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Study of the Effect of AI on Industries and Employment

Soumadeep Basu[1], Dr. Azra Nasreen[2]

[1]Dept. of Computer Science and Engineering, RV College of Engineering, Bengaluru, Karnataka, India
[2]Professor, Dept. of Computer Science and Engineering, RV College of Engineering, Bengaluru, Karnataka, India

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Abstract – *This paper investigates the different ways that Artificial intelligence has changed the various industries and affected them. Artificial Intelligence or AI has a wide plethora of concepts that fall under it. The paper dives a little deeper into these, shedding light on the fact that they have a huge impact on the world that we live in and are commonly used in various industries. The paper identifies some of these key concepts and highlights how they benefit and optimize the different areas that they are implemented in. Further, the paper tackles the myth as to whether automation leads to unemployment or not.*

Keywords- *Artificial Intelligence, Computer Vision, Data Mining, Computer Vision, BRATS, Conversational AI, Unemployment*

1. Introduction

With the invention of the Turing machine in 1936, the world was fascinated with what a machine could do. The fact that metal and wires might be used to build something that might "think", shook the very foundations of logic and reasoning. This also paved the way for various developments including modern computers and also the rise of intelligent machines.

In 1956, American scientist John McCarthy organized the Dartmouth Conference, where the term 'Artificial Intelligence' (AI) came into being. Today, several billion dollars' worth of research goes into the development of the latest technology which may behave autonomously. AI has revolutionized various industries like healthcare, Finances, E-Commerce, etc. The most common term associated with AI is automation. It refers to the process of developing algorithms and algorithm-based machines to effectively replace or assist humans in order to make processes more efficient and to ensure that human effort is conserved. In other words, the use of AI in an industry, or automation can be used to do the following things:

Eliminate the mundane and static, repetitive tasks that exist: This is the most common use of AI. Once a system has been trained it can essentially replace a human when it comes to tasks such as answering a set of questions, packaging, picking out defects, etc. Mckinsey Research, for example, has shown that 53% of retail activities can be automated using AI. This allows humans to spend time on activities that involve creativity, innovation, and intuition. [1]

Save resources and time: Although humans are considered to be smarter, computers are way faster. When a system is properly trained, it can reduce the time taken to perform a given activity. Further, it can handle multiple use cases at once which again gives it an advantage. Lastly, AI can save costs as well. It is available 24/7 and does not need to get paid monthly in the form of a salary. [1][2]

Improve Quality and Safety: AI also increases overall quality. Human error is always a factor with jobs, whereas AI is less probable to malfunction. Further, it enables a deeper personalization by understanding what customers' desire over time, providing better products and services with improved quality. Automation can also be used to improve safety by working in dangerous fields such as construction and mining. Similarly, AI can be used to identify sicknesses and potential safety and health risks ensuring a better quality of life.

Thus, it is no doubt that AI is becoming extremely popular. As a formal definition, however, AI or Machine Intelligence as it is sometimes known is the ability of machines or to be specific, computers, and computer software to behave and react to situations like humans.

Such behavior stems from concepts such as reasoning, various programming constructs, artificial life, belief revision, data mining, and associated tools, distributed AI systems, expert systems, genetic algorithms, knowledge representation methods, machine learning techniques, natural language understanding, artificial neural networks, theorem proving, constraint satisfaction, etc. All these constructs help developers create platforms that can perform human-like tasks with precision and accuracy which are then deployed into various industries. Let us now see the effect some of these concepts have had in their respective areas of functioning. [1][3]

2. Artificial Neural Networks

Artificial neural networks computing systems which are in a way, inspired by the biological neural networks that are present in the human brain. Such systems "learn" to perform tasks by considering examples, generally without being programmed with task-specific rules. [5]

This type of learning is commonly known as unsupervised learning. This kind of learning is excellent for a plethora of tasks including pattern recognition, compression, etc.

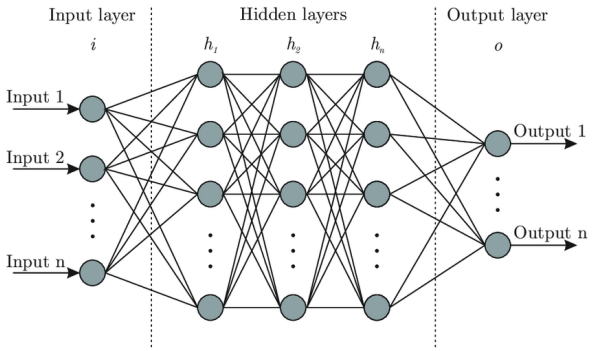

Figure 1 : Artificial Neural Network Structure

Fig1. represents an ANN.

The input layers are tasked with gathering inputs from the outside world and transforming it into something that the network can process, whereas the output layers take the generated output and transform it into something which the user or system can use. The hidden layers are in charge of processing the data and extracting information from it. This information is then converted into an output using various algorithms.

These algorithms can represent pattern recognition, speech detection, segmentation, etc. [5] The use of ANN's can be found everywhere, but notably, the following are the ones that have the most effect.

2.1 Image Compression:

This kind of neural network has input and output layers which are of the same size. The hidden or intermediate layer(s) is usually smaller in size. The compression ratio of the network or degree of compression of the image is equal to the ratio of the input layer to that of the intermediate layer. [4] The comparison ratio for image compression can be obtained using the following formula:

Comparison Ratio = Input Layer / Intermediate Layer

The main goal behind data compression neural networks is to store, encrypt, and restore the original image once again.

These networks use images for training purposes. The applications of these networks can be found in various communication platforms. Whatsapp and Instagram, for example, use compression techniques so that sending images across the internet becomes easier.

Similarly, picture libraries and galleries such as Shutterstock and Scopio use image compression techniques to store millions of pictured effectively. Further for video analysis, hundreds of frames are required to be processed in a matter of seconds, this can be done using efficient compression and is the working principle behind security providing software. Apart from this, a lot of websites such as Amazon and Flipkart also make use of image compression to upload a large number of product pictures on their site with ease. [6]

2.2 Stock Market and Business Related Predictions:

For trade companies and companies who work with the stock market such as Reliance, Wells Fargo, etc. Predicting stocks and how the market behaves is a huge plus point. Usually, this is done with the help of an analyst who spends hours crunching numbers.

However, now ANN's are capable of doing the same much more efficiently and accurately. Developing an algorithm taking into account parameters such as current trends, political situation, public view, and economists' advice can help predictions related to the market less burdensome.

Since large companies often invest in stocks, this kind of automation is becoming increasingly popular. Neural networks are also used in business liability prediction, debt assessment, currency prediction, and credit approval. MJ Futures [7], for example, claims a 199.2% return over 2 years through the use of neural network prediction methods. Similarly, Dean Barr and Walter Loick at LBS Capital Management generated staggering results using ANN's. As inputs, it used 6 financial indicators. These included the ADX, the current value of the S&P 500, etc. [8][9][10]

2.3 Neural Networks in Tumour Detection:

With the growing number of patients each day, a lot of pressure falls on doctors to treat them. But this cannot happen in reality as the volume of patients outranks the volume of doctors. Neural networks can act as a bridge that connects the two, screening the patients.

This method commonly makes use of the BRATS dataset to classify a tumor into a carcinoma, glioblastoma, etc. which all refer to different kinds of tumors. Based on the severity the patient can then be assessed by a doctor. [11]Further, these methods can also calculate the size, volume, and location of the tumor and then make deductions such as whether it is operable or not. This is known as MRI segmentation. Recent research also suggests that segmentation algorithms can be applied to normal JPEG images of MRI files to extract the tumor region and perform analysis. Although this isn't as established as MRI segmentation, if developed accurately, it can increase its outreach as all patients have access to their phones. This would help us move further in the journey of reaching the primary goal of using ANN methods to aid doctors and patients. [12][13]

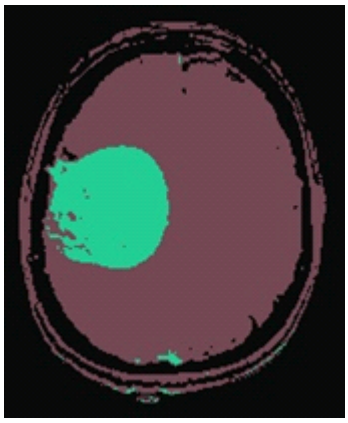

Figure 2 Segmented Brain Tumour

Fig 2. Represents the segmented image of a tumor using a combination of the k-means clustering algorithm and the Watershed algorithm.

3. Natural Language Processing

Natural Language processing deals with the area of Artificial intelligence which allows computers to interact with computers using the Human language.

It involves processes that allow computers to read, understand, and converse in languages such as English, Hindi, etc.

There are some basic functions when it comes to Natural Language Processing or NLP. They are:

- Sentence Segmentation
- Word Tokenization
- Predicting Parts of Speech for Each Token
- Text Lemmatization

- Identifying Stop Words
- Dependency Parsing
- Finding Noun Phrases
- Named Entity Recognition
- Co-reference Resolution

These 9 steps form what is known as the NLP pipeline. The input to this pipeline is text or a text document whereas the output is Data structures representing the parsed text. These Data structures can be used to analyses a lot of things, and based on the algorithm, different ways of parsing a given sentence can exist.

For example, to see what exactly happens in an NLP pipeline, consider the statement "London is the capital and most populous city". [14][15]

The first two steps break down the sentence into individual words.

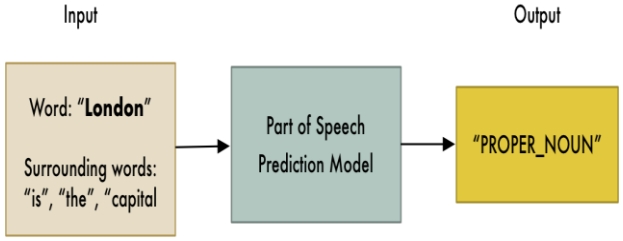

Figure 3 Parts of Speech Classifier

From *Fig 3*, it is observed that Step 3 is tasked to associate a certain part of speech to each word. Following this, as seen in *Fig 4.* Step 4 and Step 5 find out the importance and context of each word.

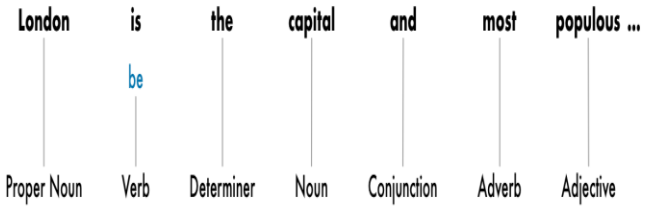

Figure 4 Type of word

Finally, as *Fig 5.* depicts, step 6 creates a parsing tree which tells us how different words are related to each other:

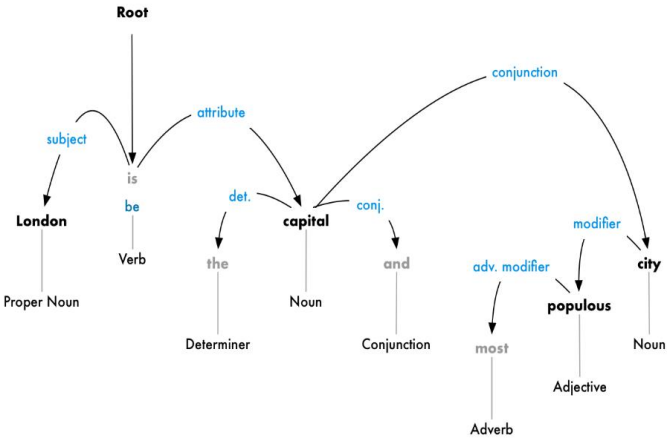

Figure 5 Dependency Parse Tree

From here, steps 7, 8, and 9 are tasked with extracting the most important words which have value. This can be seen in *Fig 6.*

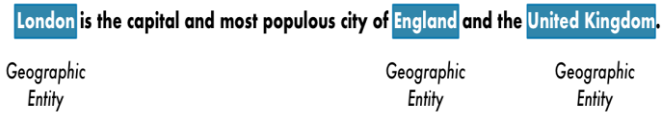

Figure 6 Important Named Entities

These words are then stored in a Data structure that can be used later and, which can be analyzed to find important analytical deductions from the text. [16] NLP has many uses in today's world, the following section shall discuss some of them.

3.1 Chatbots:

Chatbots are one of the driving forces which have changed customer relationship management (CRM).

CRM was traditionally operated by manned personnel who used to manually answer calls. But with the creation of chatbots that are capable of answering questions like humans, and can do so with more speed and accuracy, automation is taking over.

Chatbots can also store data, provide insights into what the customer likes, and address questions with some intelligence. Further, with the release of software such as Microsoft's Luis

and QnA maker, Google's Dialogflow, etc. More and more companies are shifting to Chatbots. From retail to financial services and insurance to travel to B2B services, it seems like every large brand has begun dabbling with automation.

31% of global telecommunications technology decision-makers who are significantly involved in contact centers cited customer-facing chatbots as a top priority for technology investments; 30% cited agent-facing chatbots as a top priority. All that demand has caused an explosion in the number of vendors offering Chatbot technology[17]. CRM's opt for automation as it:

- **Deflects volume away from expensive human agents**.

More than half of customer service executives who dimension data surveyed believe they will realistically be able to automate between 11% and 50% of agent work through chatbots.

As most contact centers still run on a diet of efficiency-driven metrics, this benefit remains top of mind in the space.

- **Allow human agents to tackle more interesting — and thorny — customer issues**.

Many brands in North America and Western Europe talk about deploying chatbots as a way to free up their human agents to deal with customers who have more complex or more emotionally fraught issues. Although brands may be hewing to a responsible corporate line when they say this, the reality is that agents do prefer not to have to provide repetitive service for easy issues.

- **Make the economics more palatable for providing service via new channels**.

Brands face an onslaught of new channels that they could invest in as touchpoints for providing customer service. From Instagram to Line, from SMS to Twitter, and from native mobile apps to embedded messaging on the corporate website, the options seem endless.

Using conversational AI to remove a sizable chunk of the human-assisted interactions on those new channels can dramatically transform the cost calculations and put more of those new channels within reach. [17][18][19]

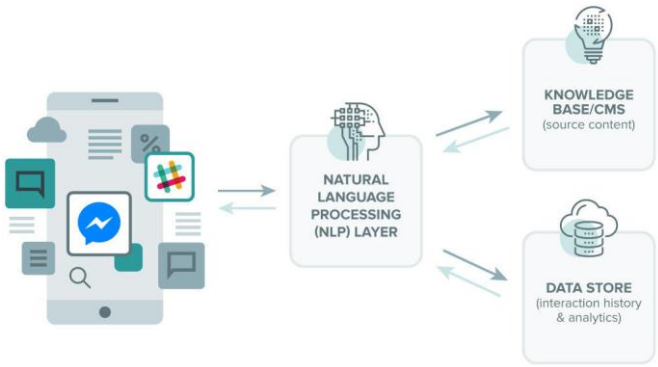

Figure 7 Chatbot Architecture

Fig 7. Describes the architecture that most Chatbots used today.

3.2 IVR (Intelligent Voice Response) With Conversational AI:

An IVR is similar to a chatbot as based on user input, it can provide an accurate response. Usually, IVR's were menu-driven. Based on the toll-free number dialed by the user, the call used to be routed over the PSTN (Public Switched Telephone Network) to the IVR systems. Here using DTMF (Dual Tone Multi-Frequency), the user could drive the menu to make selections or in the end talk to a live agent. However, today with the emergence of new technology such a Voice over IP (VOIP) and Text to Speech and Speech to Text software more customer-friendly solutions are coming out. The traditional IVR's and call centers are being replaced by conversational bots that are intelligent.

These Bots can answer questions, accept serial numbers, and also book slots and appointments.

Platforms such as Twilio, Bot.ai, etc. are designed to facilitate such designs. Further networking companies such as Genesys, Avaya, Cisco provide infrastructure in terms of computer telephony interfaces, servers, voice gateways, automatic call distributors, etc. [20][21]

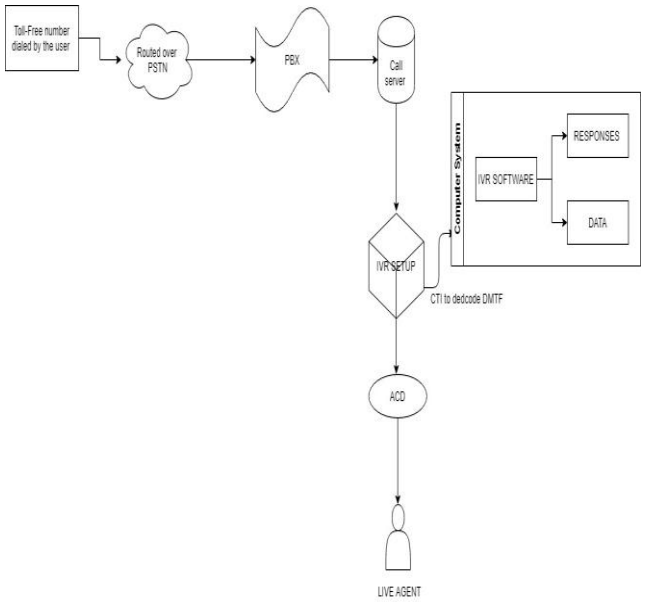

Figure 8 Traditional IVR

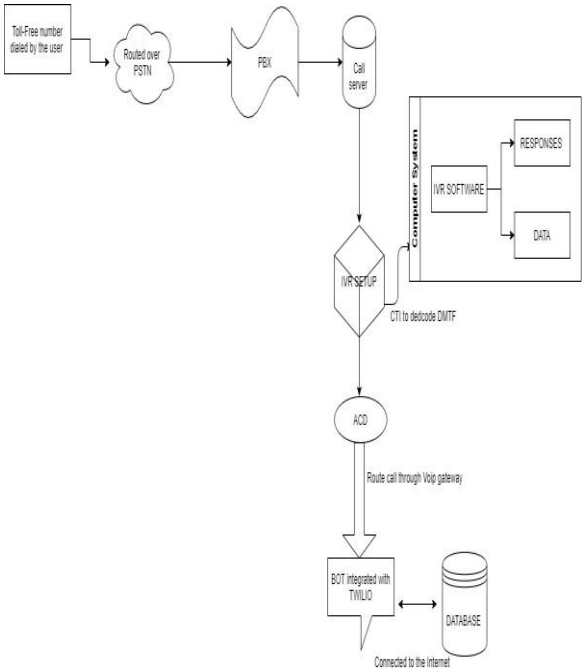

Figure 9 IVR with Conversational AI

The legacy IVR technology which ran on menu-driven static technology is described in *Fig 8*, whereas more recent and intelligent IVR systems capable of interacting with users with the help of conversational AI are shown in *Fig 9*. The conversational AI used in *Fig 9*, is a platform known as Twilio. [22]

3.3 Sentiment Analysis:

The first step to Sentiment Analysis is for the text to pass through a parser. Once the words in the sentence have been analyzed, there are 2 broad ways to perform sentiment analysis

- **Rule-Based**

The first methodology is rules-based and uses a dictionary of sentiment-labeled terms to assess a sentence's sound.

Usually, emotion ratings ought to be paired with alternate guidelines for minimizing sentences involving negations, sarcasm, or contingent clauses to function properly. For example, good can be given a rating of +0.5, and terrible can be given a rating of -0.8, positive and negative can have values -0.1 and +0.1, etc.

Word	Sentiment
good	0.5
great	0.8
terrible	-0.8
alright	0.1

Figure 10 Sentiment labeled Dictionary'

Such a labeled dictionary is presented in *Fig 10*. They can be used to perform sentiment analysis on sentences, paragraphs, and even articles. [23]

- **Machine Learning**

Here, utilizing a sentiment-labeled training collection, we teach an ML model to identify the

emotion dependent on the terms and their order. This method is highly based upon the form of the algorithm and the consistency of the training data used.[24]

Sentiment Analysis can be used in a lot of practical applications:

A) Social Media Analysis:

Social media analytics (SMA) analyzes trends in social network data. It does so by employing sophisticated techniques to allow educated and informative decision making. It offers different opportunities to generate value for companies and achieve a competitive edge. For example, Alibaba manages to sell more products than Amazon and eBay combined. To do so they use AI to predict patterns to deduce what customers might want to buy. Social media analysis is also the way that advertisements that are customized specifically for you pop up when you visit sites such as Amazon and Flipkart.

Similarly, it is also through Social Media analysis that Youtube manages to give you recommended videos that are so catered and in tune with your liking. [25]

B) Feedback Analysis:

To effectively analyze and compile thousands of customer feedback responses at restaurants, movie theatres, and other public gathering spots, applications are created using sentiment analysis algorithms. These applications such as Clarabridge which is a Customer Experience Management platform can sort through and summarise the feedback given by multiple customers in a matter of seconds letting the owners or authorities know exactly what the customers want. [25][26]

4. DATA MINING

Data mining is an important phase in the cycle of Knowledge Discovery in Databases (KDD), which produces valuable trends or models from data.

- ***Classification*** is finding models that analyze and classify a data item into several predefined classes
- ***Regression*** is mapping a data item to a real-valued prediction variable
- ***Clustering*** is identifying a finite set of categories or clusters to describe the data
- ***Dependency Modelling*** (Association Rule Learning) is finding a model which describes significant dependencies between variables
- ***Deviation Detection*** (Anomaly Detection) is discovering the most significant changes in the data.
- ***Summarization*** is finding a compact description for a subset of data.

Data mining has two main goals of Prediction and Description[27]. Prediction includes the use of certain variables in data sets to forecast uncertain values of certain related or cohesive variables (e.g. estimation, correlation, and identification of anomalies). The description includes identifying comprehensible human patterns and trends in data (e.g. clustering, understanding connection laws, and summary). Data Mining has extensive use in Knowledge Base Management and Knowledge Base building. These knowledge bases might be used in the medical domain, business domain, financial domain, etc.[27][28] Within the context of analyzing data belonging to different domains, Data mining can be effective in the following ways:

4.1 Classification:

Classification is one of the most popular Data Mining learning methods. The purpose of this assignment is to map a data element into one of many predefined groups. Types of classification tools utilized in information management include the referral of patients from primary health services to specialists; the application of data collection and decision-making support techniques in strategic planning of the regional healthcare system and mapping approaches to promote KM and decision-making processes.

For example, Cheng, Lu & Sheu developed an ontology-based approach of Knowledge Making, to aid their company. [27] They also proceeded to do the same with respect to knowledge sharing in the domain of financial knowledge management systems (FKMS) and implemented the hybrid SOFM/LVQ classifier of clustering and classification data mining techniques in order to effectively sort corporate bonds. This proved to very effective, and thus is an excellent example where Data mining can effectively help classify data.

4.2 Clustering:

This includes the definition of a finite collection of groups and the classification of items identical to each other and dissimilar to the members belonging to certain clusters.

This can be applied to:

- **Healthcare**: Clustering definitions and characteristics used to evaluate correlations between health facilities in the city.
- **Retailing**: Clustering of potential product line segmentation and model extension to define consumer clusters.
- **Financial/Banking**: Identifying classes of corporate bond clusters by sector and a particular market segment; instead tuning cluster data for the growing industry as a framework for forecasting improvements in the ranking.

These are just examples of the areas in which clustering can occur.

4.3 Dependency Modelling:

This relates to seeking a model that explains substantial relationships between sets of attributes. For example, it is commonly used in healthcare to create recommendations for therapeutic processes to have an evidence-based medical framework. [29]These are the widespread use of Data mining over various domains or industries, in terms of change, it automates the need to manually go through data to find similarities or patterns between a seemingly endless amount of random data. This makes processing much faster and more efficient. [27][29]

5. COMPUTER VISION

Computer vision can be described as a field of science that extracts information from digital images. The type of knowledge derived from a picture may range from recognition, navigational space measurements, or virtual reality applications. In other words, it is a field of Artificial intelligence that allows computers to see and perceive the environment through images. [30]

Computer vision researchers aimed to create algorithms for certain visual perception activities, including (i) object identification to evaluate if picture data comprised a particular entity, (ii) object detection to identify instances of symbolic artifacts in a specified type, and (iii) scene interpretation to dissect a picture into coherent fragments.

Computer vision is an important part of various autonomous and robotic applications. During the 90s, the emergence of feature descriptors (SIFT, SURF) was seen as the main tool used to overcome a variety of computer vision issues

(image interpretation, object identification, facial recognition). These function descriptors are also paired with the standard classification algorithms for machine learning such as K-means or Nearest Neighbours in order to solve a variety of different problems such as object detection, contour scaling, etc. Computer vision algorithms primarily deal with Image compression, Image resolution, object detection, Image Segmentation, Image colorization, Object Segmentation, Object Tracking, etc. [30][31]

In today's Industries, it is widely used to do the following:

5.1 Retail:

The retail industry has seen a major revolution due to AI in particular. Computer Vision has also transformed the way that marketing and customer engagement is carried out. For example, Amazon also launched the Amazon Go store to the public where customers do not wait in line to pay for their orders at the checkout counter. The Go store is based in Seattle, Washington, and is equipped with machine vision cameras. Initially, it allowed only Amazon staff but invited the public beginning in early 2018. Before entering the stores, the customer activates an IOS or Android-based app.

The store ceiling is fitted with cameras that can track the customer and identify the products that he or she picks up. Based on this, items are added or removed from their virtual carts.

Similarly, Lenskart also makes use of computer vision technology to enhance customer experience on e-commerce websites. On the site, the person can choose from different frames and spectacle designs, he or she can then see what they look like as the site displays a picture of the glasses on their face. This realistic image which can be created due to computer vision attracts more customers and also makes buying from the website more popular. [32][33]

5.2 Facial Detection:

This is yet another extremely popular use of computer vision techniques. Accurate detection of faces can have a lot of applications in the real world. It is mostly used by Phone companies to provide a layer of security to their devices. Similarly, Instagram and Snapchat filters use facial detection to accurately impart to effects to pictures and frames. Facial detection is also used to aid law enforcement officials. The FBI, for example, has a widespread dataset that can recognize criminals from pictures obtained from CCTV cameras, street cameras, and other public surveillance means. Lastly, biometric scanners present in research facilities and other high-security areas also make use of facial detection to maintain discretion and security clearance. [5][33]

5.3 Automobile and other Manufacturing Industries:

The automobile industry makes use of Computer Vision in a variety of ways.

Firstly, the combination of sensory and display equipment in cars today can accurately predict distances between the car and obstacles and alert drivers of unseen dangers. This makes it easier and safer for drivers to navigate turns and also drive the car in reverse. Further, computer vision has a huge role to play in the development of self-driving cars. These cars can prevent traffic-related accidents making roads safer and less congested. In terms of manufacturing as well, computer vision has wide applications. Identification of parts that are defective for example is a way in which computer vision helps automate a supply chain. Similarly, industrial automatons or robots need to identify and isolate objects accurately so they can grab, pick up, rotate, or do other physical and mechanical operations on it. Here, again machine vision becomes the driving force for automation. [34][35]

Computer Vision is not limited to these fields. In agriculture, it helps farmers distinguish between fresh and rotten yield. In the medical industry, it is a driving force in the field of robotic surgery. Medical imaging and the way we analyze and interact with the human body has also come leaps and bounds due to computer vision. Thus, the ability to augment and automate computers by allowing them to "see" allowed computer vision to enforce automation in various fields such as medicine, agriculture, security, retail, etc.

6. THE UNEMPLOYMENT BUBBLE

It is no surprise that Artificial Intelligence and its growing popularity would raise the alarms for consequent unemployment.

Further, to a certain extent, it can be observed that the implementation of AI in various industries will lead to displacement or the disruption of workers. This can be seen in the above-mentioned effects of AI.

In the above example given, the survey highlights how Customer Service Relations can be better managed through chatbots and autonomous agents. The immediate assumption is that this leads to unemployment for the thousands and employees who were previously tasked with the labor of taking care of customer relations. However, this is a disruption, it does not spell unemployment. With growing trends, although many jobs are being assigned to machines, many more are opening up. For example in the examples given above, jobs can open up in the field of testing the solution, creating new knowledgebases, developing algorithms, maintaining and migrating the framework, etc. In fact, in some cases, Automation can improve employment conditions. As per a survey done in 2017, the rates of unemployment hit a record low in 16 years. Therefore, the assumption that industries shed jobs on automation is more or less flawed. This can be attributed to a major element of control which is the increasing essence of demand.

In the dynamic market that prevails, technology does more than just cut back on the amount of labor required to manufacture, say, such a length of fabric, it also reduces the price and increases the quality. Such developments contribute to an increasing market for products and services. Consequently, if demand increases significantly, jobs may increase in the provided sector, even though lesser labor is required to generate the same. [36]

When analyzing the demands of the manufacturing and IT sectors today, as shown in *Fig 11*, similar trends can be seen.

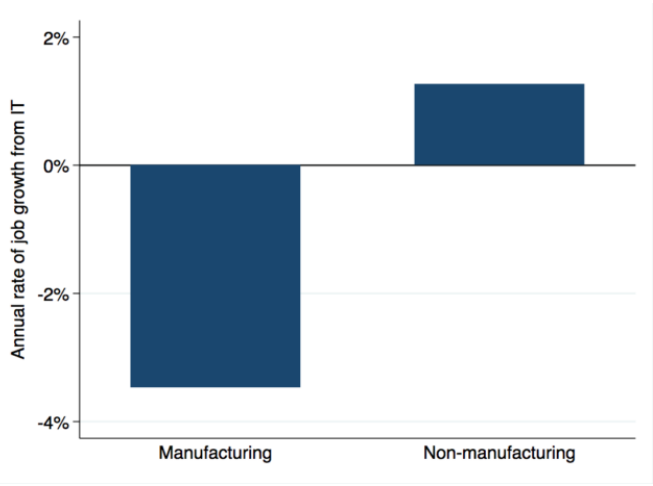

Figure 11 Demand of Sectors

Due to the rate of the increase in the IT sector, we can see a potential boost in the employments rates here. Likewise, Mogstad, Gaarder, and Akerman (2015) noticed that IT automation had little impact on the unqualified and unskilled workers but saw improved professional opportunities for the people who were skilled and were willing to adopt new technology. [36][37]

With respect to the manufacturing industry, the process of physically creating or assembling something might indeed be assigned to robots in the near future. However, with the freeing of

labor in these assembly lines, workers can now be trained to design, innovate, and create products. In other words, employment will be lost in terms of physical labor, but intellectual and creative roles will open up in great numbers with automation.

This allows one to conclude that as long as current and emerging technologies meet unmet big needs, mass unemployment should not be generated. And now, the goal is to help Business leaders develop and train employees to possess the expertise required to operate through the new technology. [37][38]

Lastly, the biggest factor to bolster the fact that automation leads to more if not equal opportunities is that it has inherent flaws and limitations. Further, just like supply and demand, expectations of what automation should do are often grander than what technology permits. These factors imply that multiple jobs in research, testing, maintenance, and other associated fields rise from automation. These are explored as the following points:

6.1 Not everything can be automated:

Any industry or business is broken down in parts. As far as automation goes, however, some things cannot be automated.

This can stem from various reasons. Firstly, it can be due to technological constraints. Despite advancements in neural networks, Natural Language Processing, Robotics, Computer Vision, etc. There are still years of research that need to be done before we can expect that a computer, can do "anything" a Human does. A good example of this can be seen in the case of pilots. Although the autopilot switch can steer the plane and keep it on course, take-off and landing are still entrusted to human experience and discretion. Further, no computer is equipped to handle unexpected occurrences that can happen in the course of a flight. Computers are still not able to make such choices that can differentiate life from death. Similarly, even the trolley problem can be used to address this. Scientists say that this philosophical question can be used to test whether systems are moral and whether they can make life or death choices.

This problem can be applied to a variety of situations, including self-driving cars, automated flight systems, etc. Hence, the jobs which are taken up by automation, are mundane. They are jobs which "free" human resources so that labor can be more innovative and productive. It does, however, mean that now people much be educated more and be willing to learn and practice new things. Consider the analogy of an Author and his Scriber. The author dictates and the scriber writes. If new technology allows the author to simply speak into a microphone to create a document, the scriber loses his job, yes, but now he can become an author himself. Further, the number of stories written now increase exponentially. [40]

6.2 Many companies are going for Augmented Agents rather than Automation:

This is particularly becoming popular with brands and companies that interact and manage clients and customers regularly. These include banks, CRM's, etc.

Here, customer surveys have shown that chatbots and automation do not reduce the headcount or total interactions per day, further,

they also decrease the satisfaction rate of customer satisfaction as well. Thus, in such cases, the businesses adopt a way in which automation can assist the employee rather than replace her or him. Here mundane tasks such as scheduling, analysis, debugging, editing, etc. are done by a virtual assistant, whereas the person can focus more on interactions and pivotal decisions. Such techniques are becoming more and more common today. The most common examples are editors and debuggers that help programmers. Further, insights and algorithms which help scan customer patterns that help salesmen make better sales and target a more accurate demographic are also a relevant example.

Hence, automation can be used to assist humans and act as a front end or intermediate agents. [40][41]

6.3 Research and other Areas which provide opportunities:

According to the recently updated International Data Corporation (IDC) Worldwide Artificial Intelligence Systems Spending Guide, spending on AI programs will hit $97.9bn in 2023, more than two and a half times the $37.5bn invested by 2019 [39].

Those proceeds would go to science, in addition to facilities and repair expenses. Currently, Industries are investing a total of $8-10 trillion a year on science. Further, career-wise, research, and innovation are becoming more popular by the second. There is a steady yearly increase since the mid-2000s concerning the number of students who are opting to take part in such jobs. With the growing need for AI to become more complex and functional, it is no surprise that this is becoming a very steady source of employment.

Another region where employment is opening up is in the management, setting, and documentation of these systems. Imagine a system being designed to recognize faces. Apart from research and coding, a lot of work has to be done. Gathering and setting up the right hardware, understanding all the factors and problems that may arise, or that have already shown up, gathering all the relevant data, etc. These kinds of jobs will slowly start to replace the current mundane and labor wasting jobs in the future.

No doubt that it will require training, but it does not mean that people who are willing to master a skill will remain unemployed. [36][40]

7. CONCLUSION

In conclusion, it is clear that Artificial Intelligence and to a great extent, ANN, NLP, Data Mining, and Computer Vision have taken the world by storm. Billions of dollars' worth of research go into funding projects which facilitate automation and AI. In fields such as Healthcare, Retail, Security, Finance, Agriculture, etc.

AI has the ability to conserve human effort and labor, allowing humans to invest time in doing things that are more creative and innovative. Further, even though there have been notions that AI will lead to unemployment, this is not true.

It is possible that it might disrupt employment, but as long as people are willing to learn new skills and adapt, job opportunities will be on the rise. In the years to come, AI will not only make

our lives better, but it will make it safer and more efficient as well.

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