand all day long to make money by putting together pieces of a product—a repetitive task at the time. But today, the manufacturing industry has jumped leaps and bounds to enter the stage of its breakthrough using AI to its rescue and development. For instance, an aircraft factory churning out associated products detects a defect. This data is immediately signaled to the cloud computer and the defective piece is replaced. Not only is this a practical and a steadfast approach, but it is cost saving for the manufacturers too. Application of Artificial Intelligence to manufacturing processes requires a particular number of basic essential technological techniques and innovation. A networked factory is deemed to be smart, to which data from various business functions like supply chain, production line, and quality control are connected to create a greatly coherent and intellectual design engine where Artificial Intelligence plays a major role.

In legal organizations, *Back off all the multinational law firms that charge by the hour!*, because AI is the most efficient and time reducing way there is to solve legal hurdles of summarizing and documentation. Something that would take the human alternative days to do, AI will complete in minutes and that too without any errors.

In media and entertainment, the applications that are working under the banner of AI are still not that mature; it will not be long when AI takes over the whole industry. The single-most important technological factor involved in shaping the media business today is AI. Traditionally, there were two focal points of competitive distinction amongst companies: distribution and content. Today, however, thanks to the internet, everybody can gain access and widely distribute their content. So, the competitive advantage of distribution has been replaced by a new one called relevancy. Artificial Intelligence can easily provide contextual relevance that can set the bar very high for a firm acquiring it.

In life care, Artificial Intelligence is not an old concept. Used to assisting doctors and being a great cause to reduce mortality rates and provide an accurate diagnosis, AI has covered this field too in its broad spectrum. While AI might never replace a human doctor in the hospital, therapeutic robots are there to help and reduce errors that are a result of the human exhaustion and brain fatigue.

Also, Driverless cars or talking to your cars is not out of a sci-fi movie anymore. It is an utterly shocking reality of today where cars move

around without having someone in the driving seat. The times have come where you can just sit back and relax as your car itself would take you to the destination. And this all has been achieved thanks to Artificial Intelligence.

The tech giants are running in an intense race for achieving the best of Artificial Intelligence there is to offer in this industry.

With leading names like IBM launching Watson; Google coming up with its API.ai (Dialog Flow), and Microsoft Cortana paving its way, Artificial Intelligence is creating opportunities on a huge scale for the entire world. All these globally renowned names have been struggling to steer ahead of one another in this game of technological advancement in the field of AI. It is believed that if there is an industry where Artificial Intelligence can work in its true colors, it is communication and Information technology. With constant upgradations to match the flow of the studies and researches being conducted, every new software or hardware that makes it to market should stem from a new idea. Artificial Intelligence has become that very idea.

Thus, the fact that the AI winter was here as a hurdle, is now long gone. The winter period is finally over. And every industry has taken in the investment of Artificial Intelligence that would help build the industry further. As well as the application of Artificial Intelligence would lead to leaps and bounds of providing help to the human kind. Whether is IT, manufacturing retail, health care, or any other industry, one could think of an Artificial Intelligence would prevail and change the world for better!

Chapter 10

AI in Sports

Football (popularly known as **soccer** in USA) as a sport has always been the center of attraction and excitement among the sports lovers as well as among common mass all over the world. Although there are few other sports that have gained popularity in different subcontinents here and there in the last few decades, none of them have ever dared to challenge the popularity of football anytime in the past or at present. In fact, the popularity and attraction for both football and footballers has increased exponentially over the past few decades with the introduction of humongous platforms such as **World Cup Football** organized by prestigious associations like FIFA and support from various other independent affluent football clubs.

Today, it has become the sign of dignity and status symbol for a country to host a mega event like World Cup Football and take advantage of the tourism and business opportunities associated with it. Behind the scenes, a country can showcase the strength of its infrastructure and attract foreign tourists and investors and can create huge business opportunities by hosting such an event.

The all-time great footballers around the world have always been encircled with huge fan-following, glamour, abundance of wealth, controversies, and what not at the peak of their career and throughout their lifetime. They have always been the style icon and role model for the youth around the world. You will be surprised to know that there exist countries in the world where six out of ten children want to be a footballer, contrary to most other developing countries where the common dream is to become a doctor or an engineer. So, now you probably can guess the craze of football and footballers, and there is

hardly any exaggeration about the popularity of World Cup Football around the nook and corner of the world.

Surveys suggest that football is the only sport which is equally popular among all age groups and equally liked by both male and female populations, irrespective of being rich or poor.

There has been a long history of usages of advanced tools and cutting-edge technologies in different indoor and outdoor sports from time to time, but leveraging Artificial Intelligence in an outdoor sport like football for different crucial decision-making purpose is probably the first of its kind.

Technologies used in different sports:

Let's first take a quick look at what are some of the cutting-edge technologies and tools used in some other sports worth mentioning.

Decision Review System (**DRS**) or **Umpire Decision Review System** (**UDRS**) is a technology normally used in cricket to assist the match officials with their decision-making process in a situation that may demand to challenge the decision taken by an Umpire. Some of the advanced techniques used in DRS are Hawk-Eye or Virtual-Eye, which is essentially a ball tracking technique that plots the trajectory of a bowling delivery that has been interrupted by the batsman, often by the pad, and can predict whether it would have hit the stumps.

Snickometer or Ultra-Edge is used to identify whether a ball has really hit the bat or pad on real time in a cricket match. Hot Spot is also a similar advanced technique which leverages infrared imaging system. Also, techniques like Television Replays including Slow Motion Videos has been in use in the cricket matches for ages.

In the 2011 Wimbledon Tennis Grand Slam, an online scoreboard powered by IBMs Point Stream technology was used for the first time; it identified the play-pattern of a particular player in a particular set to predict the chances of a player to win over the other. Now the same can be achieved through the IBM Watson Cognitive services. It considers parameters such as **First Server Percentage**, **Rallies own in fewer than three strokes**, and **Ground Covered** to do so. Similarly, Radar Gun is used to measure the serving speed of a particular player. It works on the principle of the Doppler effect.

In Boxing—PIQ, a French sports robotics startup developed the first AI-powered wearable for combat sports crafted using GAIA Intelligence, a machine learning platform for sports analytics. This platform is capable of tracking and analyzing **Microscopic variations in boxing movements** to help maximize the efficiency of workouts and training.

India-based Bolt Sports Technologies has forayed into the international market with its brand of AI-powered wearable products like Connected Sneakers with an interconnected approach to its offerings, which include fitness trackers and stride sensors.

Similarly, in **National Basketball Association** (**NBA**), a Chatbot called **Kings Artificial Intelligence** (**KAI**) has been introduced, which operates through the Facebook messenger platform for the purpose of answering fan enquiries.

All these are just a few examples of applications of AI and other technologies in different sports; the actual list will turn this article into a full-length book.

AI and other cutting-edge technologies used in football, specially FIFA World Cup 2018:

- Now, let's talk about Artificial Intelligence and some of the advanced sports technologies, many of those which have been leveraged in FIFA World Cup Football 2018.
- Video refereeing with **Goal Line Technology** (**GLT**) can accurately pickup errors and mistakes whether a ball has crossed the goal line or not, something which the human eye can't predict due to positioning and blockage. Advanced GLT is AI powered and is far superior that it has gained significant traction in last few years.
- **Goal Decisive System** (**GDS**) is a special soccer ball invented by a German company, Cairos Technology, in collaboration with Adidas, which sends out a beep sound from an embedded microchip installed inside the football into the referee's headset so that the referee can make a decision on whether the ball has crossed the goal line or not.

In FIFA World Cup 2014, a technologically-advanced soccer ball named Brazuca was introduced. It had a latex bladder and many impressive features that made it the most scientifically perfect ball ever made in the history of football at that time.

Telstar, the football used in FIFA World Cup 2018, also includes an embedded **Near Field Communication** (**NFC**) chip powered with AI, which enables consumers to interact with the ball using a smartphone and many more undisclosed advanced features. Isn't it amazing?

Footbonaut is an advanced technique that helps train footballers to control and pass the ball instantaneously and effectively to another player in a simulated environment. Although training cost with Footbonaut is a bit on the higher side, the effectiveness of such a technique has proven to be very significant. It is said that one session of training using Footbonaut is equivalent to several weeks of rigorous passing training in the football ground.

Astro Turf Football Fields are amazing to play on and can be used throughout all types of weather, which basically consists of plastic blades of grass that are filled with small, crumbly, rubber-like shavings. Although there is no rocket science used for building such fields, a significant amount of research has been carried out to build such weather-resistant football fields, which is commendable.

Computer Vision, a branch of Artificial Intelligence which uses Neural Networks, has been extensively used in many applications in 2018 FIFA World Cup Football, including Automated Video Highlights, Smart Ticketing, Fine-Grained control of cameras and devices and in many decision making and security applications. This is the very first time in the history of FIFA World Cup Football that such advanced AI technologies has been used so extensively.

The **video assistant referee** (**VAR**) is a football assistant referee who reviews decisions made by the head referee with the use of video footage and a headset for communication from the **video operation room** (**VOR**). In 2018, VARs were written into the Laws of the Game by the **International Football Association Board** (**IFAB**). The 2018 FIFA World Cup marked the VAR system's World Cup debut, with the first VAR decision at the World Cup came on 16 June 2018 in a group stage match between France and Australia, where referee Andres Cunha awarded a penalty to France after consulting with the

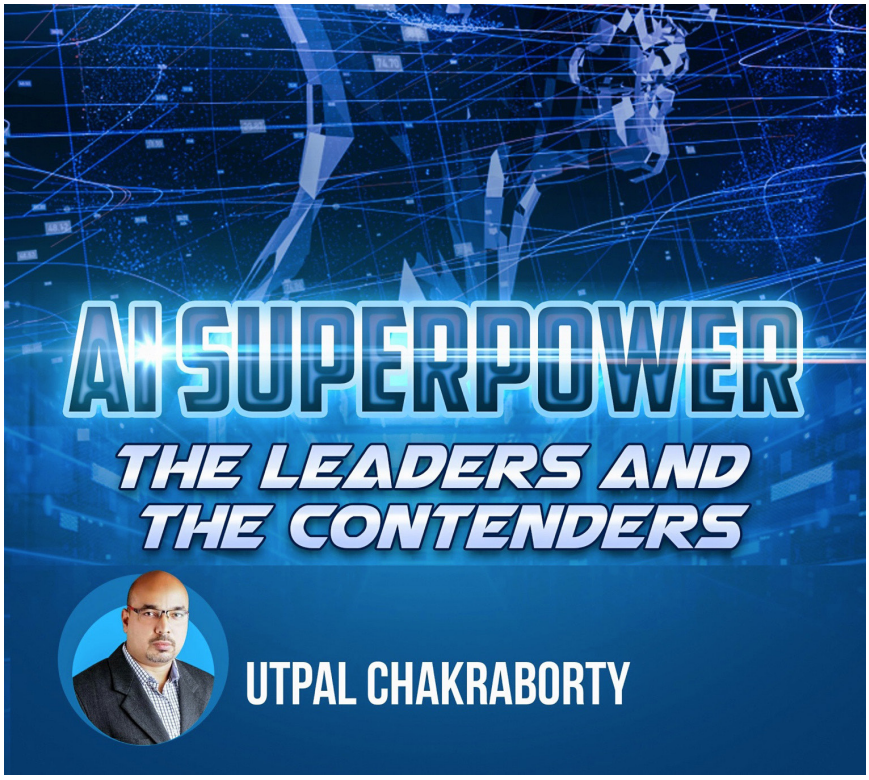
VAR. Arguably, VAR is now AI-assisted, which makes it faster and much more efficient.

Such advanced tools and techniques are not only observed inside the stadium, but have also prevailed outside the stadium in areas like Automated Sports Journalism, Marketing, Promotion, and even Sports Retails.

AI has pushed the traditional sports journalism to a new era. AI algorithms can interrogate various data sources and can automate the conventional sports journalism to a great extent. Computer Vision Referee, Fox Sports, has tapped into the potential of AI and Machine Learning to deliver the innovative FIFA World Cup highlight machine available through its Fox Sports App and Fox sports dot com. In collaboration with IBM Watson, the highlight machine analyzes the video from the FIFA World Cup archive as well as the footage and extracts data, allowing users to search for goals, red cards, players by name and the like, and so on. This also helps analyzing enormous amount of audio and video data and generate captions, which helps understanding what's happening in that particular scene of the game.

Now, the big question among experts and critics in the football world is: Can Artificial Intelligence replace human referees in a football match? Well, the answer is No. At least not immediately because AI, in its present form, cannot understand many of the field events and parameters that involves many emotional factors associated with the players, which is very crucial for a referee to make any decision. But at the same time, a group of researchers at University of Southampton are already building some Artificial Intelligence algorithms that will be able to understand those wider emotional factors and will be able to help referees take better decisions in future.

I hope this gives some insight on how advanced technologies like AI are increasingly proliferating in our sports world, like every other aspect of our life.


AI SUPERPOWER
THE LEADERS AND THE CONTENDERS
UTPAL CHAKRABORTY

Chapter 11

How a Country can be Transformed Using Artificial Intelligence

Artificial Intelligence (**AI**) should not be considered just a trend or a buzzword. It has gone above and beyond expectations in many areas and has taken over different industries like wildfire.

The business world has already adopted it in a big way and started integrating AI into pretty much everything. But what about our Governments? And, very specifically, Governments of developing countries?

I will try to put some of my thoughts on how a country can be transformed by implementing Artificial Intelligence in different government sectors.

How can AI be deployed to improve the quality of life of the citizens?

It is predicted that after the domination of Artificial Intelligence in different areas of our life, people will lead healthier and even longer lives. With AI, we will have better and personalized health care, enhanced ways of food production, and better recycling techniques and methods. AI eliminates many mundane repetitive tasks that makes up space for actual productive tasks in everyday lives of humans.

How much do the rural areas need AI?

AI can change the face of rural healthcare and education. Some countries have already stepped into AI tutoring in their rural societies, but personalized healthcare advices by an AI system have a long way to go before it can bring **Good Health for All** in rural areas in a country like India and many other developing countries.

Why do we need to empower our farmers with AI?

Many industries are interested in how technology can change their ways and improve output production. Modern Agriculture is one of them. Farmers will be making informed decisions on how to put water, soil, and other resources effectively to proper use. For example, installed cameras in the green houses would take instant pictures of the crops, then the AI algorithms will assess those images, identify problems, and present conclusions on their own. AI has become a main asset in tech companies, but the applications of AI in agriculture are yet to be pursued vigorously, especially in countries like India where farmers are unfamiliar with any new technologies like AI and are hesitant to put their crops under a computer system.

How is AI transforming healthcare?

About 40 percent of the hospitals in developed countries plan to leverage Artificial Intelligence within the next 2 years. And the companies that are already using Artificial Intelligence have a

promising future in front of them. Artificial Intelligence has the most substantial impact on clinical treatment, patient diagnoses, and population health. Apart from the actual appliances of AI upon healthcare, it helps intensely with medical record systems. Also, hospital management, physician workflow, and security systems often look to AI for decision support.

Artificial Intelligence and urban traffic control

Data collections, data analysis and interpretation, and decision and control are some of the superb functionalities of an AI system. With these algorithms, traffic engineering has taken a leap forward. The program can fully account for the complexities of traffic systems and can be extremely accommodating to the traffic police. There is so much ongoing research in the field. We are aware of the efficient image analysis technology; however, traffic control is where decision making based on video recognition has already been introduced in many developed countries. Countries like India should unquestionably leverage these kinds of techniques not only in the metro cities, but even in the smaller cities and towns where traffic control is becoming increasingly unmanageable.

Is Artificial Intelligence shaping the future of energy?

While producing energy out of other resources is difficult, integrating it correctly is even more challenging. A country might be producing too little of the energy when it most needs it, or it might be producing too much of it when it least requires. Every government needs to take the demand side flexibility of energy into account. An Artificial Intelligence system can determine where the most energy is going to, which sectors need it the most, what is it being used for, even the time at which it is being used. For an example, the demand for electricity will become intelligent that way, after which, no power line will ever be overly sacked. The demand for energy is steadily growing, but what we also need to do is limit the industry's impact upon the environment by implementing AI systems to control it.

The rise of Artificial Intelligence in the legal industry

Laws in countries like India are probably the least digitized profession even today, but it is high time that it embraces the opportunities that Artificial Intelligence brings with itself. AI is overtaking the legal research with its ability to go through a voluminous information within seconds. The legal contracts designed by the lawyers can be analyzed and dissected by the AI systems. These AI systems must be designed specifically for non-tech savvy people like the legal professionals.

Where is Artificial Intelligence headed in education?

Will it help the teachers or make them obsolete? AI enhances classroom instructions in many ways. AI is being exclusively used by the teachers in planning and grading for quite a while now. However, it is time to upgrade the use of AI in education by personalization. Every student, whether they are struggling or not, deserves individual attention. Not every one of them find it easy to cope up with the lecture; therefore, AI-based applications are especially designed to target the weak spots in an individual's concept. In fact, many of these apps can be supplied to the students in their smartphones to assist them with their daily studies.

The role Artificial Intelligence can play in women empowerment and safety

With the revolution of Artificial Intelligence, characterized by big data and cloud computation, a rise in female employment is expected to grow exponentially. This is because AI will be able to alleviate the main hindrances that women face due to socio-cultural issues. Cloud computations will enable women to get a job or even rise as entrepreneurs without having to leave their home. The technology will be exceptionally well-utilized in emerging countries. Also, female social and general skills will be enhanced. This is where the AI tutoring kicks in. Women will have direct access to education in

areas where they are not allowed to leave their homes or can't afford basic or higher education, or even skill-based education.

Females can even have a sense of security and independence while moving around the city. Such devices are being created that can help women out of any red alert situation and escape any possible sexual assault. For example, many wearable devices powered with AI are designed to help women alert the guardian networks or their friends and family if they find themselves in an uncomfortable situation. We can efficiently leverage AI along with few other cutting-edge technologies for the surveillance of women safety in almost every nook and corner of our cities and villages; it's hard but absolutely doable.

Wildlife and robotics

From voice recognition to language detection, deep learning is revolutionizing the way we interact with technologies. Deep learning enables the computer to learn from an example. Lately, it is being used for wildlife conservation. Currently, some ideas are being pondered over. For example, airborne devices equipped with high-tech AI algorithms are suspended in the sky to protect elephants and rhinos from hunters. The devices use special image recognition techniques and target the criminals at the spot. Many surveillances like this one are being introduced to protect wildlife to the max.

Artificial Intelligence in discovering new life

Scientists and researchers have admitted that even after millions of years of existence, we have not been able to discover every plant, animal, or insect on the planet. We will have to wait another 500 years to collect all the estimated number of species. Not to mention the amount of men power and resources that will be used in the process. However, with AI, this job can be made drastically easier. AI instruments can be dug in a pond, placed over an animal, or suspended in the air. Existing AI algorithms can tell apart 5000 different kinds of plant and animal species. These undiscovered species are contributing to the ecosystem, and we don't even know about it. After discovering them and collecting facts about them, we might be able to improve their breeding and enhance their impact upon the environment.

Chapter 12

Don't Underestimate the Power of an AI Chatbot

The experience of interacting with a Chatbot, at many occasions, for many of us, probably was not that convincing, despite it being marketed with catchy tags like powered by AI, Smart and Intelligent, Self-Learning, Self-Enriching, and so on. And many people have already drawn their conclusions out of frustrations that Chatbots are not at all intelligent; and behind the scenes, a bunch of hard-coded logics are working to facilitate the conversation, which was probably partially true for some cases a few years back. At large, the story today is a bit different, and we need to understand both the sides of the story to draw a fair conclusion. We will try to discuss different aspects of it one by one.

But despite all this, Chatbots are still **Hot** and their adoption across all industries have increased many folds in the past couple of years. And as per the experts and analysts, the craze for Chatbots and virtual assistants will continue in future, and they will be the primary mode of interaction and collaboration with the internal as well as external entities for any business.

Broadly, there are two reasons for the past customer complaints concerning the usability of the Chatbots and their maturity. Firstly, I think we must admit that, technologically, we are not yet at that level of maturity to provide a complete human-like conversational experience with a Chatbot; although, many of us have already claimed so desperately. We are certainly progressing towards achieving such a state at a very fast pace, but right now, we are probably not there. As a Chatbot platform provider, we should have set the expectations right in front of the customer rather than over-hyping it for no reason. We still need a few more years to arrive at that stage or anything near to it, wherein our Chatbots will be capable of providing conversational experience as good as a well-trained customer service agent. So, things are getting better, getting matured, and stable every day incrementally, and we are not that far from what we have been expecting our Chatbots and virtual assistants to be for so many years. Google, Amazon, and many others are investing a lot in this area alone as they have realized that this area is hot and it will be hotter in the coming years.

Secondly, although many of the Chatbot providers in the past had claimed that their Chatbots are powered by a strong **Natural Language Processing Engine** (**NLP Engine**), in reality, either there were no actual NLP Engines at all in many of the products, or even though they had one, it was probably not up to the standard for handling customer queries the way it was expected to do so. The core of a Chatbot is the NLP Engine, and the technological maturity of the NLP Engine within it essentially decides the efficiency of the Chatbot.

The other side of the story is that every organization wants its interaction with customers or, for that matter, interaction with any other internal and external entities to be in a controlled manner, something referred to as **Controlled Conversation**. You can correlate it with any human customer service agent; he or she has hardly any liberty to speak beyond a few hundred sentences. So, we need to also understand the fact that there's going to be some boundary and context beyond which Chatbots are not expected to be autonomous. For example, a Chatbot powered with a deep learning model, trained with few years of conversational data from some social media platform like Facebook or Twitter, cannot be deployed in a business environment because it would probably try to cross the boundary of that **Controlled Conversation** as it has been trained with such unrestricted conversations, which normally happen over social

media. Rather, a Chatbot in such delicate environment is expected to gracefully take the conversation to a logical end without crossing the predefined boundary—*The Lakshmana Rekha*. Here, a fully autonomous and super intelligent human-like Chatbot is probably of not much use, at least with the business context. That's where some amount of logic and restrictions come into picture to make a tradeoff between what a Chatbot can do and what is actually expected out of it in that particular environment. But the Chatbots and Virtual Assistants of today are far better than a few years back, and I am sure those of you who are keeping a close eye on the advancements of NLP engines will agree with me. Believe it or not, recently, I was interacting with a Chatbot and it was amazingly intelligent; I only recognized that it was a Chatbot and not a human agent almost after 30 minutes of conversation.

Unfortunately, there has not been much work done on industry benchmarking and grading of the Chatbots and their features till date. In this article, I will be trying to touch upon few areas and some of the critical features, which almost every industry and customers are expecting from a Chatbot today.

An Intelligent Chatbot's features can be broadly grouped under the following heads, and we will be discussing each of those in a bit more details in this series:

- Conversational maturity
- Handling contact center functions
- Advanced linguistic features
- Personalization features
- Smart automation features
- Smart recognition features
- Co-Browsing features
- Emotionally intelligent features
- Omni-capability
- Accessibility features
- Integration features
- Analytical features
- Advanced collaboration features with AR/VR
- Hierarchical features

Conversational maturity

First of all, a Chatbot is expected to be able to take the conversation with a user to a logical end. And, if in case, not by itself, it should be able to transfer the conversation to a live human agent seamlessly so that the continuity of the conversational experience with the user is maintained.

It is also expected to create a service request in cases where a user's request needs more investigation and expertise to resolve the same.

An intelligent Chatbot is expected to be able to take on personality traits of users; it is interacting with and customizing the response on the fly to the characteristics of the person it is talking to.

Another important feature is it should be able to take feedback from the user on the conversation instantly, whether the user query has been resolved or not before the completion of the conversation.

Other areas of conversational maturity count where the Bot should understand when the user wants to *Restart the Conversation* into a completely different conversational context or track. Similarly, it should be able to prompt the user before the session expires to increase interactivity.

But the one most important feature expected from any intelligent Chatbot is the feature of continuous learning and self-enriching, technically, which is a bit tricky. But features like feedback learning, maintaining domain vocabulary, and periodic training with newer vocabularies can surely help bringing some level of continuous learning into your Chatbot.

Handling contact center functions

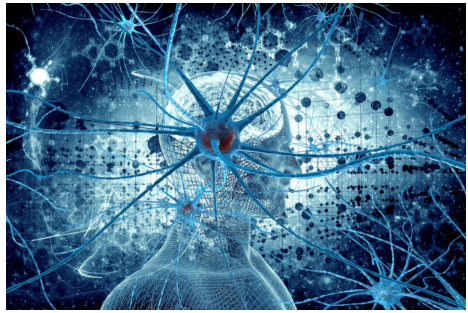
One of the most convincing role the Chatbots are playing today is taking over the contact center functions. While it's been quite successful in terms of cost optimization and providing 24x7 support to customers across geographies, but in reality, we are still far from that ideal state of relying completely on Chatbots to handle all customer interactions and transactions. Here, the **Transfer to Live Agent** feature is very essential. The Chatbot should be able to seamlessly transfer the chat to Live Agent with complete history of the conversation, wherein the live agent should be able to chat with the user in the same chat interface as the Bot. Also, features such as

Click to Call should be available to the user in the chat interface itself, in the event a live agent is not available to take the chat-control, in case of out-of-support hours. An outbound call request or callback workflow should be triggered as per the suitable time opted by the user for the callback.

Chapter 13

Industry Adoption of Cognitive and Artificial Intelligence

IT WILL BECOME INESCAPABLE—James Kobielus, Silicon ANGLE Wikibon Lead Analyst for Data Science, Deep Learning, and Application Development



Industry Adoption of AI and Cognitive Intelligence

Kobielus summarizes the far-reaching and inescapable tentacles of AI and cognitive intelligence in four simple words as it takes hold of the industry at large and thrusts worldwide revenue to shatter unimaginable glass ceilings. Data analysts predict that the industry will have increased its revenue from almost $8 billion a year ago to a mind boggling $47 billion by 2020. So, let's visualize the future vision of the industry in a few years when it will have been adopted AI and cognitive intelligence to its full potential. But, first and foremost, we must set a context and discuss a few concepts used in Artificial Intelligence and cognitive intelligence.

What is Artificial Intelligence and cognitive?

Artificial Intelligence (**AI**) is commonly described as the theory and development of computer systems that are able to perform tasks normally, requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.

Cognitive Intelligence is the simulation of human thought processes in a computerized model. Cognitive computing involves self-learning systems that use data mining, pattern recognition, and natural language processing to mimic the way the human brain works.

Artificial Intelligence or cognitive intelligence is based on algorithms that central networks can apply to create apt processing of information to arrive at a suitable decision. The following are common examples that we see in a daily routine:

- Air-traffic control systems that decide flight plans and choose suitable landing gates for airplanes
- Logistics apps that assist companies route their vehicles to save time and fuel. Examples of such companies are Uber and UPS
- Loan-processing systems that gauge the creditworthiness of mortgage applicants
- Digital personal assistants that use multiple data sources in order to provide answers in layman's terms, such as Apple's introduction of Siri

How deeply is Artificial Intelligence and cognitive embedded into the industry?

Organizations of almost all types have already begun the process of integrating AI and Cognitive into pretty much every kind of enterprise application. Also, incorporation of AI and cognitive technologies released by large technology dealers will be the factor for enterprises planning strategies and the digital disruption brought about by these technologies will be significant.

Even as we speak right now, industries are accepting Artificial Intelligence rapidly and in huge numbers. As of now, we can safely conclude that:

- By 2018, 62% of enterprises will use Artificial Intelligence technologies.
- In 2015, only 59% of industries that used big data also used cognitive intelligence. Today, that statistic has seen a whopping increase, jumping to 95% industries that were previously inclined to big data, but are now also using cognitive intelligence.
- By 2019, half of all consumers are expected to have at least one or more interactions with Artificial Intelligence.

The industry at large will be doing itself a great service by understanding the value of AI and cognitive intelligence and its adoption to their businesses.

What is weak Artificial Intelligence?

Weak Artificial Intelligence emerges when it is used for purposes different from its original intention. It is simply when, instead of using algorithms for superior problem solving, Artificial Intelligence makes tasks easy and simple for human beings. Not to be lumped in with strong artificial technology which has a much more superior role in the industry and in our society.

Exploring strong Artificial Intelligence

Strong Artificial Intelligence, as the name suggests, serves a higher purpose. Strong Artificial Intelligence will become the basis of all innovation in all the industries in future.

The best of artificial intelligence today

In both cases, artificial or cognitive intelligence is based on algorithms with the ability to manipulate information to arrive at appropriate answers. While scientists have been bustling to develop cognitive intelligence for over a few decades, it is only now entering the limelight as a valuable business tool because of three key developments:

- Processing power continues to accelerate. As proved by Moore's Law, named after Intel co-founder Gordon Moore, the number of transistors per chip have been approximately increasing twofold every year for the past four decades.
- To keep enhancing technology, companies like Nvidia are assisting the **central processing unit** (**CPU**) cores in their chips by adding **graphics processing unit** (**GPU**) cores.
- The amount of data, including but not limited to the amount of data storage, are continuing to multiply. Quoting the research organization SINTEF, *90 percent of all the data in the world has been generated over the last two years.* Furthermore, IDC reports that the amount of data that is made and distributed each year increases by two times in size every two years; so, by the year 2020, there will be 44 zettabytes (44 trillion gigabytes) of data in the world.

Current data on investment in cognitive intelligence

Deriving from the cognitive advantage global market report:

- 22% of companies have been using cognitive intelligence technologies for over two years.

- 54% of respondents have started using cognitive intelligence recently, with less than two years under their belt.
- 24% of respondents plan on adding cognitive intelligence methodologies in the next one year.
- 65% respondents view cognitive intelligence as essential to their company's strategy and success.
- 58% respondents say cognitive intelligence is essential for digital transformation of industry operations.

It must be recognized that according to this report, Artificial Intelligence will soon become a must-have accessory, acting as a prerequisite to business and industry success.

Which industry benefits most from using Artificial Intelligence and cognitive technologies?

Almost exactly half of all AI and cognitive intelligence revenue will go to the software industry, which includes, but is not limited to, AI and cognitive applications (that is, text and rich media analysis, tagging, machine processing, formation of clusters, generating various hypothesis, answering multitudes of questions correctly, visualization, and navigation) and cognitive software, which aids the enhancement and development of intelligent, guidance, and cognitively-endorsed problem solving. As both the biggest and fastest-growing niche, cognitive applications spending is predicted to soar as high as $18.2 billion in 2020.

A geographical bird's-eye-view

On a geographic basis, North America (the United States and Canada) is by far the biggest region for cognitive intelligence spending with 2016 revenues touching $6.2 billion. **Europe, the Middle East and Africa** (**EMEA**) will remain the second-largest region for a certain period of time, but Artificial Intelligence revenues from Asia/Pacific, including Japan, will nearly close the gap with EMEA by 2020.

In conclusion, artificial and cognitive intelligence should not be considered just a trend or a buzzword. It has gone above and beyond expectations and will soon be taking over the industry like wildfire, and it will be the primary mode of establishment in all sectors.

Chapter 14

Artificial Intelligence – The Biggest Disruptor in the BFSI Industry

As we are heading toward a revolutionary transformation from an era of digitization to an era of cognification, we must confess that our banks and financial institutions worldwide are the ones who have recognized the potentials of Artificial Intelligence at a very early stage and adopted it in their transformation journey. Using Artificial Intelligence to redefine their products, processes, and the strategies is the main consideration for most of the forefront banks and financial institutions today.

There are many areas of Financial Industry where Artificial Intelligence and Machine Learning have already created its footprint, but there are still many areas that are untouched and will be the core focus in the coming years.

The financial services industry can be broadly classified into three major segments where AI has become the need-of-the-day today. They are Capital Market, Consumer Banking, and Insurance, which almost covers the majority of the sector.

Robo Advisors, High Frequency Trading, Risk Management, Anti-Money Laundering, Cyber Security, Fraud Detection, Intelligent Predictions, and Recommendations are a few areas where AI applications have always been linked to. But in reality, there are many more areas in the financial industry where AI has already been playing a crucial role that many of us are probably not much aware of.

Artificial Intelligence has the ability to process enormous amounts of data very quickly, which is far more data that has ever been processed in the past by human or any conventional computer programs. And that's going to improve the financial institutions to provide better services that they provide to their customers. In wealth management, they will be able to provide much better, more targeted, and efficient advices to their customers.

Risk and Credit Assessment is an area where Machine Learning and Deep Learning are playing the role of a game changer and the insurance industry has adopted it largely. They are finding it very compelling, primarily because AI is simply changing their business entirely.

Smart wallet will be another area of interest for the banks all over the world. The banks will provide smart wallets to its customers; these AI-enabled smart wallets will look at customer's spending habits, and it will learn from his/her behavior to provide smart advice and recommendations for future spending. It will encourage savings and responsible spending on their credit and debit cards in the form of predictive alerts and recommendations. Similarly, AI can detect if a customer is likely to switch their products or services; this early signal will help banks to offer him/her a more suitable product, which may help retaining the customer.

Now, coming to the Risk assessment, Credit assessment, and Regulatory areas, today, if you want to apply for a loan, in a conventional way, a home loan or a personal loan takes couple of weeks' time, or may be even more to clear all kinds of credit checks before approving such loans. With Artificial Intelligence, the processing lead time will come down to an hour or two max. This is because AI's capability to do

credit assessment is much faster and better by interrogating various customer data sources.

We are already experiencing the change in the interface the banks are having with their customers. They are increasingly changing those to Chatbots, Robots, and Humanoids as their first line of interfaces with their customers is to enhance service experiences. We are seeing similar trends in nanks in India too.

State Bank of India (**SBI**) uses IBM Watson in some of their products like SBI InTouch. ICICI bank has leveraged AI for facial and voice recognition in a few of its products. HDFC Bank, Yes Bank, Axis Bank, DBS Bank, and a few others are ready with their AI-powered Chatbots and Virtual Assistance interfaces. Citi Union bank has launched its humanoid robot, **Lakshmi**, which can chat with its customers like a human agent. And many other banks have started floating their RFPs to their service providers for different AI-related projects, realizing the fact that AI will be the front-line troop for them to compete with their competition.

Also, there are lots of AI applications coming up into areas like Anti-Money Laundering and Regulations because it's very easy for an AI system to analyze a lot of data at its fingertips and determine the patterns and better identify frauds, money laundering, and criminal activities quickly, and highlight those to the bank authorities well in advance so that immediate actions can be taken to stop those activities.

Other areas of AI booming in the financial sector are using facial stress analysis to automatically detect ATM frauds. AI financial advisers called Robo Advisers work proactively for its customers, providing intelligence 24x7.

Chapter 15

AI in Healthcare

if that's not enough, we have leveraged Artificial Intelligence for Revolutionizing our Healthcare and Medicine.

No industry counts more than healthcare and medicine. And I don't think I should explain why. So, whatever advancements we may have done in any industry up until today with Artificial Intelligence or with any other cutting-edge technologies for that matter, our healthcare and medicine should come at the top of that list, and there should not be any disagreement on this. Let's do a reality check and see how far Artificial Intelligence has already been leveraged in our healthcare and medicine.

When you go to your doctor today, your doctor can't guarantee that a particular treatment selected for you will work for sure. For almost

half of medical treatments in use today, there is no proof of their effectivity. The proof for effectiveness of the treatment is based on only a very small fraction of the patient population where the clinical trial has been made factually; and the result of such studies is based on averages. But the fact is that every treatment has different effects in every unique human body. What does that mean? It implies that our doctors don't have the adequate information in hand today to suggest the exact treatment plan required for a particular patient. Isn't it shocking?

But with Artificial Intelligence, we can transform our healthcare and aid our doctors to be much smarter. AI can act as a second pair of reliable eyes for our doctors, and it can make good doctors great. We can equip our doctors with a treatment plan that is exactly for you and precisely according to your body condition and parameters. With the use of AI, there will be proof of effectivity of every treatment and every single decision taken by a doctor will be based on solid evidences.

The future of healthcare will be *predicting everything about our health well in advance*, before even any symptoms of any abnormalities are observed. Sounds a bit over optimistic! But it's very much possible. Whether we will be able to prevent or cure everything as per the early prediction alerts received is altogether a different question, but a majority of the ailment can be arrested at a very early stage.

Let me straightaway come to some of the examples where Artificial Intelligence has already made a huge progress:

1. AI can detect Osteoarthritis progress 3 years prior to the arrival of symptoms with more than 85% accuracy by detecting the diffusion of water inside the knee cartilage.
2. Almost all cancers can be detected in a very early stage using AI, which is simply impossible for a doctor to detect at that stage otherwise.
3. Deadly disease like Sepsis can be detected well in advance with AI and can be cured and save the life of the patient.
4. Diabetic Retinopathy, which is basically high blood sugar, damages the blood vessels in the retina, which is a slow process but can progress to loss of vision can be detected by AI at a curable stage.

5. Now, with AI, by analyzing a retinal scan of your eye and looking at the blood vessels, it can tell your chances of developing cardiovascular diseases and a heart attack at a later stage.
6. Alzheimer starts at an early stage and worsens with time to the point that a person loses mental and bodily functions. Now AI can detect this kind of a condition at a very early stage through predictions.
7. Machine learning and deep learning in Clinical Imaging is exceptionally efficient. It can largely influence key clinical decision-making processes for doctors like disease detection, lesion segmentation, diagnosis, treatment selection, response assessment, clinical prediction, and so on.
8. AI techniques have already been proved to be the most efficient for detecting tuberculosis. Similarly, AI-aided mammography is exceptionally efficient in detecting breast cancers when there is not even the slightest symptom to register.
9. In Genomic research and testing, AI is simply revolutionizing the entire panorama. It is a type of research that identifies changes in chromosomes, genes, or proteins. This test can confirm or rule out a suspected genetic condition or help determine a person's chance of developing a genetic disorder.
10. Google DeepMind's Artificial Intelligence is already improving healthcare dramatically, like preventing blindness due to different medical conditions including old age blindness.

Today, there is a huge amount of clinical data and information that's available to us, which is beyond what the human eye, brain, and ear can appreciate or process. Processing and using that information will help our doctors make better decisions. Using that detailed information to personalize the treatment plan for each of the individuals in the unique way will add a great value. And even patients will be in a position to better participate in the decision-making process of a treatment plan, unlike the paternalistic healthcare model in the past where the doctor used to take all decisions and patients were completely unaware of the implications.

Cognitive systems like IBM Watson are already becoming a practice in healthcare and it will be as common as a Stethoscopes for our doctors in the coming few years. These cognitive systems have the capability of understanding everything in your medical record, as well as almost everything in the medical literature and journals. All this information and knowledge can be combined, which is humanly not possible to know while making a decision. IBM's Watson for Oncology is a great example that diagnoses and offers treatment options for various cancers. AI can even transform the scientific method and, in turn, the pharmaceutical industry.

So, there are huge possibilities, but adoption is still very limited, especially in a developing country like India where almost half of the population is still deprived from basic healthcare facilities.

Chapter 16

AI in Cyber Security – Cognitive Cyber Defense

In this new age of cyber security, the level of sophistication of the threats and malicious activities has significantly increased. These threats are becoming harder to detect and the damage caused in an enterprise has gone up many folds. Whatever security measures you may build around your organization today, the shocking reality is no system or infrastructure till today is a hundred percent secure and neither will we be able to achieve such universal security at least in the near future. Considering this reality, the modern security systems and platforms are essentially moving away from the traditional deterministic approach of dealing with security threats to a probabilistic kind of an approach. What that means is, in the traditional approach, we used to be very certain of an attack that already happened, and then only take necessary remedial actions or take a stand on how to deal with the situation. In contrary, in the modern probabilistic approach, by using Artificial Intelligence and Machine Learning techniques, we can take a probabilistic approach to generate alert by continuously monitoring the network, devices,

and user behaviors, even when we are not very sure of an attack or malicious activity. This approach provides an advantage over the traditional deterministic approach because of its predictive nature. The same applies to the security strategy and model that we implement in an enterprise while dealing with such cyber security threats.

The approach is very similar to how a human body fights against intruders. If you consider our DNA, which is essentially an information that can be damaged, altered, or hacked by any external entities, our immune system deals with those kinds of attacks and risks every day. Millions of viruses attack our DNA all the time, but our body has an amazing security system which keeps monitoring the entire body, even to the level of the DNAs, all the time to safeguard us from any such attacks or threats. It generates early alerts and activates different hierarchies of defense mechanisms available in our immune system immediately to fight against such threats. The reason that our immune system is so effective is because it knows what is internal and what is external to our body, that is, *what is part of us and what is outsider*, like various viruses. And this is how it knows how to protect our body from the external attacks.

With the preceding philosophy in mind, a few of the leading cyber security companies leveraged the power of Artificial Intelligence and Machine Learning and developed their ground breaking AI cyber defense platform which mimics the human immune system. These platforms are self-learning, and are capable of understanding what is normal and what could be an emerging threat in real time and can take remedial measures accordingly. They are also capable of automatically modeling every network, device, user, and other asset behaviors in an enterprise. They not only provide an early alert of any probable threat, but also provide a threat visualization dashboard using tropological network projection techniques that allows security analysts to act on the security threats; thus, preventing them rather than reacting to the attacks after it had actually happened. One example of such an advanced platform that is worth mentioning here is Darktrace which uses **self-learning AI to identify and respond to in-progress cyber-threats**. This proactive cyber risk management approach in an enterprise can reduce the risk of attacks and its consequences dramatically by safeguarding its resources and users well in advance of the attacks.

I personally believe that the firewalls and **signature-based models**, such as conventional antivirus and other products, will not be completely ineffective at least in the near future, as claimed by many of the cyber security experts. Rather, we should build a layered approach wherein the firewalls and signature-based models can be one level of security, but there should certainly be an additional layer of AI and Machine Learning algorithms which will help identify unusual activities, unusual data flows and patterns, and suspicious buildups in and around your network and devices. This can tell you in advance with some degree of probability and confidence that there could be some security threat in your enterprise, considering many such factors, and thus shrink the attack surface which is otherwise simply impossible to deal with in the traditional approach.

Also, AI models, once trained, have the capability to detect the genome of many malicious entities. So, it can easily detect the advanced versions and different variances of such malicious programs. Any malware is often communicated within encrypted traffic through internet and sensitive data passed across the cloud. AI can very well be used in this type of scenarios to be able to learn how to automatically detect unusual patterns in encrypted web traffic and can improve network security defenses dramatically. These categories of products use machine learning to process incoming threat samples to determine if they are malicious, based on the knowledge and the patterns that it learns every day. It can determine how likely an incoming pattern is a new malware, and, accordingly, it can trigger the analysis to create patterns and signatures of the new malware and incorporate it into the core security fabric, which in turn distributes to the cloud or as an update to all the subscribers. AI-powered malware scanner products are becoming increasingly popular because of their various advanced capabilities.

Chapter 17

Be Aware of Cyber Threat

Knowing the strengths of your enemy before facing them in the battlefield is always an advantage. It will not only help you frame your battle strategy, but it will also help you prepare yourself for the damage it's going to make during the battle and the after effects. Exactly the same applies while dealing with cyber security and threats. In this age of cyber warfare, the key to victory is building a **Creative Defense Strategy** with the latest defense mechanisms using Artificial Intelligence and Machine Learning rather than relying completely on the conventional ineffective methods.

Historically, cyber security, for some reason, has always been ignored or has never been able to take the center stage for consideration in many enterprises, which it should have, honestly. Many big and small enterprises, government and non-government agencies, and even financial institutions have knowingly or unknowingly disregarded it at some point and have paid huge cost not only on the financial font but also in terms of reputational losses, which probably is much severe than any financial losses in today's business world.

Today, since the head to toe of your enterprise is connected to the external world through internet and the hearts, lungs, and kidneys of your enterprise systems that are residing on the cloud, you should seriously consider cyber security as one of the prime focus areas for your enterprise. And even as an individual or an ordinary citizen, the time has arrived that we all should understand the importance

of cyber security and be aware of the threats that are being primarily originating from.

Although cyber criminals can operate from any part of the world and can belong to any blacklisted or whitelisted countries, you will still be surprised to know that the majority of the devastating cyber-attacks that happened in the past were well organized, well researched, well strategized, and well conducted, originating from a single epicenter. And astonishingly, the masterminds of most of those attacks in the past had been operated from a strange world just next to you, called **The Dark Net**, which many of you probably are not even aware of.

Physically and digitally, the Dark Net, sometimes referred to as the **Dark Web**, is located deep underneath the Deep Web, which is essentially not indexed by any of the search engines like the popular Google, Bing, Yahoo search, and so on. Okey, let me take a step back and explain what is **Surface Web**, Deep Web, and Dark Web for those readers who are probably scratching their heads. If you consider the entire internet as an iceberg, only the tip of which, above the surface of the water, is just about 10% of the entire iceberg, is the Surface Web. Your search engine operates only within this tiny area that we common people have access to. The rest 90% under the water comes under Deep Web, which is not accessible to your search engines, and it contains humongous amounts of data and information from different government and non-government agencies, enterprises, military data, data from research agencies, academia and universities, and so on. Arguably, a small portion of this Deep Web, probably around 5%, very deep down at the extreme bottom of the iceberg, is the Dark Web, where all these criminal masterminds—hackers, killers, mafias, drugs dealers, terrorists, and so on—operate from.

These groups of people with a very different ideology and social mental orientation from the mainstream call themselves **Crypto Anarchists**, which is a form of cyber-spatial realization of anarchism. They safeguard the boundary of their dark world with a tight cryptowall that your normal browser cannot penetrate into. But apart from this physical boundary, there is also a thick boundary of ideology and beliefs which differentiates the Crypto Anarchists from the rest of the mainstream world.

Dark Net is not just a different place in the internet; rather, the foundation of the Dark Net is established on a different ideology, thought process, and different personalities that operate in it all

together. Although these anarchists are considered as criminals by the governments of different countries, they don't consider themselves against humanity. They claim that *for the real growth of humanity, there should always be a tough competition of good and bad minds and thus humanity can reach its real excellence*. They also believe privacy and anonymity is fundamental to humans because it allows free human action, according to their own will. Eternally, humans are made to use their own brain and mind and make their own decisions. It could be good or bad; they choose it and deal with their own consequences. These Crypto Anarchists strongly believe that if a human mind has to develop under the pressure of strict regulations and guidelines, it will squeeze or suppress the human ability, development, and the human evolution. In short, **Free Human Actions** is what these anarchists advocate. But their definition of Free Human Action is probably autocratic, which does not hold good for a healthy society or a nation or even for the whole world.

The idea of the Crypto Anarchy was to run a parallel system, a parallel economy, and a parallel world, which is a complete contrast to the mainstream world with anonymity, absolute privacy, and unrestricted human actions constituting alike dark-minded individuals. But soon, it turned into a big marketplace and operating ground for all types of criminal activities. The actual darker side of the Dark Net, the notoriety for which it's known for, is just as close to hell. Sorry for using such harsh words, but honestly, I didn't find anything better. Soon, it will become the marketplace for all types of illegal arms and ammunitions, illegal drugs, illegitimate items such as stolen credit cards, passports, visas, fake green cards, driving licenses, and so on. It is characterized by hackers for hire, professional killers for hire, political activists for hire, and even extremists from different parts of the world operate from the Dark Net. But the most worrying fact is that it has become the playground for the most dangerous Cyber Criminals, which we all should be aware of from our cyber security and safety point of view. Today, cyber-crime is an organized crime and a huge business outcome associated with it is for the criminals and is probably the most terrifying threat to humanity in the future, after the nuclear warfare. So, knowing the threat, it's probable magnitude, and assessing your security systems that are supposed to combat such threats will always give you an upper hand.

Chapter 18

AI Revolution in India – National Strategy for AI

The National Strategy for Artificial Intelligence published by NITI Aayog in 2018 seems to be quite exhaustive and ambitious. The report narrates the different pain points and key challenges involved in implementing Artificial Intelligence in India. It has also tried to touch upon many sectors where AI can play a significant role in bringing India to the forefront of AI revolution. Aayog has also made a few valuable recommendations and defined the role of different stakeholders and the role of our government in this AI journey. The report not only took a simplistic and elaborative approach, but also tried to demystify various AI jargons for the non-technical audience, which is really commendable.

Though the report runs to more than hundred pages, unfortunately, a summary view or snapshot view of the same has been missing for many of our anxious and impatient readers like me. There could probably be a one-pager infographic snapshot or something similar with a bit more quantitative analysis and depiction as a quick view laying at some corner in the report. Also, the roadmap for the AI implementation in different focus areas identified in the report seems to be bit silent, though Aayog has clarified in its report that this is intended to serve as an essential pre-read in building a truly

transformative approach in pursuit of AI-for-All in India. Also, how this entire strategy will be executed in a phased manner is not evident in the report; perhaps that part has been intentionally stashed away considering this as a pre-read paper.

Anyways, that's completely my personal take on the report. Aayog has all rights to fairly argue that *barely hundred pages for AI strategy for a huge country like India is very nominal, rather it could have actually run to couple of hundred pages*. Possible, fair enough!

When I read through the report end-to-end, I could see the whole story into three major sections and each section can essentially be segregated into further sub-sections. The top sections are somewhat similar to:

- Opportunities and economic impact of Artificial Intelligence for India.
- India-specific key challenges and focus areas of AI implementation.
- Different initiatives identified for AI implementation in India and the role of different parties (Academia, Start-Up, Tech-Giants, Citizens, and so on) and the role of our government to make those successful.

As per the report, there are huge opportunities and economic impact that AI can bring, estimating AI to boost India's annual growth rate by 1.3 percentage points by 2035, which translates to addition of approximately one trillion USD to India's economy. And not only that, AI will create a widespread transformative impact on the overall quality of life of our citizens. The report indicates that India also provides a perfect playground for enterprises and institutions globally to develop scalable solutions which can be easily implemented in the rest of the developing and emerging economies. And *Solved in India* could be the model going forward for **Artificial Intelligence as a Service** (**AIaaS**); which I feel is a brilliant concept.

Artificial Intelligence has the potential to provide large incremental values to a wide range of sectors globally, and is expected to be the key source of competitive advantage for firms. Few of the key sectors where AI has already become a differentiator are—Healthcare, Agriculture, Banking and Finance, Transports, and Logistics, Retail, Manufacturing, Energy, Smart Cities, and Education and Skilling.

Summary of the focus areas:

Healthcare

Although healthcare is one of the most dynamic yet challenging sectors in India, and is expected to grow to USD 280 billion by 2020 from the current USD 100 billion, it faces major challenges of quality, accessibility, and affordability for a large section of the population.

Application of AI in Healthcare can help address issues of high barriers of access to healthcare facilities. The difficulties like affordability and reactive approach for cancer treatment highlighted in the Tata Memorial Hospital's *Cancer Heat Map* report can be minimized with the adoption of AI for India's cancer woes. The 'Digital Pathology' and another project under discussion, namely the **Imaging Biobank** for cancer, will help the detection of the disease accurately and precisely in a very early stage.

AI-based radionics is an emerging field that results to the comprehensive quantification of tumor phenotypes by applying a large number of quantitative imaging features has resulted in improvement of the existing biomarker signature panels by adding imaging features. Also, there is a joint venture between Microsoft and an Indian start-up, Forus Health, which has developed a portable device named **3Nethra** that can screen for common eye problems as well as complicated conditions like diabetic retinopathy.

The Indian government has been making a series of large-scale interventions to address India's healthcare challenges, transformation of 1.5 lakh **Health and Wellness Centers**, developing district hospitals to cater to long-term care for non-communicable diseases, **Ayushman Bharat Mission**, and promoting e-Health where AI can play a crucial role for its success.

AI-based healthcare solutions can also help in making healthcare services in India more proactive, moving from sick care to true health care, with emphasis on preventive techniques.

Agriculture

While India has come a long way from being categorized as purely an agrarian economy, agriculture and allied sectors still account for 49% of the workforce. The Government of India has recently prioritized

Doubling Farmer's Income as a national agenda. Despite making impressive progress and receiving government attention, the sector continues to be dependent on unpredicted variables and has a weak supply chain and low productivity.

In 2016, approximately 50 Indian agricultural technology-based startups, **AgTechs**, raised USD 313 million. For the first time, this sector is seeing widespread participation by startups. Indian startup, Intello Labs, for example, uses an image-recognition software to monitor crops and predict farm yields. Aibono uses agri-data science and AI to provide solutions to stabilize crop yields. Trithi Robotics uses drone technology to allow farmers to monitor crops in real time and provide precise analysis of their soil.

Also, crop health monitoring and providing real-time action advisories to farmers and using image classification tools, combined with remote and local sensed data, can bring a revolutionary change in utilization and efficiency of farm machinery.

The obstacles that are reducing the ability of agricultural growth in India can be overcome by the implementation of AI. Artificial Intelligence will have significant global impact on agricultural productivity at all levels of the value chain. Few areas worth mentioning are:

- Application for soil care: PEAT, which is a Berlin-based agricultural tech startup, has developed a deep learning application called **Plantix** that reportedly identifies potential defects and nutrient deficiencies in the soil. The product has gained large attention from many countries, including India.
- AI sowing App: Microsoft, in collaboration with ICRISAT, developed an AI sowing App powered by Microsoft Cortana Intelligence Suite using Machine learning and Power BI. The app sends sowing advisories and notifications to participating farmers on the optimal date to sow.
- AI for herbicide optimization: Blue River Technologies has designed and integrated computer vision and machine learning technologies that enables farmers to reduce the use of herbicides by spraying only where weeds are present, optimizing the use of inputs in farming, which is a key objective of precision agriculture.
- AI for precision farming: NITI Aayog and IBM have partnered

to develop a crop yield prediction model using AI to provide real-time advisories to farmers. The project is being implemented in 10 aspirational districts across the States of Assam, Bihar, Jharkhand, Madhya Pradesh, Maharashtra, Rajasthan, and Uttar Pradesh.

Education

In India, the importance of a developed education sector is amplified by a large youth population of the society. Challenges like low retention rates in rural schools and poor learning outcomes are impacting our education system. Several AI tools can be used to overcome these difficulties. As per the report, the major focus will be on adaptive learning tools for customized learning and intelligent and interactive tutoring systems to address the key challenges.

Adaptive learning tools for customized learning

- **Intelligent and interactive tutoring sectors**: Creating **Smart content** for improved interactivity. **Content Technologies Inc**. (**CTI**), an AI research and development organization, develops AI that creates customized educational content.
- Microsoft is helping in predicting dropouts in Andhra Pradesh: The AP government is making concerted efforts to bring down the school dropout rate in the state
- Write to learn Pearson: Pearson's Write-To-Learn software uses NLP-based technology to provide students with personalized feedback, hints, and tips to improve their writing skills.

AI tools can be used to automate rationalization of teachers and development of customized professional courses for identification and fulfillment of knowledge and skill gaps.

Smart Cities and Infrastructure

As the percentage of population living in urban areas is growing exponentially and expected to around 60% by 2050, an unplanned urbanization will create challenges such as congestion, over pollution, high crime rates, poor living standards, and can potentially put a

huge burden on the infrastructure and administrative needs of existing Indian cities. The report elaborates the areas such as poor urban planning, inefficient utility distribution, improved delivery of citizen services, improved public safety, and how AI can eliminate most of the issues with Smart City and Intelligent City concepts.

The report talked about building Smart Parks and public facilities, Smart Homes, AI-driven service delivery (such as predictive service delivery on the basis of citizen data, rationalization of administrative personnel on the basis of predicted service demand, and migration trend analysis, and AI-based grievance redressal through chatbots), Crowd management, Intelligent safety systems, preventing cyber-attacks, and a few more.

Smart Mobility and Transportation

The report emphasizes great attention on implementation of Artificial Intelligence to address issues related to Mobility and Transportation, specifically to challenges we encounter in India on a daily basis.

Some of the challenging areas mentioned are congestion and road accidents, high number of traffic deaths, lack of public transportation infrastructure, and so on.

AI-aided smart technologies like Assisted Vehicle, Greenfield Infrastructure, Autonomous Trucking, Intelligent Transportation Systems, Travel Route and Flow Optimization, and Community-Based Parking can be used to address many of these challenging areas.

Challenges, remediation, and recommendations

Few of the major challenges for adoption of Artificial Intelligence in India highlighted in the report are shortage of expertise, absence of data ecosystem, privacy and security issues, lack of awareness, and absence of any collaboration.

The report also includes various valuable recommendations by the Aayog, like creating a multi-stakeholder marketplace to encourage the development of sustainable AI solutions at an appropriate price for sectors such as healthcare, education, agriculture, and so on. It

also stresses emphasis on facilitating creation of large foundational annotated datasets which will enable and accelerate development of AI solutions by startups and other AI research organizations.

For promoting development of AI tools as well as adoption of AI in different fields, the Aayog also recommends a partnership and collaborative approach involving various stakeholders and the government. The report also talks about innovative approaches and initiatives such as *Spreading awareness of the advantages of AI offers* to increase the adoption, supporting AI startups financially as well as through other means, and establishing a **National AI Marketplace** (**NAIM**) and **Data Marketplace** and a few more.

The report also briefly describes growing Ethics, Privacy, and Security-related concerns associated with AI implementations. It also talks about remediation and regulatory measures to be implemented to deal with such issues to make AI applications safe, secure, and contributing towards a better life and mankind.

At last, the report talks about **Vision and Actions for the Government**, where it clearly states that the role of the Government is to be one of the prime facilitator, an active promoter, and, wherever required, of an owner of the AI and related initiatives happening across different verticals and sectors.

In my view, NITI Aayog's report (discussion paper) on National Strategy for AI is remarkable; probably first of its kind, spanning across almost all focus areas, key challenges, remediations, recommendations to address those, and finally the role of different stakeholders to make those happen.

However, I feel it would have been comprehensive if areas such as AI strategy for Ayurveda and Alternative Medicine, leveraging AI for physically challenged citizens, AI for women empowerment and safety, AI for Youth and Sports Development, and so on had also been included and briefly described in the report.

I hope I have done justice to this chapter! I leave the judgement to my readers.

Chapter 19

AI in Tour and Travels – Journey of a Digital Traveler

The typical journey of a digital traveler can be divided into five major phases. And Artificial Intelligence and digitization has already been transforming many aspects of all those five stages significantly. These stages are loosely termed as:

1. Dreaming stage
2. Planning stage
3. Booking stage
4. Onsite experience stage
5. Feedback and experience sharing stage

I personally believe that every travel plan starts with an amazing dream and the source of that dream could be anything. In this dreaming stage, people usually look for some kind of inspiration to turn that dream into reality. So, they normally start going to the internet to get ideas about their dream travel destinations and the adventures and activities to do there. While searching so in the internet, they may find a banner ad at the extreme right hand site of a web page or in an online travel magazine. That's basically an ad rendered by a travel company, which encourages the user to click on the ad, go to their site, select a travel plan, and then do the bookings. It's a long process and there is a possibility that the user may lose his/her interest in between and simply go to some other site and start a fresh search.

Now, with the increasing proliferation of Artificial Intelligence and intelligent conversational interfaces, the travel companies have replaced that banner ad with an Artificial Intelligence Chatbot within that ad unit. This enables user to directly talk to the Chatbot and get ideas about different travel destinations, information pertaining to cost and logistics, and finally book the flight and hotel tickets in a very natural and conversational way. And if you use the Chatbot couple of times for your vacation planning and booking, it is intelligent enough to automatically register your preferences and can directly recommend you the right travel plan next time, that too in a very personalized manner which suits your requirement. This personalization of offers is extremely important today for any business because as per some studies, approximately 70% of the users want personalized and tailored information as per his/her preferences and not the generic ones.

Travel sites like Kayak and a few other are providing similar conversational interfaces to their customers for planning and booking travel, where the customer can interact with a Chatbot in natural language, either through text or voice, and can do the planning and booking.

Normally, people spend more time in planning a holiday trip than the actual trip. Here, you can see AI has been used in many channels where the customer is engaging. Most of the popular travel sites and mobile apps use Chatbot as their interface with the customers. Channels like Facebook, Slack, and Skype and travel sites such as Booking dot com, Sky Scanner have already implemented Chatbots in these channels not only for FAQs and queries, but also to help their customers for searching, booking, and getting help on other aspects of travel. There are also other advanced AI applications that are capable of reading your email and calendar and recommend you travel plans proactively, like travel site Hipmunk.

Now, let's come to the most exciting phase—the onsite experience stage. Use of AI is widespread here too. There are couple of travel companies that provide predictive analytics of different events, which may happen, and the travelers may experience during their travel. For example, flight delay is now being predicted by applying machine learning techniques into different data sources, which may include air traffic control data, weather data, booking information, or even some news or flight maintenance related data to provide meaningful insights and predict any delay in the flight. Google Flight can predict a flight delay with more than 80% confidence.

Many of the airlines are also now investing on predictive maintenance. So, using machine learning and other techniques like IoT to predict when an aircraft needs to go for maintenance. It can also help in avoiding delays and cancellations due to maintenance-related issues if the same can be predicted well in advance.

Machine Learning, Deep Learning, Virtual Reality, Augmented Reality, and Simulation techniques are now extensively used in the Travel Industry. Most of our digital experiences up until now have been experiencing everything and interacting with a screen or a device from outside. That screen could be an interactive screen of your mobile device, your laptop screen, iPad, or even a voice receiver. But the capability of Virtual Reality to put you right in the middle of that experience, and you interacting with those experiences all around, is mind-boggling.

Pre-Travel Experience with Virtual Reality includes providing an experience of the places that you are planning to visit and inspire you to be there. Hotel Marriott in US, using Virtual Reality, provided pre-booking experience to their customers of tourist places just

to give them the feeling of the location and inspire them to plan a vacation there. Travel companies are already adopting this in many areas. For example, Thomas Cook in UK uses it for up-selling seats just to give customers pre-booking experiences of difference of an economy class and an economy plus class seat so that the customer can just experience the difference of that extra six inches of legroom in advance before making a booking choice.

Quantic airlines have implemented Virtual Reality for entertainment for their first-class passenger for long-distance flights by giving them a new and different experience instead of a tiring and boring flight. It's kind of immersing someone into a completely different experience, while in actual, he/she is in a completely different environment or place altogether.

AI Facial recognition is also a pretty interesting technology used by couple of airlines. Delta, for example, has leveraged this technology for baggage check-in. They use the facial recognition to identify the person and compare it against his/her photograph in passport or driving license used during the booking to make sure they are one and the same. ZetBlue is using a similar AI technology for their passenger boarding on to the flight. Similarly, Dubai airport uses identity tunnel to identify the person while he/she is walking through the tunnel to the security checking. These technologies contribute a lot to reduce the overall friction in the travel.

Now, when you reach the destination at your hotel, here also, AI is used to enhance your experience, like identifying you automatically in the hotel lobby and doing an auto check-in into the hotel. Knowing you have arrived at the hotel lobby, automatically turning your lights and AC on in your room, allowing you to interact with a Chatbot for room service or for any queries and concerns during your stay at the hotel. For example, Radisson uses a Chatbot for room service. Just imagine all the devices and amenities in your hotel room are connected devices and can be controlled remotely from your smartphone app provided by the hotel, providing personalized menu cards in the restaurants for Food and Beverage only of your choice.

Now, during your travel and sightseeing, AI-enabled devices gives you the opportunity to explore local places and the culture. AI applications like Google Translate can help you translate anything to your own language during your travel. Also, AI-enabled digital technologies are changing the way tourists explore different places.

Using the **Times Traveler** App, a visitor can explore how the Berlin Wall used to look like in the past. To do that, they simply have to direct their smartphone to the landmark, the app recognizes the spot with AI, and plays the respective historical footage.

Coming to traveler safety, simulation techniques are used to train the rescue staffs to give them an experience very similar to the live scenarios during conditions where rescue operations need to be performed.

The self-driving car in future is going to revolutionize the travel industry. Just imagine, a self-driving car picking up a customer from Airport to the hotel or dropping him to a meeting. Let's wait for that day when a self-driving car comes for your pick up at the airport; it's going to be an amazing experience.

The last stage of travel, which is your feedback after you come back from your dream vacation. The feedback could be in many different forms like sharing your experience with your friends and relatives and encouraging them to plan for similar vacations. Some people will share their travel experiences on social media by posting images, videos, and comments. Some people may provide their good/bad rating on the travel site. And someone like me may like to write a blog on the amazing vacation they just had. For a travel company, it's extremely important to collect such feedback as much possible from their customers, which will give them valuable information on how they can improve their services further and Artificial Intelligence can be of great help here too. All the service providers in the entire value chain of travel and tourism, whether it's the travel booking company, airlines, or hotels, are trying to collect that valuable data and process it using Artificial Intelligence and capture meaningful inferences and subsequently predict customer preferences and proactively offer personalized and better services to them.

So, that's probably given you some idea on how Artificial Intelligence is transforming a traveler's journey and how different entities involved in this whole chain are getting benefited. It's all about enhancing the experience of the travelers and transforming the travel and tourism business with the enormous potential that Artificial Intelligence provides.

Chapter 20

Top 100 Business Use Cases of Artificial Intelligence

Another way of defining Artificial Intelligence in ordinary terms is something like this: Artificial Intelligence is a smarter way of learning things, a way to find patterns among the problems, and learning to solve future problems from the acquired knowledge. The use of Artificial Intelligence is expanding and making its way into all industries at a very rapid rate. Here are top 100 business use cases of Artificial Intelligence and Cognitive.

Please note that this article will provide only a high-level overview of the widespread use cases in different business domains, and each use case has many more sub-use cases. The underlying technical details of their implementations are abstracted here to make the article generic enough and perceivable for even non-technical readers.

Artificial Intelligence in Healthcare

Personal AI Analyst

Not every one of us can afford to go and see a doctor every now and then. Equipped with the right advisory algorithms, the AI system can understand complex human body conditions and give possible medical recommendations. The analyst can even deliver medicinal alerts and alarms. It is highly possible that in the coming years, AI will be able to completely look after a person even in the absence of human supervision. It might even be equipped with a simple motivational voice that can pump you up every day. It can also act as your personally hired health coach.

Health Care Bots

Health care bots act behind the scene of a Chatbot. They provide adequate guidance to help you keep a track of your clinical appointments and medications. It works to improve the output of billing, scheduling, and payment making of a hospital. It's a patient's online service provider, which enhances the overall process of treatment.

Miniature Operational Robots

A technology that is yet under a lot of consideration. It gets difficult for doctors to operate some internal areas that are out of reach. These robots, if programmed right, can be sent inside the body to perform the task that was to be done manually. The functionality of these robots can be monitored on the screen. These robots are either remote-controlled or internally programmed. Scans and pictures of a body's sensitive spots can be taken.

Advanced Analytic and Research

For a while, AI has been used to detect abnormalities in the human body. Even the abnormalities that escape X-Ray and MRI are detected by analyzing them under AI programs. These abnormalities are then diagnosed. It is being tried to develop medicating traits in AI, such that the AI will be able to provide the solutions to medicinal problems readily.

Assisting Doctors

AI is being designed to help doctors out and not replace them. It gets difficult for a doctor to provide care to a lot many patients at the same time. AI does the repetitive task of looking after numerous people at the same time. This prevents the doctor from getting physically and mentally tired.

Fast and Accurate Diagnoses

AI has the capability to perform an accurate diagnosis of many diseases and ailments since it has the ability to learn from past experiences and detect patterns that normal medical equipment and techniques cannot detect.

Therapeutic Robots

During a treatment, a patient might need to stay in his place for a long time, which can be tiring in many cases. Robots will be specially designed so that a person can cuddle to that. This reduces a patient's dependency on social service and makes the process far less exhausting.

Online Health Care and Assistance

Physical care or doctor appointments can be replaced by online health care. This kind of AI is still in process and researches are on. If it succeeds, then we will see a drastic drop in the cost of medical care.

Functional Displacement

In many cases, a part of the human body might become dysfunctional or lose its mobility. If connected to the brain right, the AI can make them work again and ensure a connection between the brain and the part.

Physical Displacement

A human body might lose a part of itself accidentally or intentionally in some cases. A robotic hand or leg powered by Artificial Intelligence

can be attached to function the way a real one does. Though this technology is new and expensive for now, we hope to see it work in the near future.

Assistance for Alzheimer's disease

Alzheimer starts at an early stage and worsens with time, to the point that a person loses mental and bodily functions. With the right assistance, one can enable the patient to make interactions socially as much as possible. Speech producing programs are infused in the systems connected to a human mind, which in return makes it possible for the person to communicate its needs.

Artificial Intelligence in Automobile

Driver Assistance

Automatic cars are developed to assist you with driving because of the sensors that they are equipped with. New features induced in cars takes a load off the driver. The car keeps on working even if the driver gets distracted for a while. Most of the drivers have now started choosing automatic cars over manual ones because of the smart AI technologies that they are equipped with.

Geo-Analytical Capabilities

With the development of the GPS system, one doesn't even need to worry about the track on which their transport is moving. A number of transport providing companies have tried to attain maximum benefit from the technology. A network of their cars or transports is made by connecting them all to one unit, which then overrules them. With AI-equipped cars, the users can detect any problems that their vehicle might be facing and can take precautionary measures in advance. The enhanced connectivity has even attached automobiles to the social media networks.

AI-enabled Smart Sensors

Smart sensors can detect any technical or even medical emergency situations inside the car. They save you from any possible emergency by warning you of any possible threat in advance. These sensors even watch over the security of your vehicle in your absence or presence and predictions are done using AI technologies.

Drives the Driverless Cars

Infused with deep learning and other advanced mechanisms, AI can drive just as well as a human. It learns from real audio and visuals. The interesting thing to notice is that a driver AI can learn from experience as well; the more incidents it encounters, the better it becomes over a period of time.

Assisted Driving

Assisted Driving is a vehicle that assists those who are less able to drive. AI-equipped vehicles are flexible and can work for a driver with any kind of dysfunctionality. Features such as speech recognition, camera-attached vision system, and much more are infused in a car. This enables the driver to work out the system without having to do much of the physical work. This human machine will make the most of the mechanical parts already attached to the vehicle. ADAS, Advanced Driver Assistance Systems, are becoming smarter with the advent of Artificial Intelligence technologies in this field.

Update System

Manufacturers of the cars will be able to update their device through the air. Internet has always been a major asset of automobile industries. With this innovation, along with AI techniques, development in technicalities and upgrade of a vehicle will become a much easier task and on the fly.

Infotainment Systems

In-Car Entertainment, ICE or In-Vehicle Infotainment, IVI are now enabled with AI which are capable of providing personalized entertainment as per your appetite and liking.

Security Advances

Advance Vehicle Security System that uses the GPS and GSM system to prevent theft and to determine the exact location of vehicle is now equipped with AI that can notify the user of a threat which is detected nearby. Infused with audio sensors, it can only work for the voice that it recognizes. Defense against any threat is achieved by efficient sensors piloted by AI capabilities.

Transportation

Semi-Automated, AI-aided truck delivery has already been tested successfully, which has a huge potential to provide a new dimension to the transportation business. AI will certainly take over the complete automation of truck delivery in future. Apart from that, AI and Machine Learning has a huge impact on other critical transportation requirements like Route Optimization, Speed Regulation, Optimization of Logistics and Network Distribution, and so on.

Banking and Finance

Fraud Detection

Artificial Intelligence can detect even the minor frauds in financial transactions that might go unnoticed under a human eye or any other conventional verification systems. Deep learning based algorithms built on Neural Network have shown promising results in this area and banking and financial institutions have started adopting it at a very fast pace. A similar kind of approach can be applied to different kinds of frauds in e-commerce and many other industries.

Counterfeited Documents

It judges the behavior of the expenditure of an amount on a certain baseline. Artificial Intelligence can detect counterfeit signatures and handwritten statements by running a single scan over them. Security is said to be the top priority of any stock market or finance center. By inducing some AI-related algorithms, security of such areas can be looked after in a very efficient way.

Algorithm Techniques

Be it transactions or stock trading, AI detects a pattern and starts altering its own techniques to process the numbers that are inputted in the numerical, after going through enough processes, which are then represented as predictions and alerts using Probabilistic methods, Fuzzy Logic, and so on.

AI Vision replacing Barcode Reading

Though barcode reading has been around for quite a while now, AI vision is one of the most efficient alternative of Barcode Reading. Image recognition could also allow customers to add products to shopping lists by taking a photo or by recognizing similar products or items.

Robo-Advisers

Robo-advisors are in-built finance guides that provide you with financial planning under the least human supervision. Combined with the Chatbot feature, the kind of AI can provide the best advice-giving experience. The advices provided are quite satisfactory and these smart advisors are well accepted across many financial institutions.

Innovative Capabilities

AI has the ability to innovate in a new condition, and that is what keeps the users updated and satisfied. It can start chatting with you the way a normal person would do in an intelligent manner, equipped with all background of the conversation and the context. It can come up with innovative suggestions, recommendations, and predictions by historical data and market analysis. These algorithms can formulate graphs and different strategies on how a project or a market will behave in the future.

Analyzing Audio Data

Calls from different centers around the world are processed and looked into. Not every company has enough employees to appoint on attending every day calls. AI, on the other hand, provides ready-

made solutions to the problems that callers talk about on call. Its Audio Data analysis is what enables businesses to draw inferences from the voice interactions with their customers in an automated way.

Finance Journalism

Finance journalism is putting an entry of every transaction taken while the business blooms. An AI can do the task far more effectively. AI is very effective with memory and number, and when time demands, it will have the entire record stored in it and can even help out with the graph making and statistics, if the need arises, with all identified patterns of the transactions.

Cerebellum Capital

The Capital firm will leverage AI to constantly make changes in the program by itself. It changes programs with respect to all other parameters and makes important investment decisions. It tests, assists, remodels, and modifies the finance systems when it thinks a change has been made.

An AI Strategist

An AI algorithm can set aims and goals for a company or a firm. An AI keeps in mind the challenges that the company might be facing in the coming years. It can also warn with an alert system and can act as an advisory system on a strategic level of an organization.

Retargets Potential Customers

Banks might need to reach out to some clients every now and then to target them for new or existing products. This job is made easier by the AI who can spot the existing and potential customers and monitors their latest research and interest on different banking products and services.

Create a more Efficient Sales System

If you want your clients to reach you more readily, then the way your AI works things out can be tailored to achieve the best of results in

terms of accuracy and efficiency. Integrating AI into CRM is a great way to make the sale system most effective.

Works for Multiple Devices

While making products and services as personalized as possible has been a challenge, making it readily available across many devices is even harder. A customer usually uses more than one device. AI aims to provide the same level of assistance by reaching through every one of those devices in a consistent manner.

Empower Store Workers

Contrary to a belief that AI is replacing humans, AI has become a backbone to many weak ones. While online customers experience with Chatbot, the AI that works with store workers also aims to make their marketing as interactive as possible.

Improves Recommendation

While keeping their interest under consideration, the AI programs keep on improvising with the changes it encounters. It even studies the behavior and levels of distaste that a person shows when he encounters a product made by that company or any fault in the product. Similarly, it tunes recommendations for positive responses.

Helps with Website Navigation

The main job of an AI is to make a job as easy as possible for humans. This is also applied to computer systems. Not every one of us knows how to navigate through a website, and not each one of us is that tech savvy. Specialized AI-intuited websites make it easier for the new users to access every information on the website as easily as possible.

Online Customer Support

With natural language detection technology, AI makes it easier for the customer to interact with the company as much as possible. It's a level up from the Chatbots or can be considered as Intelligent

Advanced Chatbot, which can simply take the customer experience to a completely different level.

Biometric Technology

Of every other AI technology, this one is the most interactive with humans. The Biometric technology has the capability of studying the structure of different human body parts and recognize a person on the basis of the physical analysis. Biometric authentication is treated as the most accurate and the best authentication technique till date.

Manufacturing and Design

Airplane Design

An airplane consists of more than 3000 mechanical parts. All these parts need to fit together well. An intelligent Artificial Intelligence software is used to ensure if each part is in the right place or not. Moreover, the use of automated engines is becoming extremely useful. The sensors induced detect any possible threat or climatic change that can in anyway harm the plane. Sensors and many such electrical parts that need to work on variable conditions are controlled by AI algorithms.

Blueprint Designing

For an AI to be efficient, it must be able to do the work that can only be done by human expertise. With Graphical Algorithms, it can produce blueprints for the required conditions. The process requires administrating the different ways a town or a smart city is built for, for which efficient Geo-analysis needs to be done. Turns out, Artificial Intelligence masters in this over human experts.

Architecture and Town Planning

AI has been assisting engineers in building and construction for quite a while now. It doesn't only design, it regenerates as well. The symmetrical design of some buildings is seen following a specific pattern. This pattern or series is decided by powerful AI-based programs.

Artificially Designed Intelligent Machines

Intelligent Machines are everywhere today, and Industrial Robots are the best examples. These robots are used for monotonous critical tasks, and they replace manpower at a huge scale. Automation using robots has a huge potential of cost optimization and brings excellence in manufacturing and production.

Graphic Designing

Designing is about being creative and not following a structured set of rules. It's a myth that the graphic designers don't have to do mechanical or logical work, rather it's completely a creative field. Here, the AI can prove to be exceptionally creative; moreover, it will never reach a state of creative saturation.

Smart Factory Technology

With the smart AI technology, a company's output is visibly improved. The employees need assistance with everyday tasks and the AI robots do the leg work and brain work, which can be exhausting for humans.

AI-Optimized Hardware

The AI-optimized Hardware is the one which can execute AI algorithms efficiently. Many companies are already in the race of developing AI-Specific chips that will enable and enhance Deep Learning and other AI techniques. The users won't have to worry if their system is updated enough to run an AI program.

Decision Making

AI has the ability to learn and regenerate based on the external conditions and its learning. It is an efficient aiding system for any decision-making process in any business as it has the capability to interrogate a huge amount of historical data and draw inference out of it, which can be a great help in any decision-making process.

3D Printing Technology

The 3D printed images are created by using Additive Technology. This enables the systems to look into the physical design closely and make necessary amendments before it is put into construction. The technology asks of great geometrical skills that only a smart machine aided with AI can master.

Animation

With a graphical design algorithm, we have begun making the most out of AI. AI helps out not only with the images of cartoon or movie characters, but also with the audio effect. It generates voice and body language of a character. In some cases, AI might need to study the human movements to bring out perfection in the character that it designs on the screen. Also, it can superimpose the human emotions into a character's face.

Education

Grading

Grading a huge number of students can be a tiring task, especially when parameters of the grading system are not so straightforward. With AI-equipped technology, some scanners or optical character recognition technologies can go through test papers at a rapid rate. They grade authentically and efficiently, and the process is fast and adequate.

Educational Software

Educational software has been in practice for quite a while now, but with AI, it's different. The AI educational software provide personalized education. They interact with humans at a personal level and understand that each student has different traits and abilities.

Course Improvement

Update and refresh is the major aspect of education. With the world changing at a rapid pace, teachers need to do research-based studies. The AI software can point out which areas of a syllabus might need

extra attention and which material needs to be updated or replaced altogether.

AI Tutors

Not every one of us is able to grasp the concept at the first time. AI tutors are a personal teaching assistance. They provide help to the students after the school hours. Thus, putting a load off a teacher.

AI effects how we interact with new information

Google makes the most of this technology. Every now and then, the demand for new resources and facts accelerates. An AI technology can keep an eye over it and modify the research engine or any other resource that we choose to use.

Grammar Correction App

This doesn't necessarily help out with education, but definitely enhances the student output result. The AI is made to learn all the grammar rules and correct the mistakes made by the user as he goes on typing. For most of us, it has proven to be effective. Unlike the word processor, it helps with sentence and paragraph structuring as well.

Alter the Role of Teachers

We know that AI has been assisting the teachers with grading, attendance, and tutoring. If this continues, AI might be able to replace the vocal role of teachers as well. While this might sound threatening to many, it's not. Teachers can always take help from the newly equipped AI systems but yet have a dominance over them.

Educational Simulations

Simulations, such as a flight and drive simulation, have been in practice for quite a while now. These simulations are easier to create than their real-life counter parts. They eliminate the element of danger and monitor the candidate's immediate reaction to those dangerous

situations. With the help of AI, these reactions and situations are taken into consideration and processed to provide adequate information for the report as output.

Smart Data Gathering

AI can decide for the curriculum far better than humans ever could. With its better connectivity to the world and smart internet research program, it learns the adequate need to expertise of today's world. It can decide what information would students need in their practical lives and what makes studies more interactive.

Creates Better Observers

With the constantly changing world, it gets kind of impossible to change the outlet at which the students can ponder their research. AI can form such conditions that enable the students to monitor the nature without having to interact with it. Observation techniques of the students can be enhanced by providing them with practical methods.

Retail

Websites that Evolve with You

With self-learning algorithms, these Webshops evolve with your needs. They keep a supervision over their searches and formulate the items that will be needed the most in the near future. This algorithm keeps updating based on the behavior, age, interest, and gender of its visitors.

Smart Assistant

For a long while, Chatbots have given you automated answers. Now the developed Chatbots give professionalized advice and keep on learning with the way you talk to it. It takes in the data and improves. The self-learning capability of an AI is seen as most effective over here.

Better Advertisement

After some days of interacting with people, AI can be enabled to know where a retailer should place the advertisement. The ad is then placed exactly where it would attract the most customers. It saves the firms from spending too much of marketing that will go in vain.

Loyalty Programs

To most of us, personalized treatment ensures loyalty. These loyalty programs are specially designed to maximize customer support. The closer a company would get to its customer, the better the output will become. This is done by AI by taking into account the personal needs of a client.

The Robot Knows You

The robot won't be a machine like you would expect it to be. It's designed to have a nature as close to that of humans as possible. It will be warm, welcoming, and will try to understand you. The AI is so designed so the humans would open up to it at the maximum. This lets the organization or the company know the most about you in a virtual manner.

Style Advice

These robots are the nearest to humans as possible. They provide you with style advice by projecting clothes and accessories on to your body so as to enable the users to choose wisely.

Attracts Attention

Admit it or not, the presence of Robots is intimidating. The more technically advanced your firm is, the greater will be the client's attention. Robots provide an artistic vibe and their presence is satisfying.

Keep the Products Up-to-Date

AI helps with the filtration. The only products that it intends to keep on the shelves are the ones in demand.

Solves Business Challenges in Different Areas

The world of marketing is never predicted. Anything can happen anytime. AI provides flexible solution for marketing, sales, and CRM systems. For example; Getty images have successfully launched its successful leads by targeting the right kind of clients using AI. Similarly, there are many companies that have started leveraging AI technologies to address business challenges in many different areas.

Smartphone Updates

It connects to the user directly through their phones. The Application installed will be updated with time. The stock market will also keep on getting the updates of how the user has been modifying his needs. Trust me, AI is working behind the scenes for all these, some way or the other.

Purchase Prediction

Sites like Amazon aim to create an algorithm that will predict exactly what you need and deliver the item before you even order it. The algorithm will be based on the machine learnings developed from your continuous visits, once the purchase is predicted.

Personalized Use of AI

Household Jobs

AI has been here for quite a while now. Robots made are now helping people out with house jobs such as cleaning, cooking, dusting, and so on.

Accompany You

It provides us with the company that we need. Some robots are even created to only let us cuddle them. Robot pets are gaining popularity. Everything else just makes your life easier by making you feel accompanied even on your lowest days.

Entertainment Purposes

With Siri put in Apple phones, it is seen that AI has been used for entertainment purposes. The entertainment market of AI is continually growing. It is entertaining to note that the AI is mostly female because the female voice is pleasant to both males and female. Just kidding!

Household Items

Homes controlled entirely by AI are being made. These homes are too friendly to its resident and makes living easier. For example; the lights turn off every time you lay back and the door opens every time you come near them.

Helps You Choose

These programmed AI help you out with lifestyle choices while keeping in mind the budget at which you live in and other things that matter in your life. It even considers the personal taste. Just like every other AI, this one develops at the pace it is being used.

Your Personal Motivator

It is no doubt that, soon, AI will be able to beat humans even in emotional cases. A person being attached to an AI-enabled Robot seems like science fiction, but it will become a reality in a short while; it's going to take care of not only your material needs, but it will also support you emotionally when situations demand it.

AI Amusement Parks

AI-themed amusement parks have robots who will entertain you the way you would want humans to do. This is yet an idea to be made real. Such amusement parks will let you live a life of your own without having to deal with any circumstances in the end.

Video Games

Video games such as **Call of Duty** and **Far Cry** make extensive use of AI. The enemies inside the games will take notice of the maneuvers

and conditions and will use them to predict things necessary for their survival. Although this use of AI is implicit yet, a huge amount of money is spent each year to upgrade the game because of the market demand.

Body Trackers

To enable the game to be controlled by your body, AI is infused in the sensors that look into your bodily movements and enable the mobility of the object on screen. These body trackers require efficient trackers and exceptional neural and physical transmitter with high processing algorithms.

Universal Translator

It can translate face-to-face conversations in real time. It uses the **Neural machine translation** (**NMT**) technique and takes into account the speech made by a person. It takes it in as a jumble, then rearranges it until it starts making sense. It breaks down samples of words and recognizes them to the maximum. That is also how the universal voice recognition system works. Microsoft and Google Translator uses AI technologies for text and speech translation for face-to-face conversations in more than 50 languages.

Military

Unmanned Air Vehicle

These vehicles seem unmanned because of their autonomous design. Either they are remote controlled or pre-defined in such a way that doesn't require a human to run them but aided with AI capabilities. Although these vehicles are difficult and expensive to make, they have been gaining popularity to minimize the human resource damage.

Military Simulations

Soldiers are being trained by keeping them in specialized cells where some dangers are imitated with AI techniques. These simulating exercises make it easier for the combatants to fight, if the real danger such as that, arises.

Missile System

Such AI has been created which assists with the missile system of the military. It will detect it when the time is right and detonates a weapon. It doesn't even need to be commanded. Though this technology is dangerous, some technologies are irresistible to try out.

Anti-Ballistic Missile System

Anti-Ballistic missile system works on unique principles. It detects when a missile is to be detonated and tries to muster a defense against it. It learns about the projector and efficiently decides the location at which the defensive missile is to be exploded in the atmosphere. A number of countries around the globe have developed this technology.

Killer Robots

This seem like the ultimate future of warfare. Robots trained to be warriors are unbelievable yet threatening.

AI Drones

AI has been used in drones for a while now. Drones and helicopters equipped with smart technology can get instant reports of the area under operation. AI has the capability to learn from the images that it gathers. This is exactly what the AI does here—it learns the visuals that it encounters.

Autonomous Military system

It is highly likely that the AI will be able to decide for itself where and how it is going to execute an operation. Thus, not needing human intervention at all. It is still under consideration whether the decisions made by Robots will be as authentic as that of a human commander.

Security Surveillance

It is difficult for a person to monitor 10 security monitors at the same time. AI can do this by its picture recognition software. Once it

detects an activity that it should not, it will alarm the person who is supervising the surveillance.

Spoken Word Recognition

Not every call made from one enemy area to another can be looked into. Therefore, AI has the potential to judge not only the words from either side, but also the tone and if it is altered. This can prevent people of two different areas from sharing sensitive information.

Specially-Designed Satellites

These satellites are the smartest and are equipped with the latest, most-effective technology. It lets an army look into the affairs of the enemy areas. If an unusual activity is detected, the AI warns the army. This technology, like many other artificial technologies, works on speech, pictures, facial recognition techniques, and so on.

News

Generation of News

Let it be Yahoo, Google, or Fox, each one of them uses AI to develop news for its customers. It writes simple articles about sports, fantasy, finance, and current affairs. It won't necessarily do an in-depth report about an investigative topic, but it will give an outline about the area under consideration.

Wordsmith Applications

These are some applications that work to help out with the report and news story writings. It requires some help from the actual author, but it certainly makes the work of writing a lot easier. This kind of AI is being used in mostly Data-Driven companies.

Music and Movie Recommendation Service

Whenever a new movie comes out, AI will be there to recommend its targeted audience of the movie. It certainly depends upon the

researches a person makes from his or her device. By monitoring the choices you make, it can help out with recommendations that is continually generated.

Helps Out News Station

These news station requires fast-processing computers and can't look after these systems all the time. With cheap parallel computation and AI technologies, the task becomes so much easier for news stations to process the ongoing world and the information that it continually receives.

Better Algorithms

These better algorithms assess the news that people want to hear. This is also why it is rare that the news station casts dull or boring news. The rating is kept in mind by constantly improving the material they broadcast.

YouTube

YouTube is a channel that enables you to broadcast yourself. You get more subscriptions through AI. The only devices where your channel's advertisement will show up is the one where the user will be interested to know. AI keeps on modifying its searches based on your search history.

Smarter Newsfeed

Facebook has hired smarter AI programmers to enable a newsfeed according to a person's recommendations. This is why we have begun seeing things that we have interest in on our Facebook wall. This Newsfeed is mustered by keeping an account of each and every thing you do on your social media account.

Science and Technology

It keeps on updating according to the new scientific inventions that are made. It lets scientists and engineers of common interest get close to each other and discuss upon a topic together.

Eliminates the Language Barrier

News formed in one language can be translated into another because of its natural language detection capabilities. People from all over the world can come closer together and ponder over one news or update at the same time.

Chapter 21

Impact of Modern Automation on Employment

Automation is gradually proliferating almost every aspect of our lives and almost every industry. Whether it is banking and financial, automobile, aviation, manufacturing, customer service, healthcare and medicine, it's everywhere and almost every day, automation is conquering more and more new fields. Some experts and economists have already forecasted that there's going to be some degree of unemployment in many sectors due to Automation and Artificial Intelligence which they term as 'Technological Unemployment'.

The most important question that arises today while an organization is planning to introduce any modern automation techniques is how the employees affected will react to it? Will they compatible with those tiny automation programs or will they start seeing them as a competition? Believe me; every management has gone through this sensitive aspect while deliberating an automation initiative in their organizations.

But the good news is that if we look back in history, many of the great inventions happened in the last 200 years has been designed to replace human labor. And on numerous occasions, the scholars, experts, and economists had raised an alarm telling ,'We will be running out of jobs and we are making our skills obsolete'.

But fortunately, every time those alarms turn out to be false in the past.

For example, when the Automated Teller Machine (ATM) was introduced to automate the basic and routine banking functions, it did not destroy the role of a Bank Teller; rather banks operated more efficiently and Human teller role shifted to do more complex tasks. As a result, allowing banks to open more and more branches than it had been before leading to an overall increase in the number of banking jobs.

Is it going to be the same this time?

As per a report published by World Bank, estimates around 65% of Indian service sector jobs are at risk due to automation. And India isn't alone. In China, it would be around 77% and similarly other countries. In Indian IT Service Sector alone, approximately 6.5 lakhs low-skilled positions are in danger.

These experts also forecasted that the new wave of modern automation is ,Blind to the Color of your Collar'. That means it's going to affect both Blue as well as White Collar jobs. More and more routine office jobs like customer support and clerical work will be affected the most, but even other semi-skilled and skilled jobs are also not fully safe.

Let's analyze why this time it's different than the past false alarms.

The industrial revolution has given the ,Mechanical Power' to the machines, the power to do repetitive things in a much larger scale, faster and more efficiently than a normal human can do. IT revolution in the 80s and 90s has given the 'Computational Ability' to the machines, ability to process repetitive computational tasks in a much faster and efficient way. But this time, Artificial Intelligence has given the ,'Cognitive Ability' to the machines. Cognitive skills include ability to learn, analyze, reason, and apply those learnings. So, machines and tools that we are using are becoming more and more intelligent. Is it going to be a real threat to our employment?

Another group of experts has some different opinions; they argue that in the long run, automation actually creates more jobs than what it eliminates. Machines are best at completing repetitive tasks and increase overall productivity which frees up a lot of time for the employees to focus on ,'Intellectually Challenging' and 'Creative Works'. And automation and Artificial Intelligence will essentially complement human skills and capabilities rather than completely replacing them. They also believe that it's going to be an era of ,'Man and Machine Partnership'. Although, Artificial Intelligence will eliminate or reduce jobs which are repetitive in nature and less intellectually challenging, new forms of employment will take their place.

So, automation in many cases helps to redefine jobs rather than eliminating those entirely. Considering this shift in paradigm, only a four-year college degree may no longer be sufficient for lifelong employment in the future. Rather, it's going to be Lifelong Learning and acquiring skills throughout life to remain relevant in the industry. Automation is not about altogether replacing the human element, but about elevating the role people play and the value they bring to their job roles. While there are some strategic challenges that automation may bring with itself, it has become a necessity for almost all organizations today and we need to also consider the merits it will have on the organization.