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Artificial Intelligence (AI) and its Prospects for the Supply Chain Sector

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Abstract— *Today's world is all about artificial intelligence, which is predicted to be the biggest digital disruption in the next ten years or so. Still, though, is the question: Are we prepared for it yet? Should I say what it can do against us, or do we need more time to realize what it can do for us? There are a number of debate topics that highlight the advantages and disadvantages of any technology upheaval. AI is not a magic show; rather, it has been existing for a very long time. The reason we did not discover it sooner was because of our poor handling skills and a severe lack of data in the past, which prevented us from processing information and creating the past. However, modern infrastructure is capable of sifting through data, creating several algorithms, and growing on its own. You see, that's machine learning. But how much do we really grasp it, and what does artificial intelligence (AI) or machine learning mean for the supply chain industries?*

Keywords— Artificial Intelligence, Machine Learning, Supply Chain, Manufacturing, Data, AI Pattern, Data Science, Algorithms, Use Cases, Industry Revolution 4.0, healthcare, travel, transport, retail, education, agriculture

I. INTRODUCTION

Artificial intelligence will help us to do almost everything better, faster and cheaper, but it will also bring about some considerable challenges that we need to start preparing for now. So, what is AI? - *"*Artificial *intelligence is software or a computer program with a mechanism to learn. It then uses that knowledge to make a decision in a new situation, as humans do. The researchers building this software try to write code that can read images, text, video, or audio, and learn something from it. Once a machine has learned, that knowledge can be put to use elsewhere.* [2]*"* Alan Turing is considered as the father of the modern Computer, back in 1947 he talked about AI. Programs that behave (externally) like humans. The history of AI begins with article from- "Turing, A.M. (1950), Computing machinery and intelligence, Mind, Vol. 59, pp. 433-460".

AI can be applied to just about every situation and offers the possibility of transforming our experiences, making things better and more effective.

Here are just a few of the fast-growing technical applications for AI that are currently in place:

- Static Image Recognition, Classification and Tagging: These tools are helpful in a wide array of industries.
- Algorithmic Trading Strategy Performance Improvements: This has already been implemented in various ways in the financial sector.
- Efficient, Scalable Processing of Patient Data: This helps to make patient care more effective and efficient.
- Predictive Maintenance: This is yet another tool that is widely applicable to different industries.
- Object Detection and Classification: This can be seen in the self-driving car industry but has potential for use in many other sectors as well.
- Content Distribution on Social Media: This is primarily a marketing tool used with social media but can also be used to raise awareness for non-profit organizations or to quickly spread information as a public service.
- Protection from Cybersecurity Threats: This is an important tool for banks and systems that send and receive payments online. [3]

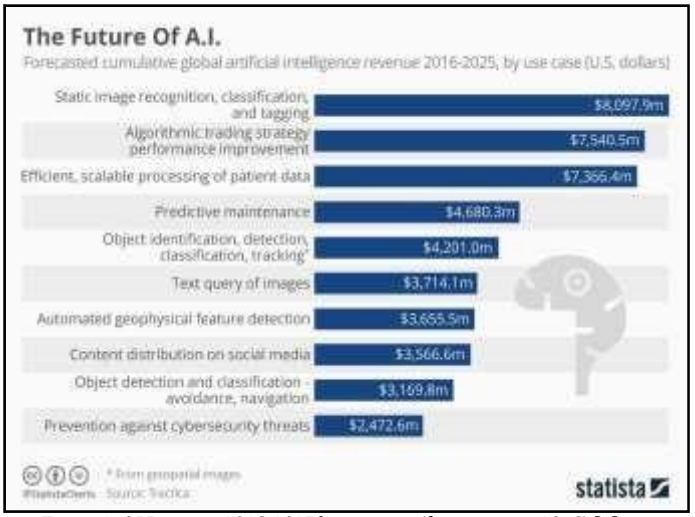

Figure 1. AI Revenue 2016-2025 by use case (from statista, 2016) [1]

A. Fourth Industrial Revolatuin and AI Concurrence

In recent years there has been an enormous digital revolution, which initially began in the 1980s with the rise of personal computers and the birth of the Internet.

Klaus Schwab, founder and Executive Chairman of the World Economic Forum, was the first to call this new era the "Fourth Industrial Revolution [4].

Some experts believe that the technologies included in the Fourth Industrial Revolution are generally of equal

importance. However, I would argue that artificial intelligence is at the core of this particular revolution, making it the most important element and a subject about which we should all learn as much as we can [3].

With electricity becoming easily accessible, mass production and assembly lines were introduced during the Second Industrial Revolution. Andrew Ng, a leading expert in the fields of artificial intelligence and machine learning, has been quoted as saying, "Artificial intelligence is the new electricity." Essentially, this means that AI is the crucial element for this era and will be used to power other technologies as it becomes embedded in our lives[3].

There are incredible opportunities available to anyone who truly understands the potential created by the Fourth Industrial Revolution. Want to be relevant in the future job market or create a successful business venture? Start studying artificial intelligence, 3D printing, robotics, the Internet of Things, autonomous vehicles, nanotechnology, and quantum computing, and you'll have more opportunities at your fingertips than you could ever fulfill [3].

An additional challenge comes from the way that technological growth can change our lives very quickly and dramatically. How can we cope with these kinds of changes? While it is important to learn as much as possible about each new technology, it is also crucial that we make an effort to appreciate the characteristics that make us uniquely human, valuing skills like social intelligence, emotional intelligence, and creativity[3].

Lastly, we are faced with the challenge of not only understanding these technologies, but also of knowing how to use them well. For many years, literacy was the most valuable currency necessary to succeed in life. Within the last few years, however, digital literacy and the ability to understand digital marketing have become the primary skills needed to help people achieve success[3].

B. Is AI Good or Bad ?

There are many important benefits to AI that are often forgotten about. Here are just a few more advantages that AI can offer.

- AI and Poverty: AI will be used to fight extreme poverty and improve quality of life for people in remote areas.
- AI and Everyday Life: AI and robotics can take on tasks that are dangerous, boring or difficult for humans.
- AI and Travel: AI will power autonomous vehicles, which will help to generate improved traffic efficiency, cheaper mobility options and greater safety on the streets.
- AI and World Peace: AI research and development can be used to help in the quest for world peace.
- AI and Businesses Opportunities: AI will create amazing opportunities for entrepreneurs and businesses worldwide and also increase productivity.
- AI and Business Processes: AI will generate improvements to almost every business process.
- AI and Industries: AI will drastically transform almost every commercial industry.

As is the case with all new technologies, it is also important to critically analyze the negative impacts AI may have. Arguably, the most daunting challenge we will face due to the AI explosion is how it might change us as humans. As AI technology continues to grow, it will become increasingly more vital for us to recognize and celebrate the traits that are innate to humans. Some Additional challenges with AI:

- AI and the Job Market: AI will significantly change the job market and might create a considerable amount of job losses.
- AI and Loneliness: The growth and development of AI will most likely increase loneliness and isolation for many people.
- AI and Ethics: It is of the utmost importance to establish ethical guidelines regarding the development and use of AI-powered products and services.
- AI and Political Propaganda: AI is already being used for political propaganda and this practice is only increasing over time.
- AI and Geopolitical Inequality: The growth of AI could lead to significant geopolitical inequalities around the world.
- AI and Fear: The rapid growth of AI is generating a lot of unnecessary public fear and confusion.
- AI and Weaponization: Unfortunately, AI can be weaponized, creating serious challenges that must be addressed quickly.
- AI and Hype: There is a great deal of hype surrounding AI, which many perceive as an exaggeration of the possible benefits of AI.

II. USE CASES FOR AI

Let's look at some of the use cases for AI which are transformational and revolutionary.

A. Travel

Did you know that travel is one of the largest industries in the world in terms of global economic contribution (direct, indirect and induced), with over $7.6 trillion in value in 2016 alone? [5]

- Hotel Bookings by Voice Command: The ability to search by voice command is becoming more powerful and effective every day. Soon, we'll find voice-powered reservation systems in place at many hotels. For those who own hotels and similar businesses, it is a good idea to learn what kinds of results come up when you search for your hotel or tourist attraction by voice on Google.
- AI Concierge Services: Both Amazon (Alexa) and Apple (Siri) want to be able to operate in hotel rooms around the world, serving as virtual assistants to guests by activating appliances and answering basic questions. Already, the Wynn Hotel in Las Vegas is planning to equip each of its 4,700 rooms with Amazon's Alexa to provide its patrons with a more modern and efficient experience.
- Travel Service Chatbots: As mentioned elsewhere throughout this book, AI-powered chatbots will soon serve as the primary method of customer interaction

for many businesses, including those in the travel industry. There are already several chatbots available through the Facebook Messenger platform. Many of these will also soon be available for use on websites for travel companies, helping clients to make reservations and answering their questions along the way. You can learn more about chatbots in the corresponding section of this book.

- Check-in Through Facial Recognition: Because of the many advancements in biometric technologies, facial recognition tools are being used more often in various businesses, helping people to save time at airports, in hotels, and even at large conferences and events. Facial recognition technologies also make it easier to identify and catch criminals, which in turn leads to better safety for those who are traveling or attending events at tourist attractions.

- Self-Driving Cars and Mobility as a Service: Over the next few years, we'll likely see many cities adapting to the use of more self-driving cars, buses and taxis. Since self-driving vehicles virtually eliminate the factor of human error, their use will greatly reduce the number of traffic accidents. Also, because many traffic jams are caused by the improper driving habits of humans, an increase in the number of self-driving cars will lead to a decrease in heavy traffic congestion [3].

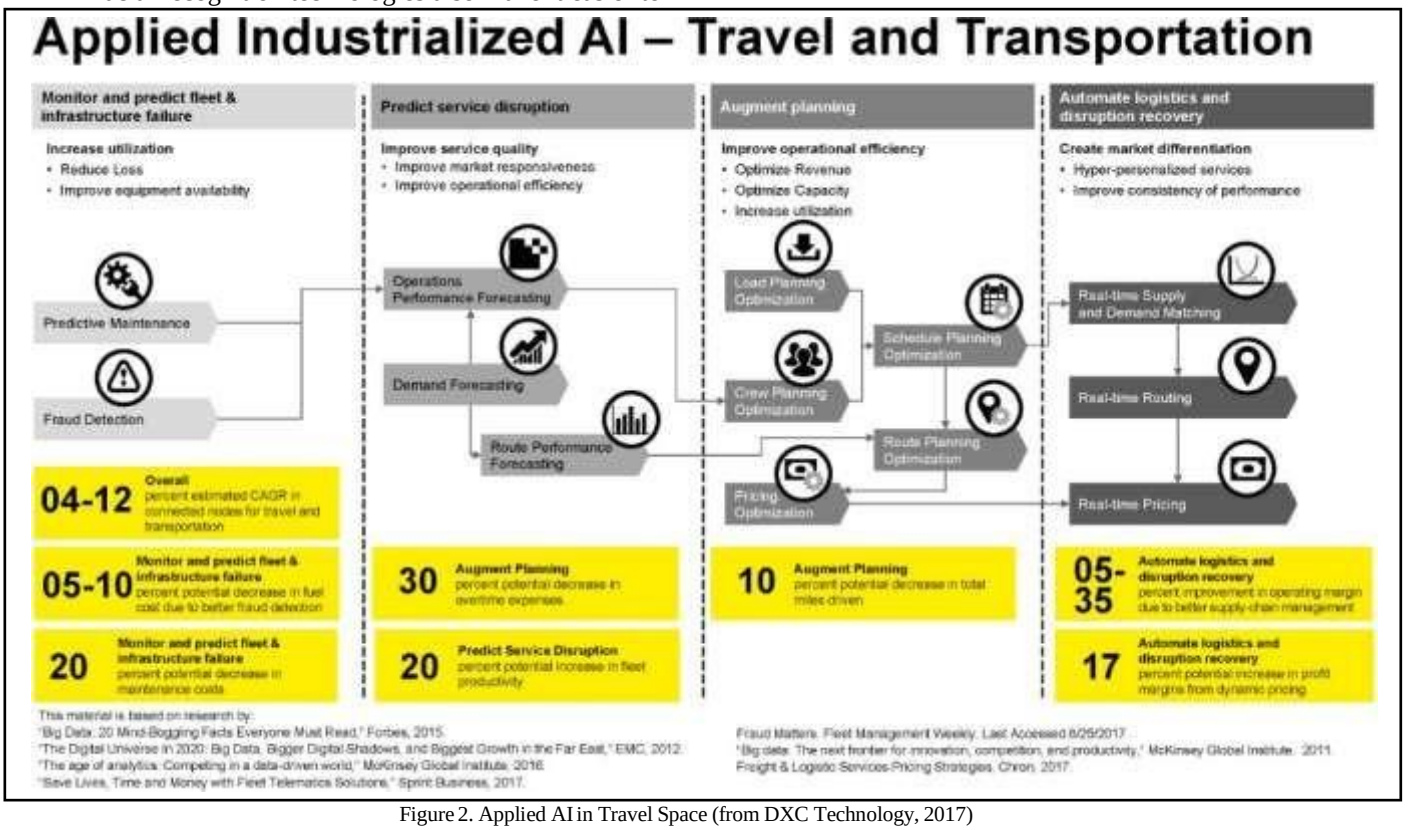

Figure 2. Applied AI in Travel Space (from DXC Technology, 2017)

B. Health Care

However, human health is quite complex and the use of AI technologies in health care can lead to several questions in regard to ethics. For example, who is responsible when a patient receives an incorrect diagnosis from their smartphone? Also, who should be able to access sensitive medical information about a patient who uses their smartphone to monitor it?

While there are certainly questions to be answered, there are incredibly helpful and exciting applications of AI software coming to the medical industry in the near future. According to Accenture Consulting's report, Artificial Intelligence: Health Care's New Nervous System, here are the top AI applications that will soon be available [6]:

- Robot-Assisted Surgery ($40 billion industry)
- Virtual Nursing Assistants ($20 billion industry)
- Administrative Workflow Assistance ($18 billion industry)

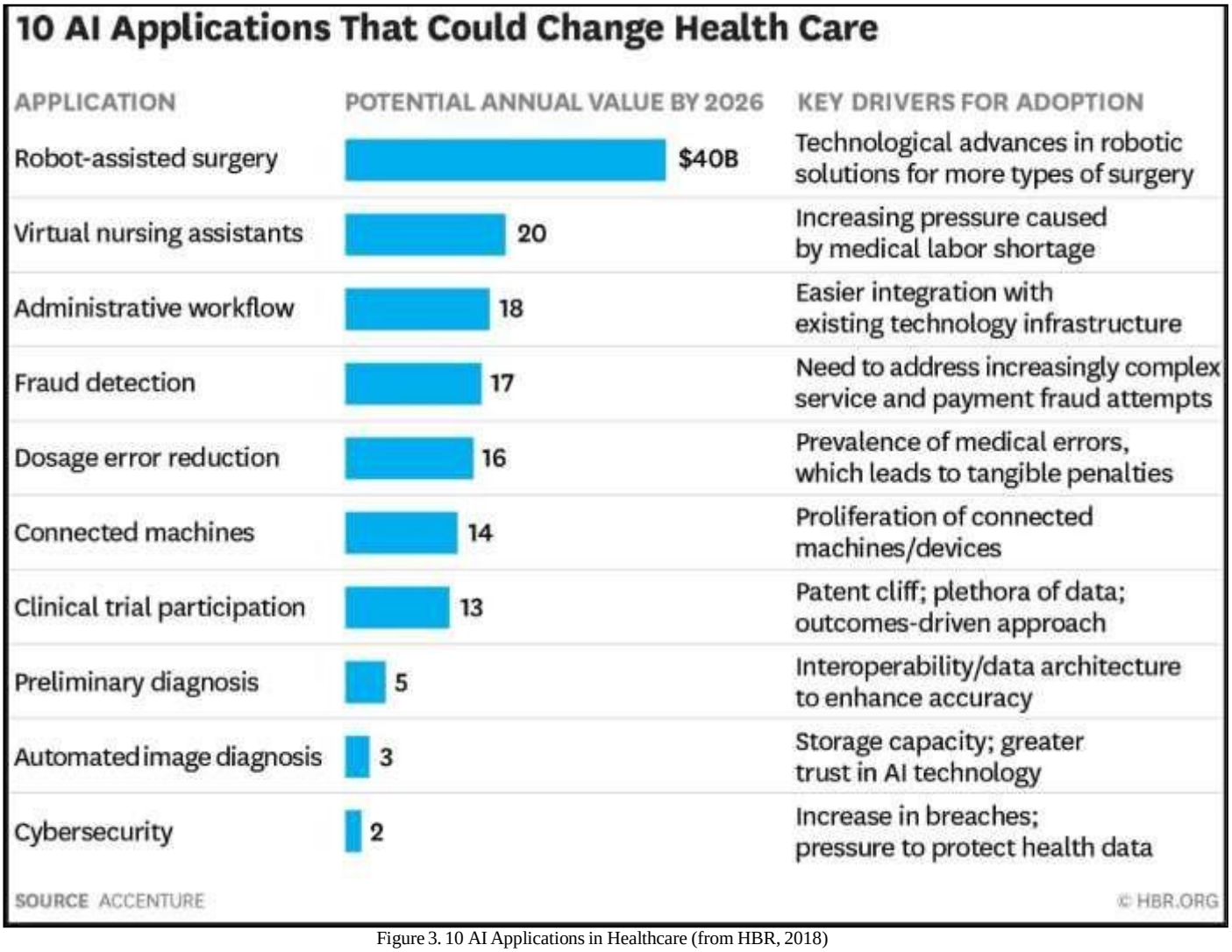

Figure 3. 10 AI Applications in Healthcare (from HBR, 2018)

C. Transport

Thanks to artificial intelligence technologies, transportation as we know it will soon be changed forever. The new kinds of transportation that are being developed right now use renewable energies or electricity and will be able to help people around the globe to travel faster and more safely than ever before.

These innovations are possible because of the exponential growth of various kinds of technologies, but especially due to the recent advancements in artificial intelligence.

- Hyperloop: This high-speed ground transportation network was originally proposed by Elon Musk, co-founder of Tesla and founder of SpaceX. Today, several companies are contributing to this effort and various cities around the world are considering how they can implement their part of the finished design. According to Musk, Hyperloop may be able to transport someone from Los Angeles to San Francisco in about half an hour.
- High-Speed Tunnel Networks: The Boring Company, also developed by Elon Musk, aims to ease traffic congestion in large cities by using a series of tunnels underground, reachable by an elevator-type system and a moving platform that can transport traditional cars much faster than they could travel on their own. Although many are skeptical about the feasibility of implementing this technology, if successful, it will create huge opportunities in big cities.
- Self-Driving Cars: Right now, every major car company, as well as a few of the other technology giants, like Google and Baidu, are working toward the development of a self-driving car. You can learn more about autonomous vehicles, including examples of their current phases of development, in later sections of this book.
- Self-Flying Aircraft: There are currently numerous projects benefiting from AI-powered flight technologies. One of the most interesting, the Kitty Hawk Flyer, which was developed by a company funded by Google founder Larry Page, is a fully electric aircraft that can be flown over water without a pilot's license [3][7].

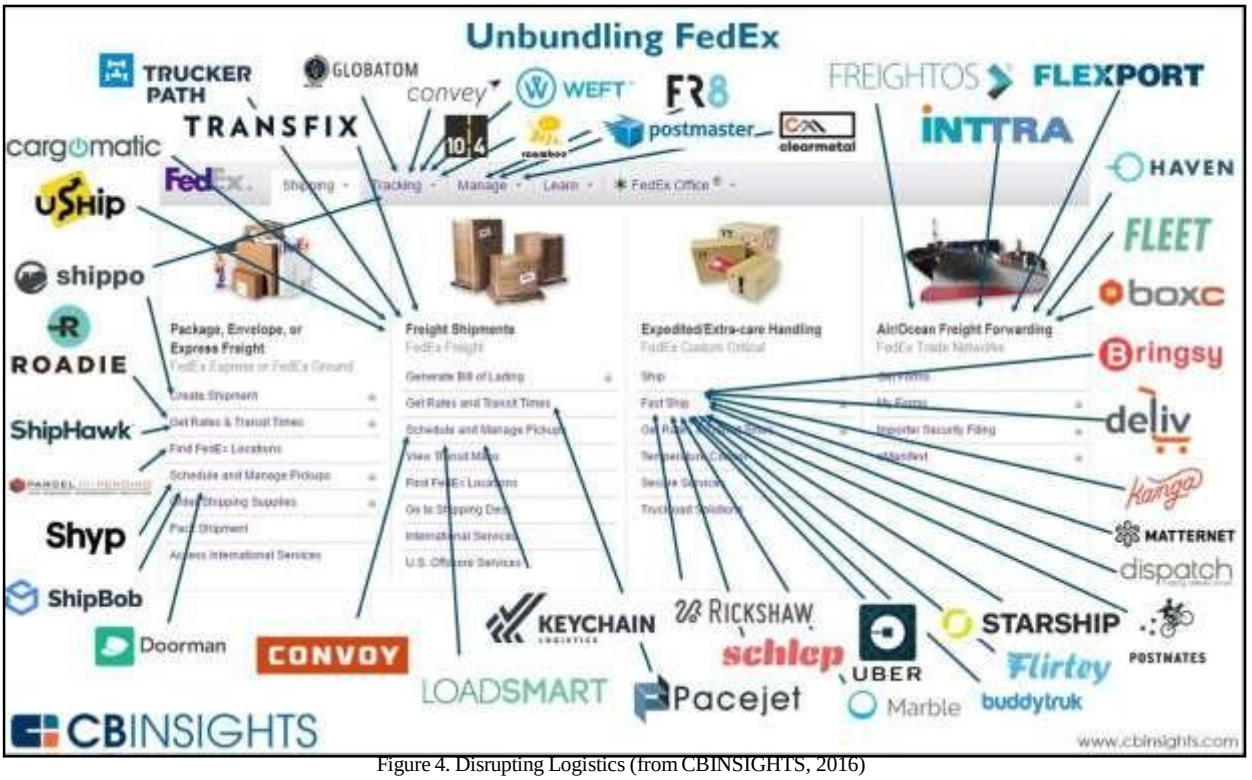

Figure 4. Disrupting Logistics (from CBINSIGHTS, 2016)

D. Retail

In recent years, technology has taken on a crucial role in the retail business, as e-commerce solutions have been developed and small, local stores without effective online strategies have been forced to go out of business.

In fact, in the U.S., bankruptcies for retail stores have increased by 110 percent in the first half of 2017 alone, according to the research organization Reorg First Day [8].

Other shopping systems that work without human clerks are being developed all over the world. For example, there is a grocery store next to my office in Spain that offers four automatic payment machines. While their automation is not as high-level as Amazon's.

Several startup companies have begun to create robots that are specifically designed to assist in retail stores. They can perform duties like restocking shelves, notifying the manager of items that need to be reordered, providing basic information to customers, and even cleaning the store when it is closed for the night.

American supermarket chain Walmart is expected to introduce robots at 50 of its stores. These robots will help to manage inventory and keep product shelves in order. According to Walmart CTO Jeremy King, robots are 50 percent more effective than humans at performing the same jobs [9].

In the future, we'll likely see grocery stores that offer a blend of automated technologies and just a few human assistants to make sure that everything runs seamlessly for the shoppers.

In addition to automated payment systems and robots, biometrics is another way that AI will change the way retail stores operate. Right now, biometric technologies are primarily being used on mobile phones and in airports to scan fingerprints. However, facial recognition tools are gaining momentum in the marketplace and will likely be implemented in stores in the future, analyzing your facial expressions as you examine various products and creating personalized promotions based on the sensors' observations.

Biometric technologies have a huge potential for stores that are interested in personalizing their promotional efforts but are also cause for concern when it comes to consumer privacy.

On a larger scale, McKinsey & Company has begun to examine the macroeconomic impacts that are likely to occur from the use of artificial intelligence in retail.

Here are some of the findings from its report entitled Artificial Intelligence: The Next Digital Frontier, which discusses the kinds of benefits that can be achieved in retail with AI tools:

- 20 percent stock reduction by using deep learning to predict e-commerce purchases [3].
- 2 million fewer product returns per year.
- 30 percent reduction of stocking time by using autonomous vehicles in warehouses.
- 50 percent improvement in assortment efficiency.
- 4-6 percent sales increase using geospatial modeling to improve micro market attractiveness.
- 30 percent online sales increases from the use of dynamic pricing and personalization [3].

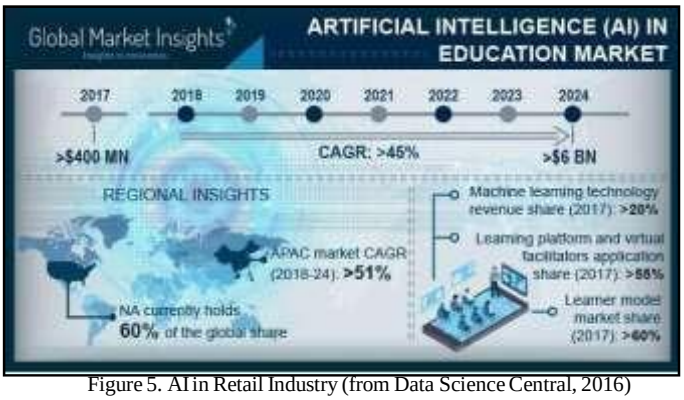

Figure 5. AI in Retail Industry (from Data Science Central, 2016)

E. Education

The exponential growth of artificial intelligence technologies will bring educational experiences and opportunities to a whole new level.

Here are four examples of how AI will impact education:

- Personalized Learning Platforms: Imagine a course in which 30 students begin to learn about the same topic online, but rather than having the same experience, the course could be personalized in 30 different ways, customized to the previous knowledge and skills of each student, making it a more enjoyable and successful learning experience for all. Not only could each individual student study at their own pace, but instructors could also provide each student with personalized feedback, support and motivation. As a result, each of the 30 students would maximize their own learning experience attained from the course, and student dropout rates would decrease.
- Individualized Artificial Intelligence Tutors: One application of this kind of tutor would be a personalized AI teaching assistant created for a particular course, to perform tasks such as answering basic questions from students regarding a given topic (such as deadlines or assignment formats), helping to keep students on track with coursework as needed, or providing information about the university or institution. In most cases, such AI teaching assistants could be run through voice recognition software, which would allow the students to speak directly to them. These AI tutors could also incorporate students begin to learn about the same topic online, but rather than having the same experience, the course could be personalized in 30 different ways, customized to the previous knowledge and skills of each student, making it a more enjoyable and successful learning experience for all. Not only could each individual student study at their own pace, but instructors could also provide each student with personalized feedback, support and motivation. As a result, each of the 30 students would maximize their own learning experience attained from the course, and student dropout rates would decrease.
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- Personalized Games: Several recent studies have revealed that playing games can be one of the best ways to learn something new. Creating effective games, however, requires a lot of time and creativity, which can be challenging. As we employ artificial intelligence tools, the generation of these kinds of games will become easier, allowing instructors to customize games to their students' personalities and learning needs. With these highly entertaining games, students will benefit from increased motivation and enjoyment, leading to better learning.
- Crafting a More Enjoyable Learning Experience: Another potential benefit of AI tools in the field of education is their ability to keep students engaged in the coursework by making the experience more fun. It is easy to see why students who have fun while they learn tend to remember the material better, making thelearning experience more effective. In the future, learning platforms powered by AI will be able to incorporate interactive tools designed to continuouslyengage the learner, dispelling boredom and lack of motivation [3].

Figure 6. AI in Education Industry (from Global Market Insights, 2018)

F. Agriculture

Roughly 70 percent of the fresh water supply in the world is used for agriculture? Agriculture is one the primary areas where AI can make a substantial impact on the sustainability of resources and our quality of life. Although agriculture is one of the oldest practices in the world, AI can provide new opportunities that will change the way we farm forever.

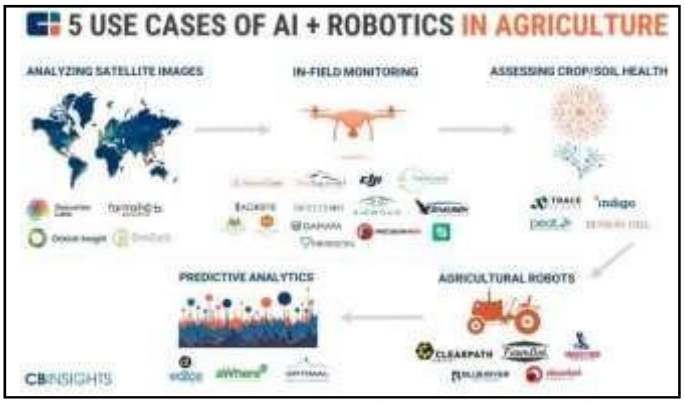

Figure 7. AI, Robotics, And the Future of Precision Agriculture (from CBINSIGHTS, 2017)

Here are some of the technologies that can make this possible:

- Agricultural Drones: These robotic, unmanned drones are able to monitor the growth and production of crops, while also identifying weeds and damaged plants. Additionally, they can be deployed to analyze the potential of a given terrain using cameras and other sensors for precision farming. Already, the market for agricultural drones is on track to exceed $1 billion in value by the year 2024, according to Global Market Insights [10].
- Autonomous Tractors: Self-driving tractors can reduce the workload on farm staff, while collecting information about the conditions and moisture of the soil from attached sensors. The data gathered and human labor spared by this kind of equipment can lead to better farming practices and lowered fuel and labor costs, offering a greater return on investment than traditional farming tools. Since the technology is in its early stages, it will most likely require some form of human participation, although the end goal will be completely unmanned operation [11].
- Vertical Farms Powered by AI: Vertical farming is the term used to describe the growth of crops in a controlled environment, usually without soil or natural light. According to a number of experts, this type of farming will help to ease food shortages around the world. Because of the delicacy of this kind of farming, artificial intelligence can be used to assist in its analysis and tracking [3].
- Based on research by Emero, the most popular applications of AI in agriculture appear to fall into three major categories:
    - Agricultural Robots – Companies are developing and programming autonomous robots to handle essential agricultural tasks such as harvesting crops at a higher volume and faster pace than human laborers.
    - Crop and Soil Monitoring – Companies are leveraging computer vision and deep-learning algorithms to process data captured by drones and/or software-based technology to monitor crop and soil health.
    - Predictive Analytics – Machine learning models are being developed to track and predict various environmental impacts on crop yield such as weather changes.

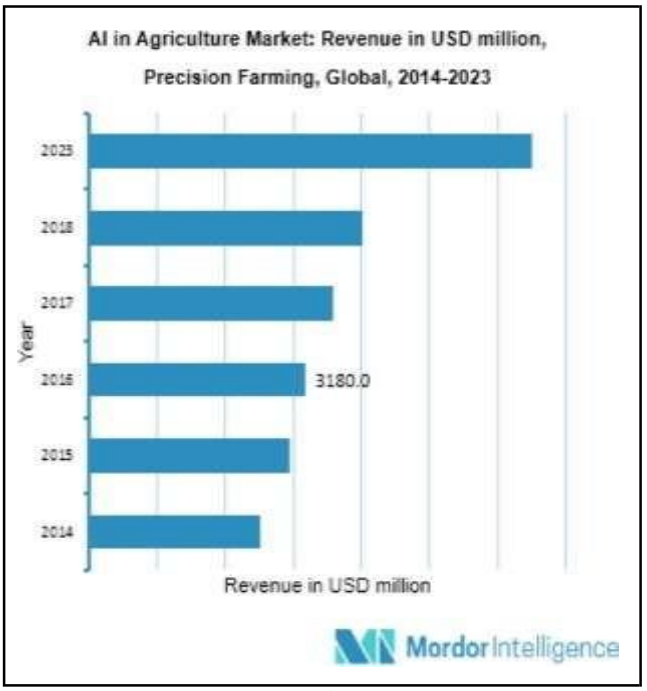

Figure 8. AI in Agriculture Market Size (from Mordor Intelligence, 2018)

III. RACE TO THE ROBOTICS

Today's robots are most commonly used for industrial tasks such as manufacturing, but they are becoming more and more commonplace for other purposes (e.g., medical operating robots, dog therapy robots). They are also increasingly being utilized for tasks that are too dangerous for humans, such as the use of drones in military situations.

The Robotics Industries Association (RIA) has announced record-breaking sales of robots in early 2017, with nearly 10,000 robots ordered in North America alone. Those orders were worth $516 million for the robotics industry. The statistics show a 32 percent increase over the first quarter of 2016.

Shipments of robots have also increased, with over 8,000 being sent to North American companies in the first few months of 2017. That is a 24 percent increase over the first quarter of 2016.

The majority of the robots ordered in early 2017 (53 percent) were for use in the automotive industry. Robot orders for use in other industries, including metals, semiconductors, electronics, food, and consumer goods, were also behind the boost for the robotics industry.

There are now about 250,000 robots being used in various industries in North America, according to the RIA. It has been estimated that there will be over 1.4 million new robots being sent to factories around the world by 2019.

Currently the European Union and China are leading the way with 65 percent of EU countries having a high average of industrial robots per 10,000 employees. However, China is expected to reach 40 percent of the market volume of industrial robots by 2019 [12].

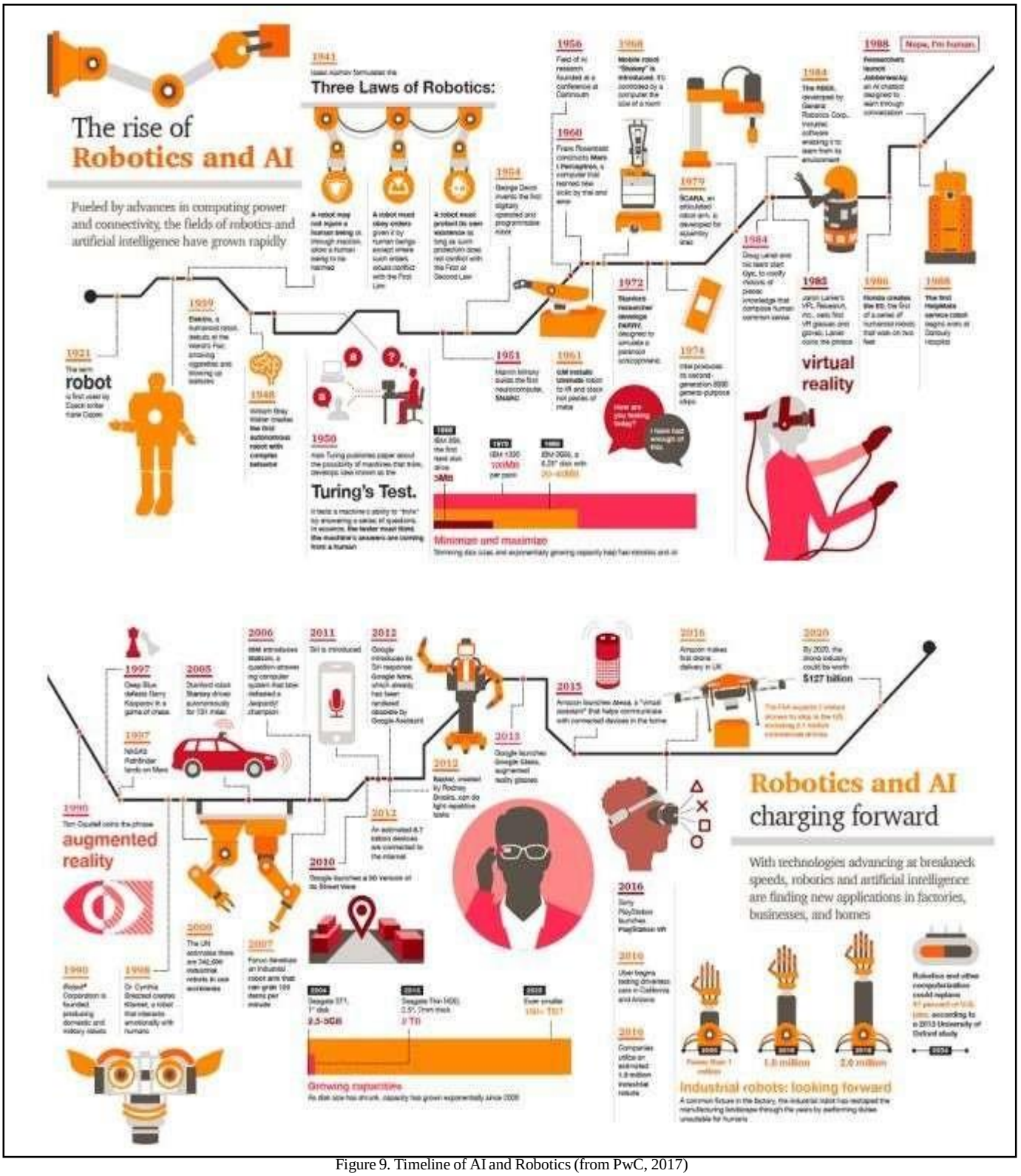

Figure 9. Timeline of AI and Robotics (from PwC, 2017)

IV. DAILY USE OF AI TODAY

There are plenty of ways that people already use artificial intelligence every day without even thinking about it or realizing it. Here are some of the most common examples:

- Smart Virtual Personal Assistants: Siri, Cortana, and Google Assistant are prime examples of widely used AI tools, and are covered extensively in other areas of this book.
- Personalized Media Recommendations: Have you ever used Netflix or Spotify? Each of these companies uses AI resources to recommend movies or music based on your previous selections.

- Smart Searches on Facebook: Facebook's AI tools allow you to search for photos by content using image recognition programs. For example, you can search for images related to "family" or "pizza" and the Facebook AI tools will find them for you.
- Product Recommendations: When you purchase something through Amazon.com, its machine learning algorithm provides recommendations for similar or related products that you might also be interested in buying.
- Google Searches: For many years, Google search results have been a direct product of machine learning, personalizing your results based on your location and past searches.
- Speech Recognition in Google Search: In addition to text-based searches, you can also input voice commands, which Google can interpret using AI technology known as speech recognition.
- Facebook Messenger Bots: Many businesses now use chatbots in Facebook Messenger to respond to everyday customer service requests.
- Online Fraud Protection: PayPal, the online payment system, uses machine learning for fraud protection by analyzing large quantities of customer data to help evaluate risk. AI is a key technology for all online financial services, since they are frequent targets of cyber criminals [13].
- Online Advertising: Online advertising works most effectively when enhanced by the application of artificial intelligence. For example, Facebook advertising uses deep learning algorithms to analyze ad performance data in order to understand how best to target the ads. This makes it much likelier that the ads will be viewed by, and clicked on by, the intended audience.

V. INDUSTRY EXPERT TALKS

Industry experts predict that by 2019, artificial intelligence will transition from a "Nice-to-Have" to a "Must-Have" technology. This is in spite of the fact that advancements in the realm of AI and machine learning can often seem too bleeding-edge to be useful in day-to-day business scenarios. Fortunately, many organizations are discovering tangible business benefits from utilizing AI technology in real-world use cases. Hear from leading data scientists and practitioners about how A.I. is transforming business' approach to decision-making and problem-solving across a variety of industries and marketplaces [14].

"We can virtually eliminate global poverty, massively reduce disease, and provide better education to almost everyone on the planet. That said, A.I. and ML [machine learning] can also be used to increasingly concentrate wealth and power, leaving many people behind, and to create even more horrifying weapons." --Erik Brynjolfsson, director of the MIT Initiative on the Digital Economy

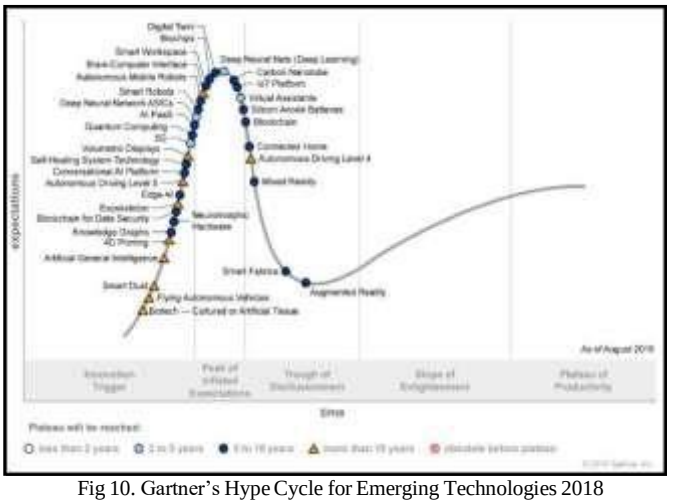

Fig 10. Gartner's Hype Cycle for Emerging Technologies 2018

Worldwide spending on cognitive and AI systems will reach $19.1 billion in 2018, an increase of 54.2% over the amount spent in 2017, according to IDC data. AI spending will grow to $52.2 billion by 2021, with a growth rate of 46% between 2016 and 2021. And according to the survey "Artificial Intelligence in Business Gets Real; Pioneering Companies Aim for AI at Scale," 66% of companies are implementing or exploring AI, while 34% have no interest in AI at this time [15].

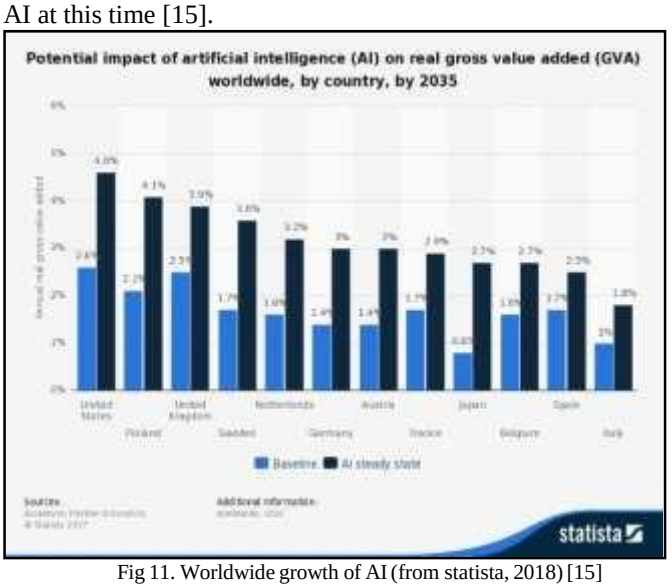

Fig 11. Worldwide growth of AI (from statista, 2018) [15]

VI. CONCLUSIONS

AI is stepping into our lives like never before and are touching us to the core, should we ignore it, I don't think so, the world is changing, and we must embrace the AI evolution. AI Bots and applications are in their blue print stages and needs more training, but they are not far away from reality when Humans and BOTS will work hand in hand. AI needs our help, we are in process of that realization at this moment. All that is needed is we need to be more educated about what it can do for us. I agree that someone can use it with the bad intentions and these points have been raised in the recent past. There has to be some guidelines and ethics about its operation to secure the future of our children's and forthcoming generations who will see the new world of AI.

AI can be widely accepted if the AI products are built Ethically, without a bias and with good intentions, adding ethics as a parameter will resolve a lot of inequality questions. But, remember Machine Learning can be poisoned and mold in a certain way and could lead to someone's gain and another person's loss. In the end, machine learning influences our lives as it lives and feeds on the real-world data that we provide to them. AI highly relies on the information provided to them and North American experts expect AI to outperform humans at everything in the next 45 Years. In Asia, they say it is 30 Years. The AI has the potential to transform the businesses and disrupt the way we produce, market, purchase and consume our goods. [16]

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