Machine Learning Driven An E-Commerce

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Abstract: With the renascence of traditional technology to more modern technology and utilization of digital technology, where most of e-commerce are now built on back of such revolution and innovative advances such as automation, next generation will demand of such commerce site. Most companies or owner/owners of these sites are launching more dynamic site than old fashion catalog and static sites, thus integration of machine learning, augmented with artificial intelligence and deep learning into the e-commerce site of today which is in demand and very much becomes mandatory in order to be most effective and money maker for the owners of these sites. This type of approach with the site makes these commerce site more business resilience in such competitive market. In this short communication, we are presenting such innovative and dynamic sites utilizing artificial intelligence along with its sub-sets of machine learning drive by deep learning. Such implementation makes the total cost of ownership more revenue driven based upon return on investments for the owners of the site.

Keywords: Artificial Intelligence, Machine Learning, Deep Learning, E-Commerce, Dynamic Site, Return On Investment, Total Cost of Ownership.

1.0   Introduction

Due to recent advances in the digital world, the new and most modern E-Commerce sites are taking the advantages of this revolutionary technical progress and with the next generation of Artificial Intelligence (AI) with its sub-components Machine Learning (ML) and Deep Learning (DL) and their integrations into most modern E-Commerce technically, we are seeing more and more tradition front store are migrating into the internet and the presence of their shopping online. Furthermore, recent technical progress in AI, ML and DL, allows the revenue from these commerce sites to be more enhancing and driven by these combined components. The fundamental relationship between AI, ML, and DL is presented in Figure-1. [1]

Most owners of these newly developed sites are after a better and more dynamic presentation of their good online by bridging between sellers of the goods and consumers that are very computer-driven savvies, thus these owners get a better return on their investment or simply ROI versus their Total Cost of Ownership (TOC).
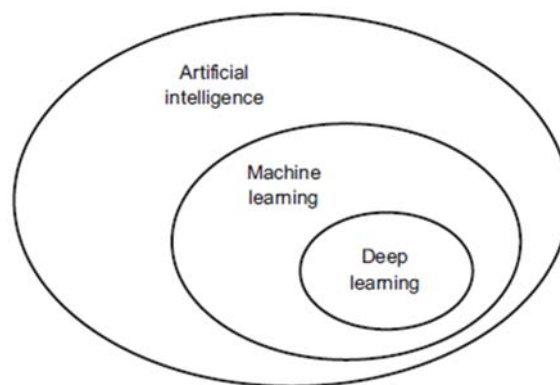
Figure-1: Artificial Intelligence, Machine Learning, and Deep Learning at Work

Today's machine learning relies on the data that comes from deep learning by learning from it in real-time that is driven by comparing the repository of historical data with incoming data within deep learning layer. Through this learning information gets passed into artificial intelligence and thus keeps the site very efficient by being able to achieve a thorough data analytics, and consequently data predictive to make the site to be more business resilience within its business market.

The technology built into this machine learning and methods that are used in this systems allow to learn more about you as a consumer of the site and the fundamental things that make you whom you are by simply collecting data information based on your habit and behavior of interacting with commerce site.

Furthermore, customer relationship building, and retention of the clients is very critical to the retail and E-Commerce industries – and the best way to manage that is to manage big data. Retailers need to know the best way to market to customers, the most effective way to handle transactions, and the most strategic way to bring back lapsed business. Big data remains at the heart of all those things.

2.0   What is Artificial Intelligence, Machine Learning and Deep Learning

Holistically and briefly, we define these three elements that can be fully integrated into any modern E-Commerce site of today in order to increase revenue from the site, while helping retention of an existing consumer of the site as well as taking advantage of technique such as Price Promotion Optimization (PPO) to also attracting new a consumer to the site, and this generates additional income for the site as well.

Price Promotion Optimization (PPO) is the practice of using data from customers and the market to find the most effective "price" point for your product or service that will maximize sales or profitability. PPO is a must feature on any online retail store, no matter what channels a retailer sells on, their pricing is one facet of the selling experience that cannot be stagnant.

With competitors, just a click away and comparison shopping engines making it easier than ever for consumers to find the lowest price, having that competitive intelligence on hand and taking action accordingly is a required. [2]

Holistically, we can define AI by stating that Artificial intelligence (AI) is the ability of a computer program or a machine to think and learn similar to what humans do naturally. It is also a field of study which tries to make computers "smart". However, there are key factors to know about AI: [1]

- It is very important to distinguish different types of Artificial Intelligence and different phases of the evolution of AI when it comes to developing application programs
- Without recognizing the different types of AI and the scope of the related applications, confusion may arise, and expectations may be far from reality
- In fact, the "broad" definition of Artificial Intelligence is "vague" and can cause a misrepresentation of the type of AI that we discuss and develop today

Different types of Artificial Intelligence (AI) is illustrated in Figure-2. [1]
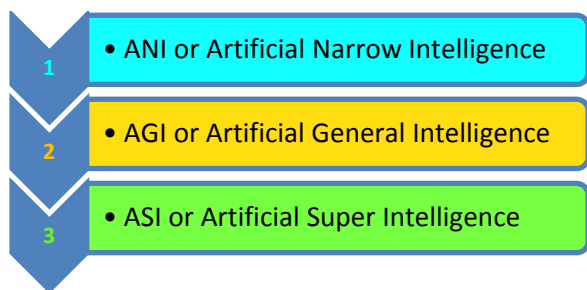
Figure-2: Different Types of AI

On the other hand, **Machine Learning (ML)** addresses the question of how to build computers that improve automatically through experience. It is one of today's most rapidly growing technical fields, lying at the intersection of computer science and statistics and at the core of artificial intelligence and data science.

Recent progress in machine learning has been driven both by developing new learning algorithms and theory and the ongoing explosion in the availability of online data and low-cost computation.

The adoption of data-intensive machine-learning methods driven by deep learning can be found throughout science, technology, and commerce, leading to more evidence-based decision-making across many walks of life, including health care, manufacturing, education, financial modeling, policing, and marketing.

Deep Learning (DL) is a subfield of machine learning concerned with algorithms inspired by the brain's structure and function called artificial. This layer that is embedded deep within a schematic of the Artificial Intelligence (AI) layer is depicted in Figure-3 which is the brain of the AI with its repository of historical data, which could be compared with new incoming data.
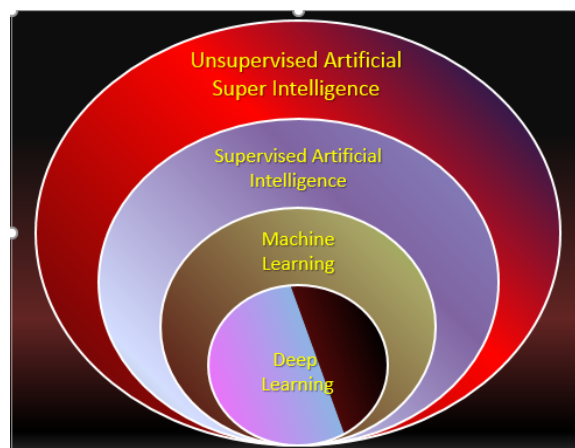

Figure-3: Schematic of Artificial Intelligence Levels

Put it in simple terms; deep learning is all about using neural networks with more neurons, layers, and interconnectivity. We are still a long way off from mimicking the human brain in all its complexity, but we are moving in that direction.

Bear in mind that, the future of any business from banking, e-commerce, real estate, homeland security, healthcare marketing, the stock market, manufacturing, education, and retail to government organizations depends on the data and analytics capabilities are built and scaled. The speed of change in technology in recent years has been a real challenge for all businesses. To manage that, a significant number of organizations are exploring the Big Data (BD) infrastructure that helps them to take advantage of new opportunities while saving costs. Timely transformation of information is also critical for the survivability of an organization. Having the right information at the right time will enhance not only the knowledge of stakeholders within an organization but also providing them with a tool to make the right decision at the right moment. It is no longer enough to rely on a sampling of information about the organizations' customers.

The decision-makers need to get vital insights into the customers' actual behavior, which requires enormous volumes of data to

be processed. We believe that Big Data infrastructure is the key to successful Artificial Intelligence (AI) deployments and accurate, unbiased real-time insights. Big data solutions impact and change the way the organization needs to work with help from AI and its components ML and DL. [4]

In summary, associated with smart AI or in a sense Super Artificial Intelligence (SAI) with capabilities of Natural Language (NL) and Neural Network (NN) [3], we need further components as sub-set of such AI that makes the processing of the data either structured or unstructured in a more accurate and faster way as they arrive with speed of electron cross-network into the data bank as a repository for processing purpose for the right information at the right time.

Digital transformation (DX) is reaching a macroeconomic scale, and that is the core of a modern E-Commerce site with integral of AI, ML, and DL. Intelligent applications based on Artificial Intelligence (AI), machine learning (ML), and continual Deep Learning (DL) are the next wave of technology transforming how consumers and enterprises work, learn, and play.

A simple high-level infrastructure Super Artificial Intelligence (SAI) Business Resilience System (BRS) are illustrated in Figure-4 and Figure-5. [5]
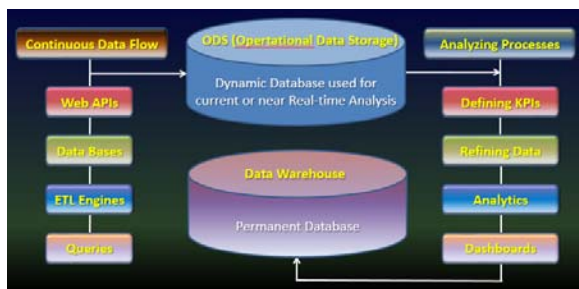

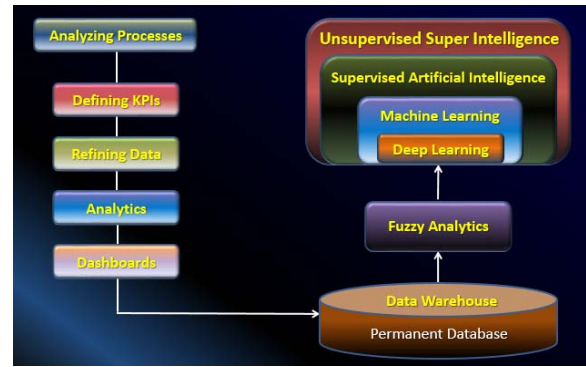**Figure-4: Path to Super AI Business Resilience System – Step 1**

Figure-5: Path to Super AI Business Resilience System – Step 2

While data is at the core of the new digital economy, it's also about how you sense the environment and manage the data from the edge to core to cloud, analyze it in near real-time, learn from it, and then act on it to affect outcomes. The Internet of Things (IoT), mobile devices, big data, AI, ML, and DL all combine to sense and collectively learn from an environment continually.

What differentiates winning and money-making online retail store or E-Commerce in respect to their competitions is how they leverage that to deliver meaningful, value-added predictions, built on top of their Data-Analytics and Data-Perfective and actions for improving their marketing processes, such as experiential engagement of the customer with the commerce site, or any other kind of enterprise decision making. AI business objectives are balanced between tactical and strategic, and they can range from improvement in operational efficiencies to increasing competitive differentiation, from maximizing existing product revenue to launching new digital revenue streams.

Moreover, having the right Business Resilience System (BRS) with augmentation and help from Artificial Intelligence (AI) and its sub-components such as Machine Learning (ML) and Deep Learning (DL) by building the proper intelligent models from data mining to data predictive analytics and data analytics, an organization can prevent

any hostility and take over the ongoing operation that they have in place. [5]

3.0 Risk Atom and Business Resilience System (BRS)

For Business Resilience System to function and induced advanced warning for proper action, the BRS Risk Atom and, in particular, the fourth orbit have to stay in stable status by assessing the risk elements and responses. Thus, looking at risk assessment and understanding it is an essential fact, and it is inevitable; therefore, we need to build an intelligent model to invoke information from a variety of data available to us at more than terabyte from around the globe we are living on, and it is Omni-directional that is traveling at the speed of electron due to Internet of Things (IoT).

These data need to be processed by Process Data Point (PDP) in the core of Risk Atom, either real-time or manually, as illustrated in Figure-6. [5]

Figure-6: The Business Resilience System Risk Atom

The feed point for PDP is structured on fuzzy or Boolean logic as suggested by us authors in this book. This chapter under lays foundation for Risk Atom by discussing the risk assessment and goes through the process of building intelligent models, along with data mining and expert knowledge and a look at some fundamental principles that can interact with the Risk Atom [

One of the critical aspects of the Business Resilience System is the Risk Analysis and Risk Assessment Process. However, a critical aspect of the risk analysis process is to identify the preparedness and preventive measures in place at any point in time. Once the potential areas of high exposure to the organization are identified, additional preventative measures can be considered for implementation.

In conclusion, For any critical business process, there may be one or multiple Risk Atoms, but any Risk Atom must reflect a critical business process measure that, when "tipped, "it will begin degrading process capabilities, and, if left unchecked, it will result in a disaster/destruction situation requiring the invocation of a Business Continuity Process (BCP).

A PDP can "move" through various levels of thresholds (as a result of threat manifestation to the business of commerce site or for that matter any other online business so long it is engaged with a network of the digital world via IoT), which will determine the type of business activities to be performed to remedy any foreseeable process degradation before it becomes process destruction.

4.0 Machine Learning: Trends, Perspective, and Prospects in Support of E-Commerce

One general perspective is to support its high-level companion that by now, we know it is called Artificial Intelligence (AI) or in the near future will be known as Supper Artificial Intelligence (SAI) and long-term, hopefully, has a trend toward a system known as "Matrix", which is able to be as capable as his or her human-being partner.

Machine learning becomes enabled and knowledgeable by way of its sub-layer deep learning, as illustrated in Figure-3. Furthermore, the perspective and prospect of Machine Learning (ML) have a discipline of focusing on two interrelated phenomena as follows:

1. How can we construct computer systems that automatically improve its information through past or present experience to know about predicting the future by a set of paradigms?

2. What are the fundamental statistical - computation-digital information and theoretic laws that govern all level of learning systems that are derived either from its partner human or computer processing of data-driven by a repository of deep learning data, both present and collective of historical data as part of Risk Atom and the Process Data Point (PDP), as it was discussed in the previous section. Both these perspectives are very important for and E-Commence to be super smart in order to generate not only more revenue but retain the existing clientele of the site as well as adding more new customers, when they visit the site with a click of their figures.

Machine learning has progressed dramatically over the past two decades, from a laboratory curiosity to a practical technology in widespread commercial use. Within Artificial Intelligence (AI), machine learning has emerged as the method of choice for developing practical software for computer vision, speech recognition, natural language processing, robot control, and other applications.

Many AI systems developers now recognize that, for many applications, it can be far easier to train a system by showing it examples of desired input-output behavior than to program it manually by anticipating the desired response for all possible inputs.

There are three aspects of machine learning that their integration to an E-Commerce site, will tremendously enhance the site performance by making more and more dynamic and will separate itself from an old fashion and the traditional static site as a shopping cart online.

With its capability and built-in functionality of Artificial Neural Network (ANN), which is a computational model based on the structure and functions of biological neural networks and is one of the main tools used in machine learning. They are brain-inspired systems that are intended to replicate the way that we as humans learn.

ANN belongs to a group of information-processing techniques that can be used to find knowledge, patterns, or models from a large amount of data. In general, there are three classes of Artificial Neural Networks that one needs to focus on, and they are listed below: [4]

1. Multilayer Perceptron (MLP).
2. Convolutional Neural Network (CNN).
3. Recurrent Neural Network (RNN).

These three classes of neural networks provide and augment much flexibility to Ais and SAIs and have proven themselves over decades to be useful and reliable in a wide range of problems that are tasked to Artificial Intelligences (AIs) or in the near future to Super Artificial intelligence (SAIs) to handle. They also have many subtypes to help specialize them in the quirks of different framing of forecasting and prediction problems and different datasets at the level of Big Data both, structured and unstructured. [4]

With this new technology in the horizon and rapidly growing among companies and startups in Silicon Valley, in particular, one is wonder if this augmentation really helps

human or hurts it by taking over of so many traditional labors works away from human by industry going toward full automation in their assembly line as an example. [4]

5.0 Machine Learning Shaping World of E-Commerce

Although E-Commerce has actually been around the past few decades and is nothing new, its performance and presentation in today's world are not built upon Business Intelligence (BI) but Artificial Intelligence (AI). [8]

Such transition from BI to AI has taken place because the data we need to analyze has changed its volume from few tera-bytes to the level of Big Data coming from omni-direction as fast internet speed due to nature of Intent of Things (IoT).

According to Statista, 2017 retail e-commerce sales worldwide have reached $2.29 Trillion and are expected to grow up to $2.77 Trillion by the end of 2018 and surpass that amount by being tripled in revenue by 2021. See Figure-7
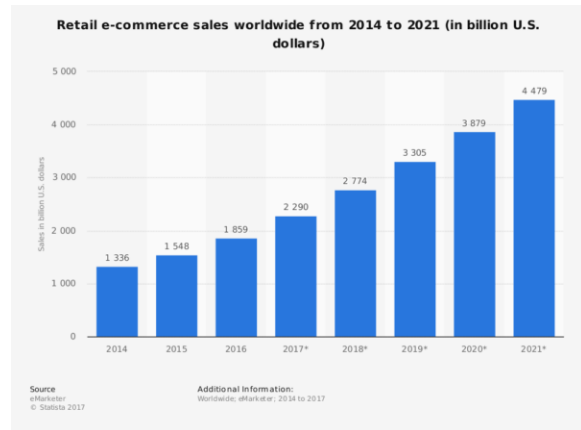

Figure-7: Retail-E-Commerce Sales Worldwide from 2014 to 2021 (In Billion US Dollars)

Some of the trends that have enabled the e-commerce to have such astonishing growth include: [7]

1. Mobility

Mobil e-commerce is growing by far out much faster than e-commerce in general. With the popularity of smart-phones among folks in any society and installing the Apps on their smart-phone, thus these devices were responsible for around 70% of the total e-commerce traffic and consequently sales of goods from the site.

2. Artificial Intelligence

Most globally companies in the countries with high Grows Domestic Product (GDP) are integrating the artificial intelligence and machine learning into their e-commerce site exclusively, and for these companies, this is due to their not so accessible price. However, Gartner predicts that by the end of 2020, over 80% of all customer interactions will be handled by AI. See Figure-8
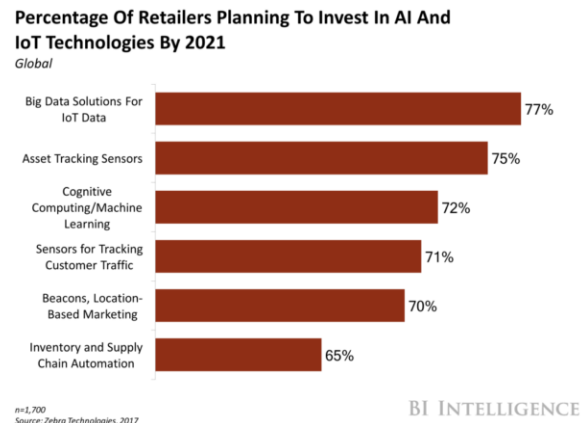

Figure-8: Predicted Retail Investment in AI by 20121

As we have learned by now from this article, anytime we integrate an AI technology, we also need to augment its layer such as ML and DL as well, with the following perspectives in mind:

- **Artificial Intelligence:** Machines that are able to complete specific tasks by mimicking the human brain and cognition

- **Machine Learning:** That is a sub-layer of artificial intelligence and it is a method used to improve performance through experience over a period of time and data that is driven by deep learning
- **Deep Learning:** This is the central processing of the collective data from past and present, where it sends the specific sets of data to inform the ML and thus, makes AI more knowledgeable and consequently makes the e-commerce site more powerful to generate more revenue and retain the existing customer as well as bring a new customer on board.

One of the elements and side benefits of machine learning integration into an E-Commerce site is reducing customer service issues before they even occur. As a result of such automation, the site becomes more efficient and provides a better Return on Investment (ROI) based on Total Cost of Ownership (TOC) for their owners of the site.

This also results in cart abandonment rates that should be lower, and yet sales should be higher. Unlike humans, customer service bots are able to provide unbiased solutions around the clock.

6.0 A Good Looking and Feeling of An E-Commerce Website

For any E-commerce that is going to have a footprint in the E-World, besides its back-end that takes advantages of technologies such as AI, ML , and DL as part of its data analytics and predictive analytics tasks to generate revenue for the site, it also measures customer behavior and habits according to their historical purchase and information of each client, who visited to guarantee the stream of revenue in a continuous fashion. With that we need a good front-end with a good looking and feeling of Graphics User Interface (GUI) not only retain the existing customer but bring more long term and loyal visitors on board.

For this purpose, it is essential that the business launching such commerce web site to have an attractive, yet very clean and function dynamic website, which would be very appealing to both existing and future clients as well, while maintaining their interests for the purpose of retention and being loyal enough to come back for more and more shopping from the site.

Front-end development of the website is a crucial aspect of e-commerce for this concept. A website's "front end" comprises all the things the user sees and interacts with directly on their screen and is essential to convey the branding to customers. The website's attractiveness is not sufficient, and it should attract a specific type of customer that company wishes and offer what they need right away. For this reason, colors and graphics efficiently help customers to associate a business website with their products. When Machin learning (ML) as a back-end is used to strengthen the front-end development, the designers and developers get more time to work on creative tasks. Modern technologies like Machine Learning and Artificial Intelligence (AI) are accelerating front-end development and making coding and testing website layout easier, faster, and more efficient.

Moreover, the designs of the front-end should be in a way that builds your business from the bottom up. Whether you are a start-up or an enterprise business, your goal should be in a 360-degree website solutions and digital branding that will turn your idea into an online success as most efficient and money-making E-Commerce by:

- Bring the World to Your Commerce Website.
- Responsive and User-Centric Websites
- Reach and Grow your Audience.
- A Custom website that converts clients.

- Being as dynamics as possible, so it communicates with site visitors

With the above goals in mind, it will help your business sell your products and services globally with a robust, stable, and secure online e-commerce system in particular if you present the most popular brand names.

Furthermore, the color schema in the design of a website from a look and feel perspective can influence how users think and behave towards a brand and how they perceive some details. That is the reason why designers need to understand the meaning of colors. Colors can stimulate our brain chemistry and generate feelings accordingly.

It is crucial to make an excellent first impression on those who visit the website, so website's feel and look is the first chance of doing this. In this case, an attractive, professional design will better engage viewers in the content. Depending on how to communicate with the audience and visitors, colors' choice will significantly shape the business's voice and tone. As an example, green and blue colors can provide better healing for the stressed-out mind. There is a wide agreement on the psychological effects of the color blue. Blue is extensively used in mental therapy for reducing stress. Its subtle message the trustworthiness and serenity are true. So, it could be the advantage of the website and landing pages.

Technology is changing rapidly, so to survive in the competitive industry, the need is to adapt to new technologies quickly, from static websites to a more dynamic website. It is a well-known fact that the human eye is attracted to motions, and it is no surprise that companies use the animation as a tool to grab the user's attention. Animating the elements could be used to develop the front-end website.

The animation is the must-have aspect of a modern interface, from tiny hover actions to elements that move across the screen to engage the parallax scrolling. Animation can provide an additional source of engagement to keep them with the design. The animation could be a color change hover effect or moving the interface element.

7.0 Conclusion

In conclusion, integration of Machine Learning, along with its super-set Artificial Intelligence as well as its Sub-set of Deep Learning into any E-Commerce, is the way to go if we are looking to be more resilience and money maker site by retargeting the existing consumer and targeting the new customer as well. Techniques such as Promotion Price Optimization and Business Resilience System (BRS) allows us to do so.

To thrive in the e-commerce industry, retailers should be as agile as possible, and machine learning is the way to do so. Machine learning is a necessary investment for e-commerce players.

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