Artificial Intelligence: Industrial Applications And Management Challenges

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Abstract - **Artificial Intelligence(AI) is the most striking trend in the business today.It is the sub-field of computer science which has enhanced the quality of human life in many areas.In the last two decades AI has greatly improved performance of the manufacturing and service systems which   enabled an extraordinary array of applications that forge new connections among people, computers, knowledge, and the physical world. Some AI enabled applications are Fraud detection,Law,Retail,Manufacturing,Finance,Sales,Healthcare,Socialmedia,Human Resources and recruiting, Transportation and Education.AI technologies help enterprises reduce latency in making business decisions, minimize fraud and enhance revenue opportunities. This paper gives an overview of this technology it include Artificial Intelligence, Artificial Intelligence Methods, Real time applications, few case studies, management challenges and also include how the various sectors are moving to next level of excellence with this technology.**

Keywords: Socialmedia, Transportation, Frauddetection, Pattern recognition, KBS,NN.

I. INTRODUCTION

Technological innovations have been fundamental drivers of economic growth for years. But general purpose technology plays an major role in everyday life. Steam engine, electricity, and the internal combustion engine belong to the category of general purpose technology. The most important general-purpose technology in the present era is Artificial intelligence. Artificial Intelligence can help in building systems that learn how to perform tasks on their own. Artificially Intelligent machines can achieve superhuman performance in a wide range of activities, ranging from fraud detection to   diagnosing disease. In future   we   may   see more effects of AI in various fields .The term artificial intelligence was introduced   in 1955 by John McCarthy[1].Most practical advances in AI have been made in relation to speech. Voice recognition is still far from perfect, but is being used by millions of people currently Siri, Alexa, and Google Assistant are prominent among them. the speech recognition is now about three times as fast   as typing on a cell phone. The error rate, once 8.5%, has dropped to 4.9%.The biggest use cases driving AI in business include automating job functions, improving business processes and operations, performance and behavior predictions, increasing revenue, pattern recognition, and business insight[2]. Some of the advantages of Artificial Intelligence are automate job functions to improve effieciency, to improve business processes, predict performance and behavior, increase revenue, pattern recognition[2,3,4]. Not only advantages with AI but also few drawbacks also there ie. AI is expensive. AI takes time, AI needs to be integrated, AI has security and privacy concerns, AI may disrupt employees[5].
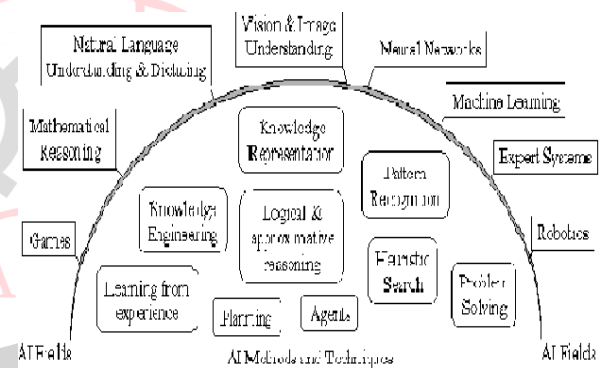

Fig2:AI methods and Techniques

II. ARTIFICIAL INTELLIGENCE METHODS

The Artificial Intelligence   methods are of two types ie. (a) symbolic Artificial Intelligence, that is   focuses on the development of knowledge-based systems (KBS); and (b) computational intelligence, which includes the methods like fuzzy systems (FS),neural networks (NN) and evolutionary computing. All these methods are briefly discussed below.

A)**Knowledge-Based Systems**:A KBS which is defined as, "a computer system capable of giving advice in a particular domain, utilizing knowledge provided by a human expert". A different feature of KBS lies in the separation behind the knowledge, that can be represented in a number of ways like frames, or cases, rules and the inference engine or algorithm which uses the knowledge base to arrive at a conclusion[6].

B)**Neural Networks:**Biologically inspired systems consisting of a massively connected network of computational "neurons," organized in layers . By adjusting the weights of the network, Neural Networks can be "trained" to approximate virtually any nonlinear function to a required degree of accuracy. Neural Networks typically are provided with a set of input and output exemplars. A learning algorithm (such as back propagation) would then be used to adjust the weights in the network so that the network would give the desired output, in a type of learning commonly called supervised learning[6].

C)**Fuzzy Systems:**Fuzzy set theory was proposed by Zadeh (1965) as a way of dealing with the ambiguity associated with almost all real-world problems. Classic set theory means sharp boundaries between sets,ie. an object can only be a member or non member of a given set. Fuzzy membership functions allow for gradual transitions between sets and varying degrees of membership for objects within sets. Complete membership in a fuzzy function is indicated by a value of +1, while complete non-membership is shown by a value of 0. Partial membership is represented by a value between 0 and +1.The use of fuzzy set theory does not necessarily minimize uncertainty related to problem objectives or input values, but rather provides a standardized way to systematically capture and define ambiguity[6].

D) **Genetic Algorithms :**In recent years, GAs have been applied to a wide range of difficult optimization problems for which classical mathematical programming solution approaches were not appropriate. The basic idea behind GAs is quite simple. The procedure starts with a randomly generated initial population of individuals, where each individual or chromosome represents a potential solution to the problem under consideration. Each solution is evaluated to measure of its "fitness." A new population is then formed by selecting the more fit individuals. This step by step process of evaluation, selection, and alteration is repeated for any number of iterations or generations in GA terminology. finally after few generations, it is expected that the algorithm "converges" to a near-optimum solution.

In addition to the above AI methods, there is one more new modeling paradigm known as agent-based modeling (ABM). This new modeling approach come out as as a result of   research work in AI as well as in complex systems analysis. The idea behind ABM is to describing a system from the perspective of its constituent units. So This approach is more suitable for modeling complex systems whose behavior emerges as a result of interactions among the components making up the system. As transportation systems exhibit almost all the characteristics of complex systems, ABM has been attracting more in this field

Fig1:Artificial Intelligence

III. REALTIME APPLICATIONS

1.Law:A city-centre development might require the examination of hundreds of title deeds. Traditional law firms give this routine and repetitive work to trainees or paralegals which is exactly the sort of work that lends itself to artificial intelligence or AI-based automation.Automation of the traditional work of lawyering is going on throughout the legal sector.Artificial Intelligent is used to screen claims for personal injury damages for signs of fraudulent behaviour[7].

2. Marketing And Advertising: Artificially intelligent poster campaign demonstrated by a partnership of advertising giant M&C Saatchi and media firms Clear Channel and Posterscope is an advertising hoarding capable of sensing the presence of passers-by before displaying an advertisement and learning from their individual reactions how relevant it is.It's the first time a poster has been let loose to entirely write itself, based on what that works, rather than just what a person thinks may work.The poster uses a body-tracking technology originally developed for the Microsoft Kinect system to work out who is standing in its vicinity, assessing up to 12 people at a time. It displays a combination of pictures and advertising copy from a "gene pool" and learns from the audience's reactions which are the most attractive. [7].

3. Finance: The financial services industry was one of the first commercial sectors to deploy Artificial Intelligence in mainstream business decision-making.On top of structured data about millions of transactions held by every financial services   a)Reuters publishes 9000 pages of financial news every day and Wall Street analysts produce five research documents every minute.Today 80 per cent of the underlying data in the financial service sector remains either semi-structured or unstructured and has to be processed manually[7]. With Artificial Intelligent, firms can analyse and contextualize such data almost instantly. Artificial Intelligent technologies in financial services include data mining and text analytics, semantic technologies,   natural   language   processing,and machine-learning.b)IBM's "ultimate financial services assistant which is capable of performing in deep-content analysis and evidence-based reasoning to accelerate and

improve decisions[7].Integrating structured and unstructured data ensures compliance rules are being applied and can help to detect offences, such as money laundering and insider trading. Natural language processing systems can uncover subtle cues in transactions that might indicate behavior that does not show up in the numbers.

4. Retail And Customer Service: Artificial Intelligence in the retail industry is categorized into the following sub-categories:

1)Sales and CRM Applications

2)Customer Recommendations

3)Manufacturing

4)Logistics and Delivery

5)Payments and Payment Services

4.1 Sales and CRM Applications : a)Pepper Robot:Pepper, a humanoid robot that can interact with customers and "perceive human emotions" is used as a customer service greeter and representative in 140 SoftBank mobile stores in Japan[7].b)Conversica:Conversica the sales assistant software is designed to automate and enhance sales operations processes by identifying and conversing with internet leads resulted in an average engagement rate of 35%[7].

4.2CustomerRecommendations: 1-800-Flowers.com launched Gifts When You Need (GWYN) in 2016,makes use of IBM Watson for AI gift concierge.The GWYN experience attempts to replicate the role of a concierge at a store through a personal and detailed conversation with users and within two months, 70% of online orders were completed through GWYN.

4.3 Manufacturing: under this there are two types ie a)Brilliant Manufacturing: General Electric's (GE) Brilliant Manufacturing software,which includes analytics and operational intelligence tools which is designed to make the entire manufacturing process from design to distribution and services more efficient and hence save big costs over time.b)WIP Manager software: It provides industrial and discrete manufacturers with plant-floor and plant-wide collaborative visibility of all work in process.

4.4 Logistics and Delivery: a)Domino's Robotic Unit (DRU):Domino's prototype of delivery robot can keep food and drinks at the appropriate temperature, the DRU's sensors navigate it through best travel path for delivery.b)Amazon Drones:Amazon is currently working with aviation agencies around the world to implement its small parcel delivery via drones within the regulations.

4.5 Payment Services: a)Amazon Go :Amazon Go, uses check-out-free technology that allows customers to check in,thereafter the entire shopping experience is automated. Customer purchase patterns are tracked by Sensors and are automatically charged through their Amazon accounts after exiting the store.b)PayPal :PayPal has has been using fraud detection algorithms which makes use of customer purchase patterns to make the difference between friends and the thieves who are making similar purchase with a list of stolen accounts.c)Payment Fraud:Fraud and payment security are major areas where companies like Sift Science are applying machine learning to detect user and payment fraud both of which are relevant for retail applications.

5.Healthcare: Typical applications of AI is the detection of a tumor.Heart sound analysis,Companion robots for the care of the elderly,Mining medical records to provide more useful information,Design treatment plans,Assist in repetitive jobs including medication management,Provide consultations,Drug creation,Using avatars in place of patients for clinical training.The goal is to create a cognitive system is to help clinicians and interpret a child's genome sequencing data, compare this with medical literature , quickly to identify anomalies that may be responsible for the unexplained symptoms.Problem: Healthcare environment is the apparently simple matter of ensuring that patients take the pills they are prescribed. An alarming percentage of patients do not complete courses of medication, creating dangers ranging from antibiotic to underestimating the side effects of drugs.This is particularly crucial in clinical trials, which often rely essentially on patients.some tests are carried out, and finally they find that less than 30 per cent of participants in clinical trials may be completing their course of medication.Solution:A mobile phone application, that is called AiCure records people taking their medication, identifying the patient and drug, with sophisticated features like facial recognition to ensure it is not being tricked.

6.Aviation:In Aircraft warfare the computers are able to come up with the best success scenarios. AI systems prove useful in creating strategies based on the placement, size, speed and strength of the forces and counter forces. assistance for the pilots may be given in the air during combat by computers[7]. The autopilot records and imitates the actions of the human pilot generating learning models using artificial neural networks.

7.Education: MOOCs, or Massive Open Online Courses, which allows students from around the world to take classes online makes use of advanced natural processing and Machine learning to grade the assignments of students [7]**.**

8.Finance:

8. 1Algorithmic Trading:Algorithmic trading typically used by large institutional investors makes use of complex AI systems to make trading decisions with utmost speed greater than any human capacity, often making millions of trades in a day without any human intervention[7].

8.2 Market Analysis and Data Mining: Black Rock's AI engine, Aladdin, is used both within the company and to clients to help in investment decisions with wide range of functionalities including the use of natural language processing to read text like news,social media feeds and broker reports [7].

8.3 Personal Finance: Digital AI powered application automatically helps the consumers to optimize their spending and savings based on their personal habits and goals which can analyze factors like monthly income, current balance, and spending habits, then make its own decisions and transfer money to the savings account[7].

8.4 Underwriting: An online lending platform analyzes large amount of consumer data using machine learning algorithms to develop credit risk models that predict a consumer's likelihood of default[7].

9. Heavy industry: Countries like China, Japan, the United States, the Republic of Korea and Germany together amounted to 70% of the total sales volume of robots. Japan had the highest density of industrial robots in the world: 1,414 per 10,000 employees.

10.Human Resources & Recruiting:AI is used to screen resumes and rank candidates according to their level of qualification. Artificial intelligence is used to predict candidate success in given roles through job matching platforms.From resume screening to neuroscience, speech recognition, and facial analysis,it's clear AI are having a massive impact on the human resources field. The latest development in AI is in recruiting chatbots.

11. Social Media:a)Twitter has begun to use artificial intelligence behind the scenes to enhance their product. It makes use of Deep Neural Networksto process the data and to understand users preferences.b)Facebook is making use of Deep learning to draw value from a larger portion of its unstructured datasets created by almost 2 billion people updating their statuses 293,000 times per minute.c)Instagram also uses big data and artificial intelligence to target advertising and fight cyberbullying and delete offensive comments[7].

12. News, publishing and writing : a)Echobox :Echobox is a software company which can help the publishers to increase the traffic by posting articles on social media platforms like twitter and Facebook.By analyzing the vast amounts of data, it learns how specific audiences respond to different articles at different times of the day. It then chooses the best stories to post and the best times to post them.b)Yseop: A company that uses artificial intelligence to turn structured data into intelligent comments and recommendations in natural language and writes financial reports, executive summaries, personalized sales or marketing documents speed of thousands of pages per second and in multiple languages including English, Spanish, French & German.

13.Transportation:Today's cars now have Artificial intelligence based driver assist features like self-parking and advanced cruise controls. Artificial Intelligent has been used to optimize the traffic management applications, which in turn reduces waiting times, energy use, and emissions by as much as 25 percent.

IV. CASE STUDIES

1)DOMO – AI for Business Dashboards: It is a fast -growing software business company that has created a cloud based dashboard that gathers information to help companies make decisions and can scale with the size of the company, so that it can be used by teams as few as 50 or by much larger enterprises[8].For example, Domo users who are merchants can extract data from Facebook, Shopify, Salesforce, Square and many other applications which is used to manage online stores.The extracted information can then be used to generate reports and spot trends in real-time, such as in product performance, which can be shared to any device used by the company.Detecting the changes and patterns is expected to fuel the predictive analytics and help companies predict the return on investment for marketing in real-time, customer churn, and sales forecasts[8].

2)Apptus – AI in Sales Enablement:Apptus specializes in the connection between a customer's intent to buy and the realization of revenue by a company.The software combines big data and machine learning to determine which products might appeal to a potential customer as they search online or get recommendations[8].For example, when a customer visits an online store that uses Apptus eSales and starts to type in search terms to look up products, the machine learning solution automatically predicts and displays related search phrases.It can also display products associated with those search terms.

3. Avanade – AI for Business Insights:This is a joint venture between Microsoft and Accenture that leverages the Cortana Intelligence Suite and other solutions for predictive analytics and data-based insights.Avanade says the future will populated with smart technologies where machines take on more work than that of people traditionally do. According to a study commissioned by Avanade, a survey of 500 business and IT leaders from around the world revealed that they expect to see 33% increases in revenue as a result of smart technologies. They also believe this will lead to new and redefined job roles for employees, as well as more benefits to customers.[8]

4. Automate job functions to improve efficiency. AI automates any job function which requires repeated manual input. AI can provide efficiency in automating machine workloads, such as collecting and analyzing sensor data.

5. Improve business processes. In transportation and logistical supply chains this AI improves a lot of business a processes, such as dynamically adjusting trucking routes by tracking weather and traffic delays. Another important AI frontier is biomedicine.

6. Predict performance and behavior. For web search and social media users this AI applications can predict time to performance milestones based on progress of data, and can enable customized product offers. Based on the past actions,the neural network analyzers can make decisions and suggests optimal decisions in future plays.

7. Increase revenue. In the field of sales and marketing companies increase revenue by using this AI .for example If a customer is looking for a jacket, the retailer asks customers what, when, and where they need to get the jacket. The customer can give their response, and scans a product database to locate and identify two things: 1) a jacket that best fits the customer's requirements and 2) cross-references the recommendation by weather patterns and forecasts in the customer's stated area.

8. Pattern recognition. AI pattern recognition helps in finding non-compliance or fraud in digital communications. It also plays a vital role in social semantics and sentiment analysis works for the purpose of social media marketing and terrorist investigations.

9. Business insight. AI interprets big data for better insight across the board: assets, employees, customers, branding, and more. AI applications work with a lot of unstructured data as well as structured, and enables business people to make better and faster business decisions.

V. AI STATISTICS

In this business world Artificial Intelligence is one of the growing trend. Following are few statistics of Artificial Intelligence

1. More than $300 million was invested in AI startups in the year 2014, which was a 300% increase over the year before.

2.IBM,Amazon, Alphabet, and Microsoft to host 60% of AI platforms

3. AI bots will power 85% of customer service interactions by 2020

4. In the year 2018, "customer digital assistants" was recognized customers by face and voice across channels and partners.

5.Among the AI applications voice assistant software tops

6. 80% of executives are believing that artificial intelligence will improves worker performance and creates more jobs

7. 20% of business content will come from AI by 2018

8. Gartner has said that the smart agents would manage 40% of mobile interactions at the end of 2020.

9. Robots may be smarter than humans within a couple of decades

10. AI will enable businesses to obtain or sustain a competitive advantage.

VI.MANAGEMENT CHALLENGES

Organizations rate their companies higher in several general management and leadership areas: vision and leadership, openness and ability to change, long-term thinking, close alignment between business and technology strategy, and effective collaboration[8]. As with other technology-driven transformations, these are essential general capabilities for high-performing companies.However, there are also some specific challenges: Executives may still need to (1) learn more about AI; (2) deepen their perspective on how to organize their business around AI; and (3) develop a more expansive view of the competitive landscape in which their business operates.

Challenge 1: Develop an Intuitive Understanding of AI: TIAA, a Fortune 100 financial services organization with nearly $1 trillion in assets under management, states, that every frontline manager needs to understand the difference between deep and shallow learning within a neural network[8].For those who have already been exposed to the marvels of robots, self-driving vehicles, or poker-playing machines, there is little new to experience at AI companies. Instead, managers should take some time to learn the basics, possibly starting with simple online courses or online tools. They can understand how programs learn from data and how Artificial Intelligence can be benefited a particular business.

Challenge 2: Organize for AI: Adopting AI broadly across the business will have an effect on soft skills and organizational flexibility that enable new forms of collaboration, including project teams composed of humans and machines.A survey by MIT Sloan Management Review research initiative in sponsored by The Boston Consulting Group finds that companies are exploring many approaches to developing AI capabilities.Some firms have not even started to lay out clear responsibilities for AI initiatives, perhaps because very few see AI having a large effect on their processes and offerings in the next five years[8].Ultimately, a hybrid model may make the most sense since many companies need AI resources both centrally and locally.

VII.FUTURE AI TRENDS IN BUSINESS

1)A significant increase over this year's $643.7 million mark[9] is the market estimation about global AI revenue, will reach $36.8 billion by 2025.

2)AI will drive 95 percent of all customer interactions by 2025, with consumers unable to differentiate bots from human workers via online chats and over the phone. (Servion)

3)"By 2020, 30 percent of all B2B companies will employ AI to augment at least one of their primary sales processes." (Gartner, Predicts 2017: CRM Sales, 31 October 2016)

5)"By 2018, 20 percent of all business content will be authored by machines"[9].

6)Even though many more commonly recognized technologies like robotics and self-driving vehicles depend on AI to properly function[9] but only few ie. 54 percent of business executives are currently aware of AI as an emerging technology,

8)By 2020, 85% of customer interactions will be managed without a human. (Gartner)

9)By 2018, six billion connected devices will proactively ask for support. (Gartner)

10)Artificial intelligence's most important benefit is "automated communications   provide data that can be used to make decisions" that was believed by 44% of executives.

11)"Customer digital assistants will recognize customers by voice and across channels and partners"is at the end of 2018, (Gartner)

12)80% of executives believe artificial intelligence improves worker performance and creates jobs. (Narrative Science)

VIII. CONCLUSION

Artificial intelligence gives the capability to the machines to think analytically, using concepts. Tremendous contribution to the various areas has been made by the Artificial Intelligence techniques from the last two decades. In this we have discussed about Artificial intelligence methods and few real time applications, few case studies and some future trends and challenges in few fields like medicine, Transport, cyber security, Retail, Manufacturing. Future scope of Artificial Intelligence in Business is also discussed. This brief overview of artificial Intelligence may help the researchers who want to make further

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