ACTA SCIENTIAE

ISSN: 2178-7727

Role Of Artifical Intelligence in Food Industry

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ABSTRACT

Artificial Intelligence has gained a lot of importance across the globe in the last one decade. Its applications are rapidly increasing in every sector. It has scaled new heights with the advancements in technology particularly Nano technology, neural networks, cloud computing, machine learning etc. This paper discusses and gains and insight into applications of AI for the food sector.

KEYWORDS: Artificial Intelligence, Computing, Technology, Machine Learning, Applications, Growth.

INTRODUCTION

The Artificial Intelligence or AI is branch of Computer Science in which the Machines basically show human behavior. The machines try to act like humans by imbibing human intelligence traits. This is possible with the help of Deep Learning, Neural Networks, Machine Learning and Language Processing softwares. AI has widespread applications in varied sectors like Healthcare, Automobiles, IT, Agriculture, banking, Education, Medicines, transportation etc. across the world. It is one of the most trending things right now. In India it is at a nascent stage and has a long way to go. This article throws light upon role of AI in Food and Beverage sector.

REVIEW OF LITERATURE

Artificial intelligence (AI) is the simulation of human thinking imbedded in the computers. It means computers depict human like behavior like reasoning and problem solving. Artificial Intelligence is a sum total of reasoning, programming, , expert systems, genetic algorithms, systems, artificial life, belief revision, data mining, knowledge representation, neural networks, theorem proving, machine learning, natural language understanding, constraint satisfaction, and theory of computation Artificial Intelligence is being used in different sectors like healthcare ,automobiles , IT , Retail , Financial Services , Transportation ,education and many more. The Food and beverages industry is also no longer different .With the increasing income demand for travel, entertainment and consumption of food sector related products is increasing at a rapid pace. Mobile applications, kiosks, Robots, and chatbots, allowed by artificial intelligence, dramatically transform the guest experience [11] and robots independently automate restaurant operations [12]. The purpose of this article is to discuss some uses and applications of artificial intelligence in the food & beverage service sector. The automated restaurants enhance the customer experience and at the same time maintain the quality of products and service but in terms of employees attitude and behavior they show a negative impact [13] and artificial intelligence also helps in marketing and reputation management activities. Moreover, voice operated agents and robotics make operations easier [14], most of the guest thinks that robotic restaurants are attractive for kids because they can see their robots are making and serving food and sometimes showing entertainment activities but the serving point of sometimes robots are unable to do service properly as humans. [15] Service process automation can assist with process optimization, quality control, and market planning and cost reduction. Service robots are extremely helpful in manufacturing and serving the food items at a reasonable cost and provide superior service. [16] Although the restaurant industry is suffering from labor shortages created by a rise in the minimum wages, the results of this study indicate that using powerful serving robots may be beneficial, particularly now that non- contact service is in the spotlight due to the covid-19 pandemic. [17]

ISSN: 2178-7727

METHODOLOGY

This study is Descriptive in nature and the data collected is from secondary sources. A number of Journals, articles, websites, periodicals have been referred to for preparing this paper in detail. The main purpose of this study is to gain an insight into the AI applications in the food sector and how it has evolved over the years. The study throws light on uses of AI for improving the overall efficiency and productivity of Food Industry and how AI can be used in various facets of Supply chain starting from the source to the destination .In the end it will discuss some of the challenges faced in adoption and implementation of AI in these sectors.

EVOLUTION OF AI IN INDIA

Although it may seem a new term but the history dates back to 1936 when Turing designed an Algorithm machine. Is was coined in terms of science at the Dartmouth conference by John McCarthy in 1956, In our country Professor H.N Mahabala executed the first program on AI in India in 1960s at IIT Kanpur. Research in this field took off in 1986 when the Government of India launched the Knowledge-Based Computing Systems (KBCS) program in conjunction with the United Nations Development Program as part of its Indian Fifth Generation Computer Systems (FGCS) research programme.

THE RISE IN INDIA AI'S ADAPTATION AND GROWTH

Since the early 90s, India's IT and ITeS services sector has been growing at a rapid pace of 7.7% of India's GDP in 2016. India has a significant stake in AI being second largest economy. Government of India, has mandated the NITI Aayog, to establish the National Program on AI in 2018 — to assist the R&D work in AI-enabled technologies. Henceforth, NITI Aayog has adopted a three-pronged approach — crafting, building and collaborating with several leading AI players. to implement AI projects in critical areas such as agriculture, food and packaging, healthcare services, education, finance, e-commerce, smart cities and infrastructure.

THE CURRENT SCENARIO

India witnessed the highest increase in the AI's adoption and related driven technologies in 2020 as compared to developed nations like US, UK, and Japan, according to PwC report, India. There was an increase of 45% post Covid 19 in the use of Artificial Intelligence and computing, the highest as compared to major economies like the USA (35%), Japan (28%) and the UK (23%).

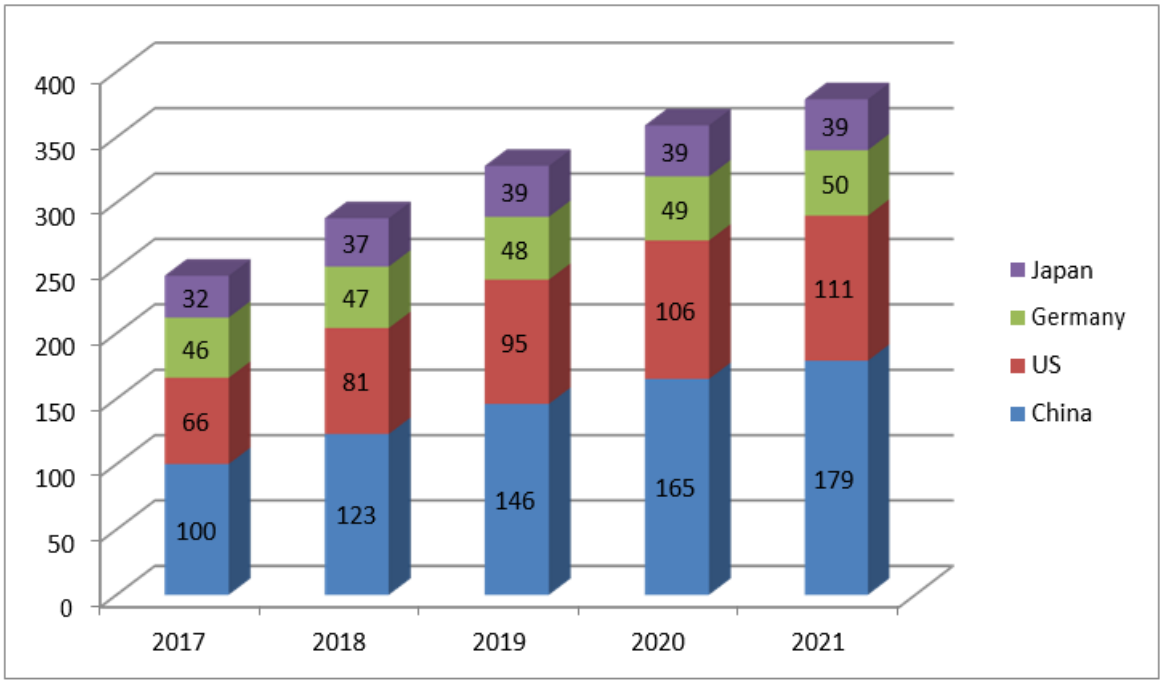
India has taken a giant leap in AI by joining 'Global Partnership on Artificial Intelligence (GPAI)' as a founding member to enhance and support use of AI and its growth. This will help in bridging the gap between theory and practice in field of AI by exclusive research and applied activities on AI-related priorities.

Artificial intelligence (AI) is taking giant leaps in the food and beverage (F&B) industry. AI in the food and beverage business is predicted to increase at a CAGR of 45.77 percent over the next five years, with a market value of $4.07 billion by 2030. Its all called as Industry 4.0 in which overall efficiency is enhanced by minimizing wastage, guarding supply chain interruptions and hence maximizing profitability.

Artificial intelligence can keep a check of customers including their preferences, purchases and attitude towards food industry which is crucial towards predicting sales. For example, a retailer has better understanding of the customer based on re-purchase behavior and hence pile up inventory. Artificial intelligence takes past trends, then forecasts future sales by making estimates with the help of, AI- enabled algorithms, which can be immensely beneficial in planning strategies.

Fig. 1 :- AI enabled Sales in Million US Dollars.

ISSN: 2178-7727



Source:-Accenture and Frontier Electronics Survey , 2022

As is evident from Fig 1. that AI assisted Food and Beverage Sales is increasing year on year from 2017 to 2021 and is predicted to do so in the coming years as well. This is by and large evident in case of developed nations but in developing and underdeveloped countries it is at a very nascent stage.

Most important fields of Artificial Intelligence are as follows: -

1. Machine Learning (ML):- It is a scientific study of algorithms and statistical models that computer systems use to effectively perform a specific task without using explicit instructions relying on patterns and inference instead. For example to identify a fruit, the idea is showing different pictures of the fruit that is to be identified and feeding the same into the machine using different permutations and combinations.
2. Natural Language Processing (NLP):- Natural Language Processing is primarily defined as the manipulation of speech and text, by software. It is a subset of computer science concerned with the machine interactions with human languages and programming the same to process and udnestand large quantum of data.
3. Vision:- It is a scientific field which enables the machines to see. This is done by using cameras, Analog to Digital devices and Digital Signal processing to automate tasks that human visual system can perform.
4. Robotics:- It is a field of engineering and science that deals with the design, construction, operation and use of robots as well as computer systems for their control, sensory feedback and information processing. These technologies are used to develop machines that can substitute for humans and replicate human actions .Robots are often used to perform tasks that are difficult for humans to perform or perform consistently.
5. Autonomous Vehicles: - This is self-driven car or an robot that is capable of sensing its environmental surroundings and moving with little or no input at all from humans.

APPLICATIONS OF AI IN FOOD SECTOR

Smart Farming

Smart farming is the use of AI to improve output and optimize growing conditions. AI can help farmers by detecting pests and plant diseases. It can also detect environmental variables like temperature, soil, humidity etc.

The data can be gathered and used with the help of sensors, drones, and satellites. This will save the cost on field trials and also enhance accuracy of studying and interpreting geographical topography.

DOI: 10.2030/ASCI.25.5.AS.2

ISSN: 2178-7727

Inventory Forecasting
Biggest challenge in Food and beverage business is to predict and analyze which products to be stocked, in which quantity and when and where they will be stored. Retailers benefit from artificial intelligence since it can pin point accuracy in guiding the companies in inventory management. As a result AI in business of food sector can forecast high demand, items and also help in Just in time management in case of last minute demand surges.

Maintenance of Process Equipment
Predictive maintenance is a technique in AI can be used to repair the tools and equipments in a cost effective manner before the fault becomes too severe. This uses cause and effect analysis to repair and maintain equipment and keep them in proper shape to enhance their longevity.

Product Sorting, Food Sorting, and Quality Control
The food sorting process is a necessary step in ensuring that the food supply chain functions properly. Using AI products and food articles can be sorted in a proper way and ease of doing business can be enhanced by reducing wastage, defectives and improving the overall efficiency.

Food Safety Compliance and Materials

Food safety regulations and security management are becoming tougher and tougher by each passing day and AI has come to the rescue of the food sector. AI sensors and cameras are deployed that can warn workers and send alarm signals to their managers incase they miss something during operations. By doing so the food contamination, degradation of food can be checked in turn improving the overall quality.

Automated Food Packaging
Applications of AI in food packaging can help to improve the design of food packaging, as well as its function. It can be used to label products accurately and sort packaging items as per size , order , type etc. It can detect spoiled and failed food items which can be sent to the warehouses for recycling and rework.

Quality assurance sorting
Sorting is one of the most time-consuming process in the manufacturing process. Sorting potatoes by size, for example, can assist manufacturers in determining which ones to utilize for French fries or hash browns. Sorting out off-colored tomatoes will help in reducing rejections. Article Sorting can be simplified by artificial intelligence. This procedure is automated using AI, which employs a machine learning-powered sensor-based optical sorting approach. As a result, time is saved and its more fruitful to enhance yields.

Food Transportation
When it comes to food transportation, it has a gamut of opportunities. AI can track food from the Source to Destination with the help of Satellite tracking, GPS systems. The cargo can be tracked in case of delays and food spoilage and deterioration can be avoided by having alternative options to expedite the transportation mechanism,

Improve Customer Experience
Artificial intelligence can improve customer service and support by predicting future trends, automation of tasks, freeing the employees for other tasks.. As a result customers will have a more fun filled and satisfying experience. Some of the benefits accrued to the customer are as follows:-

Face Recognition:-Paying with the help of Facial Recognition Software. Yes, you heard that right .KFC and many food majors are using this in various developed countries. Not only this has the system also reminded you about the last order you placed there.

DOI: 10.2030/ASCI.25.5.AS.2

ISSN: 2178-7727

Burger Flipping Robots: - Californian burger chain CaliBurger used a real life robot named as Flippy, in the kitchen of the restaurant. It cooks, plates up and even flips burgers using sensors and AI cameras and also detects the temperature of the food it is cooking.

Then we have a robot that interacts with its customers, greets them, makes recommendations and takes

orders. It is developed by Japanese technology firm SoftBank in partnership with Mastercard, and also takes payments. Pizza hut in Singapore and the French supermarket chain Carrefour are using it.

We also have scanners that decode the amount of calories in your food, nutrient levels, freshness of food and allergens if any that can cause reactions to certain individuals.

Technology can help customers make purchases based on their past experiences by using predictive analytics. Applications are not only restricted to restaurants but have widespread uses in smart kitchens by guiding and supporting people cook meals in terms of ingredients and recipe preparation.

Retail Shopping

AI could reduce food waste by 2030 by introducing more meaningful regenerative recreational agricultural practices. Tracking of food items can help reduce food waste and make more food available to people and also reduce the problem of undernourishment and poverty.

CHALLENGES AND CONCLUSION

One of the challenges faced with AI is implementation and integration with other technologies across varied sectors. In India, we have started to take healthy steps in line with mission of NITI Aayog that will help to make this market competitive and meaningful. Also, the adoption of technology is very important by the existing employees. The process of automation will lead to job loss for the current employees. Cost is another big factor as these systems need an initial setup cost in tunes of crores of rupees. Sometimes employees may feel threatened by automation.

AI has a lot of potential for expanding its reach, making advanced recommendations, developing new products, improving user engagement, and, most crucially, increasing efficiency. It’s high time for food and beverage companies to embrace AI and realize its benefits.

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ISSN: 2178-7727

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