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A Critical Review on Artificial Intelligence and Robotic Vision in Food Industry

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Abstract

Artificial intelligence (AI) has been implemented into the food industry over the last few generations as food demand has expanded in parallel with the global population. The capability of the aforesaid intelligent systems to perform a variety of tasks, including food quality assessment, process controls, food classification, and prediction purposes, has raised their demand in the food industry. The food manufacturing and handling sector is among the most important of the world's numerous industrial industries, with the highest employment. Human labour is essential for the efficient manufacture and packaging of food products. As an outcome of human participation, food corporations are struggling to sustain the requirement cycle and are lacking in food safety. Smart manufacturing is the appropriate solution for addressing these difficulties in the food business. Artificial intelligence (AI), machine learning (ML), and deep learning (DL) algorithms are at the heart of automation. This review will discuss expert machines in the food industry, which offer significant capital savings while increasing resource efficiency by reducing human error. AI has the potential to greatly improve packaging by increasing shelf life, incorporating AI algorithms into selections, and enhancing food security by building a more visible system for controlling supply chains.

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1. Introduction

Artificial intelligence (AI) and machine learning are predicted to take use of massive data availability, culminating in functional real-time smart gadgets, active training, and predictable models. With the advancement of automation, the economic growth and modern industry have reached new heights of productivity in a matter of decades. In the early 1900s, the idea of machinery addressing work with better precision and replacing human labour in all imaginable domains was always a future goal (Bucher et al., 2021). Artificial intelligence, generally known as AI, has gained significant success in replacing humans in activities such as computer vision and object identification in recent years. Artificial intelligence (AI) is a group of various phenomena and methodologies, with two key notions at its core known as Deep Learning (DL) and Neural Networks (NN) that accounts for AI's remarkable progress (Tripathi et al., 2020). AI's appealing performance has made it the most desirable tool for use in industries such as process and decision-making estimate with the goal of productivity development, quality enhancement, and overall cost reduction (Dewi et al., 2020).

One of the concerns is food safety, where primary issues in the food business has resulted in the creation of smart packaging solutions to meet the needs of the food supply chain. Intelligent packaging monitors the state of foods to provide information on their quality during delivery and storage. Another research considers Innovative packaging as a way for decreasing food waste, where 45 recent advances in optoelectronic devices for freshness monitoring were discussed. The study included fruits and vegetables, poultry & meat, fish products because they are the most represented fields of application (Pnishchuk et al., 2020). Several research on intelligent packaging have been undertaken, and these studies have demonstrated that the use of smart packaging systems in the food processing plant is critical in food chain framework since they can check the quality of food stuffs and crops (Rary et al., 2020).

AI is divided into two categories: strong and weak Artificial intelligence. The principle of weak AI claims that the machine should be built to serve as a clever unit that replicates human decision-making, but the strong AI concept asserts that the technology can really reflect the human mind. Automation or artificial intelligence-based methods are widely used in almost every aspect of technology. It enables the globe to quickly resolve issues, computerise the food industry, and modify food things (Dehnavi et al., 2020). Using a computerised system, the industry may study and improve the best conditions, including soil preparation, crop management, irrigation, and climate control, resulting in the excellence of food sector products (Yost et al., 2021). AI applications are not limited to these examples. It can also be beneficial in storage, food manufacturing, and transportation. Intelligent devices such as robotic systems and intelligent robots can also play a crucial role in lowering packaging costs. The significant tasks of AI in the food industry can be divided into two categories: food quality management and food security management. Among the industries that have used AI approaches include Gaming, Climatology, Industrial Plants, Processing industry, Food Service Industry, Healthcare Establishment, Information Retrieval, Progenitors, and Information Extraction are all examples of industries that use data mining (Wang et al., 2020).

2. AI in Food Industry

For years, the applications of artificial intelligence in the food sector have been developing for a variety of reasons, including food sorting, classification and parameter prediction, food safety and quality control. Expert systems, adaptive neuro-fuzzy inference system (ANFIS), computer vision, ANN, and fuzzy logic are all popular approaches in the food sector. Quality control, customer psychology, human wellness, current trends, and food type all have an impact on the food processing sector (Schmidth et al., 2020). According to Global Food Technology, characteristics such as social occasions, time restrictions, stress reduction, and indulgence have raised the market demand for modular food. Earlier to the introduction of AI, food-related studies had been conducted for many years in order to raise public awareness about dietary diversity and to improve the end results associated with food features and food production. The AI method can provide numerous benefits, and its application in the food business has been ongoing for decades and is still growing. Additionally, Trends such as rising desire for awareness and wellbeing have prompted a significant surge in functional food adaptation. Quotes like "Eat Global-Buy Local," "Organic 14 Healthy," and "Gluten-Free in Major Asian Markets" demonstrate the enormous influence of health knowledge and fitness on market trends (Wardah et al., 2020). It is worth noting that several methods that have been used for prediction and enhancement of the food industries, such as ambivalent least squares, competitive adaptive reweight ed sampling, empirical models, in silico models, successive projections algorithms, sparse regression and gastrointestinal unified theoretical framework, are not discussed here; rather, the focus is on the widespread application of AI in the food industry.

2.1 Smart Farming

AI also has key applications in the food business, such as Robo cropping, predictive analysis and soil monitoring. Agriculture-related innovations increased Global capital investments and expanded international trade. The price of this advancement in terms of environmental degradation appeared unavoidable.

2.1.1 Soil monitoring

The food industry is evaluating the advantages of AI-based solutions. The deep-learning algorithms and computer vision are highly significant in the AI-based system and are utilised to investigate the chain of data or information obtained by AI based agents in order to track agricultural and soil health progress. The system's major objective is to identify harmed crops and find the most likely method for healthy yield enhancement (Bhattacharya et al., 2021). According to the most current Soil Monitoring (SM) scenario, a farmer sends a sampling of their crop soil to the monitoring organisation, and the client receives a comprehensive report on the contents of their field soil. Following the results, an appropriate decision for broad microbial progression (fungi and bacteria) was made. To keep an eye on crop health, most businesses now use farm drone technologies and AI (Tao et al., 2020). The primary goal of the company is to reduce the cost and enhance crop growth. Now, subsequent technology has uplifted to a new phase of advancement known as the Internet of Things (IOT). The Internet of Things plays an essential role in soil and crop monitoring decisions. SM with IOT is an AI tool that helps food and farmer companies to maximise on their economics, reduce the likelihood of illness, and optimise the use of existing assets. Sensors are used in these, to detect soil temperature, nitrogen, phosphorus, and potassium (NPK) content, water content, oxygen concentration, potential in soil, and quantity of photosynthetic radiation in soil. The data collected by the various sensors is communicated to a computer system or the web for proper decision-making, allowing corrective actions to be conducted in a timely manner (Fainshtein et al., 2021). The output of analysis, visualisation of collected signal, is useful in resource utilisation. Identifying system behaviour demands recognizing the soil patterns and making tough decisions to circumstances in order to achieve optimal crop yield and wonderful products. Agricultural in nature IoT is also known as smart agriculture. The IoT-based food business is referred to as the smart food industry.

2.1.2 Robo cropping

With technological advancements, the food business is likewise utilising modern-technology-based instruments to boost productivity. Numerous research groups have created Robo crop technologies. It is an AI-powered robotic system that improves yield by optimising usefulness and consistency. It properly and efficiently lines up crop tools (Topleva et al., 2020). Several authors have produced outstanding work in the subject of harvesting robots in Robo cropping or agricultural automation, which has enhanced production significantly in recent decades. These systems gained popularity as a result of innovation and additional benefits such as reduced worker force and increased productivity. In agricultural automation, robotic weeding automates and effectively controls weeds along or within crop rows. The performance of the Robo crop is fully reliant on the properties of the input image. It produces excellent results when the supplied image contains more prominent characteristics. In each input frame of the video, the crop should contain more plants than the wildflower, and the field shrubs should be close to the color information band average.

The researchers investigate the importance and use of several artificial intelligence-related fields in the food processing industry, such as robots, patterns, data science, advanced analytics, and classification. Along with food preparation, there is a sizable food handling business, and AI plays a significant role in managing the complete processing unit operation (Misra et al., 2020).

2.2.1 Product Sorting and Packaging

Proper food supply acquisition and packing is one of the most time-consuming and tiring processes for food processing units. Such time-consuming procedure can now be handled by AI-based systems, minimising the possibility of error and dramatically increasing the industry's output rate. Because vegetables and fruits vary in shape, coloration, and size, designing AI-based solutions is a difficult task (Fesaghandis et al., 2018). A huge amount of data is required for the development of an AI-based sorting and packing system in order for the system to be correctly trained and do the work efficiently. An automated system currently performs the whole of goods grading and packing tasks.

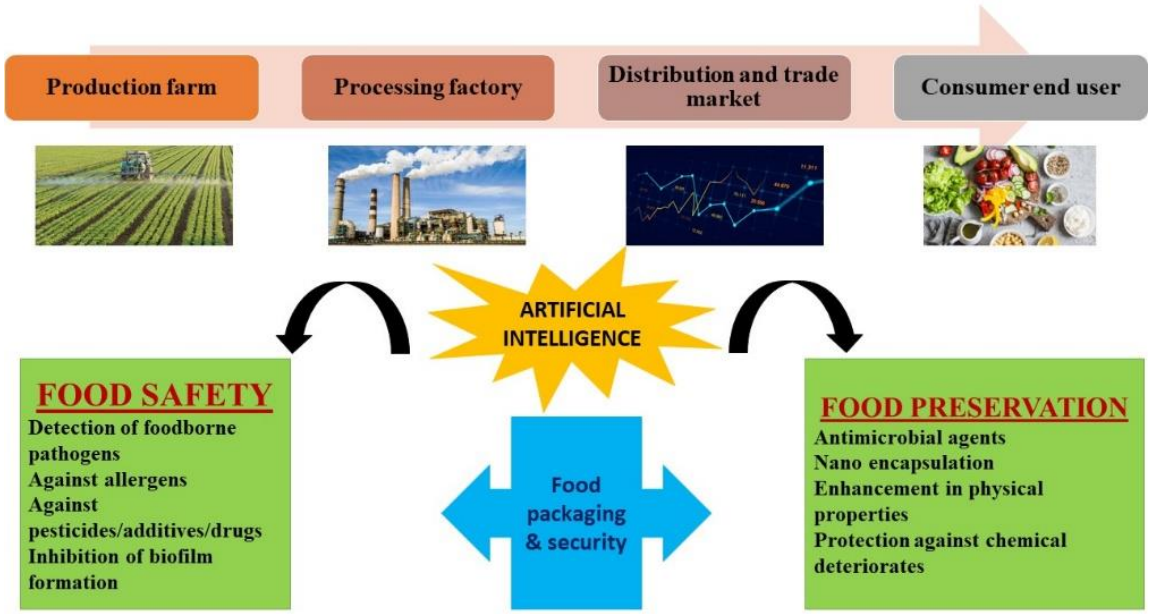

Figure 1 – Artificial intelligence used in Food safety and preservation

2.1.3 Predictive analysis

Weather fluctuations, for example, are used to trace and forecast multiple ecological effects on agricultural productivity. In cooperation with satellites, ML machine learning algorithms analyse agricultural sustainability, anticipate weather, and evaluate farmland for the presence of pests and illnesses. The model specializes at providing superior data and information that is frequently and rapidly updated (Kakani et al., 2020). Furthermore, the business is quite confident in the data it supplies to its consumers, having regular access to over one billion agronomic data stacks. Temperature data, wind speed, solar radiation, and Precipitation, as well as Historical data is useful for predictive analysis. The resultant analysis takes into account, a prominent influence for proper crop selection and scheduling for specific agricultural property.

2.2 Artificial Intelligence in Food Processing Industry

Employing such strategies resulted in benefits for industries such as faster production levels, greater good products, and reduced labour costs. AI-based intelligent decision-making systems are comprised of a wide range of methodologies and tools, including infrared spectroscopy, laser-technology-based systems, X-ray-based systems, and high-resolution cameras. These technologies and methods are used in the input channel to analyse every component of food commodities such as fruits and vegetables (Donepudi et al., 2014). Artificial intelligence used in Food safety and preservation is depicted in figure 1. This technique produced outstanding results in other food processing industries as well. Furthermore, each organisation discovered that the AI-based solution functions more accurately. TOMRA has been shown to improve the separating and ordering difficulty by 5-10% in the instance of potatoes alone. A similar type of difficulty was overcome by a Japanese firm using a

TensorFlow ML-based system, resulting in a spectacular result and enormous advantage in their production unit. This approach also produced excellent outcomes in other food manufacturing sectors. In addition, each organisation realised that the AI-based system performs more accurately. The development of AI-based potato systems spurs the development of comparable systems for other uses. It can be expanded to include separate divisions or sectors of the food processing.

2.2.2 Self - Health Sanitation

It has also been proved that nations all over the world, have put food manufacturing unit sanitary laws in place. AI-based systems have also taken care of such guidelines (Vadlamudi et al., 2018). Initially, the Shanghai primary healthcare office and KanKan worked together to develop an AI-powered system. The very first AI based system is designed for object recognition and faces, given a random number. These technologies are used to monitor users who break the rules. If anything coincides, it can be resolved quickly without any delay (Bera et al., 2021). These designed systems produce excellent outcomes; so, it is intended to extend the system to include more and more organisations.

2.2.3 Decision

AI is not only supporting food processing enterprises in the creation of unique flavour amalgamations, but also serving customers in the selection of novel essences in a variety of organisations. In 2018, Kellogg's created Bear Naked-Custom, which lets customers to make their own granola out of more than 50 different ingredients (Tyagi et al., 2021). It captures their flavours, client taste choice, and much more information while caring for each individual. This type of data is essential for releasing a new item onto the market (Sepulveda et al., 2020). As a result, AI once again played an important part in the development of decision-making tools for customers.

2.2.4 Launching of New Products

Any production unit's creation of new items is a time-consuming operation. It is entirely dependent on the consumer's interests, especially in the food industry. As a result, the knowledge obtained by various client decision making processes is beneficial for the development of new products (Jayaraaman et al., 2016). The ML-based module analyses the collected data before making the suitable product decision. An ML-based strategy was used to make statements such as "what precisely are purchasers looking for?" (Morva n et al., 2008). Almost all the food packaging and food processing industries are currently using artificial intelligence to create and market new products. Coca-Cola has placed a conscience soft drink area around the United States. Customers may use this to create hundreds of different cocktails by varying the flavours slightly. The machine has recorded this type of behaviour, and the remainder of the research is handled by the ML and profound machine learning. New goods can be launched using this data. Cherry sprite is a real-time product sample. It has also been predicted that, in the following decades, the majority of food industry will use the suggestion system to design new goods.

2.2.5 Machine Learning for food delivery

Machine Learning (ML) can help with the appropriate solution of challenges like selecting delivery routes, delivering raw materials, anticipating desire for certain food products, and managing logistics. The delivery route concerns can be managed with ML by maximizing the delivery agent's geolocation with respect to current or upcoming traffic patterns and then alerting them of the ideal path in an efficient manner that allows us to focus on other tasks. By ensuring effective and timely delivery, it becomes simpler to place consistent orders and even cope with issues such as having to run from out delivery agents or delivery delays. Moreover, by incorporating ML, the quantity of obtained data expands with time, allowing it to be investigated using other AI-based algorithms to produce a more expert system. Such research might be performed out to use more advanced AI-based methodologies, such as deep learning (DL), giving a competitive advantage.

2.2.6 Equipment Cleaning and Maintenance

Adequate maintenance and cleaning of processing gear is critical in the food industry. AI-based systems can readily manage such task. Different sensors and cameras are used to carry out this duty. One Whitwell and Martec product suffers from a muscular weakness that can only be reduced to 50%, allowing for high efficiency and a shorter length of time (Wolfert et al., 2017). Martec is currently seeking to justify its artificial intelligence-based cleaning place paradigm. Martec uses optical fluorescence methods and ultrasonic sensing imaging methods in this strategy to foster the acquired knowledge for the development of AI systems (Gupta et al., 2021). It counts the quantity of food and microbiological waste which is still inside the machine (Lozano et al., 2021). The system will go into standby mode after the whole testing phase report is released.

2.2.7 Demand-Supply Chain Management

Food industries must be more honest about the route of prepared foods in the system of supply chains as long as they are worried about food safety measures. Each phase of the process is monitored by AI (Yagci et al., 2021). It manages everywhere from pricing to inventories. It also forecasts and monitors the movement of assets from the place they are produced to where clients receive them. Symphony Retail, powered by AI, offers inventory control, transportation booking, and billing (Qin et al., 2021). It also maintains discipline and avoids acquiring a large number of goods that result in depleted material.

3. Artificial Intelligence in Food Safety

Because of their sterility, robots are widely accepted in the food processing industry. This characteristic is important in minimising the number of food-related illnesses. The Food Safety Growth and Market (FSGM) has established stricter sanitary standards that are applicable to whole system of supply chain (Raut et al., 2018). Spices, Cereals, and other food products that does not require refrigeration and are in the most risk regions of infection are the culprits. Previously, such food items were free of pathogens, but the scenario has altered drastically. AI-based technology can surely assist in resolving such difficulties. They cannot spread disease in the same manner that people can. Maintaining an AI-based system, on the other hand, is simple and straightforward. Robots in food processing industries will enhance production by 30% while meeting government demands (Singh et al., 2021). There are also some new breakthrough concepts that are using artificial intelligence in food safety procedures that are predicted to

gain popularity in the near future. They are particularly focused with lowering the incidence of foodborne illnesses (Giri et al., 2020). Figure 2 shows the Artificial Intelligence used Globally in market of food industries.

algorithms, and appropriate decisions are made. Using these, people have to make much more accurate and timely decisions. Here are some suggestions for using artificial intelligence to reduce food waste:

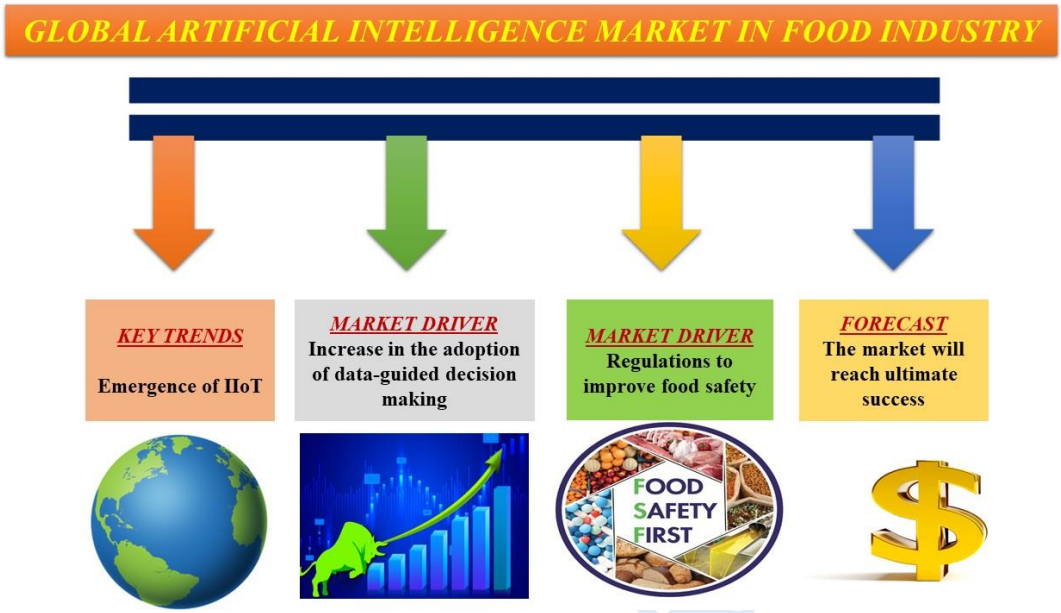

Figure 3 – Artificial Intelligence used Globally in market of food industries

3.1 Next-Generation Sequencing and Electric Noses

Electronic noses (ENs) and Next generation sequencing (NGS) are the two most promising food sector advances. In the field of food security, NGS is rapidly replacing the DNA technique. AI-based technical solutions and workflows have assisted in the more efficient and precise formulation of data collection and laboratory studies, than ever before. The NGS can identify unsafe inclination quickly and accurately. It has the potential to help avert large-scale illness epidemics. In production environment, ENs are typically utilised as a hold for a human face (Jingjing et al., 2020). Sensors that can accurately identify a wide spectrum of odours have been placed. These sensors merely detect odours in their environment, and the collected data is transferred to a data centre wherever ML algorithms may retrieve it. Depending on the decision determined by the ML-based system, a warning signal is issued to the production units. As a consequence, EN may become synonymous with food product safety.

3.2 Food Waste Management

"Food waste in the United States is estimated to represent between 30 and 40% of the food supply," according to data supplied by the US Department of Agriculture. By 2030, AI will be able to handle such challenges and by dipping food waste, you can disengage a huge number of apertures. Surprising numbers can be achieved by introducing new sustainable recreational farming strategies. It demonstrates that humans are inefficient in their use of available resources (Tohidi et al., 2018). Traditional farming methods can be superseded by smarter farming methods. In this scenario, various sensors are employed to collect data. The obtained information will be analysed using machine learning

• While some research focus on fruit maturity, others investigate how microorganisms might help vegetables and fruits thrive without the use of artificial fertilisers.

• Firms can get bottom examination purging while benefitting from machine learning compensation that will keep a large amount of money. Machine vision technology is used in farm-based food supply chain management programmes to regulate and analyse each process, resulting in considerable reductions in food waste.

• Artificial intelligence-powered food tracking systems will enable everybody to sell food before it spoils. This enables more growers and consumers to connect in order to acquire food. The major hurdles of implementing such ideas in practise can indeed be conveyed by a single entity of structure. The entire food sector must be changed. A whole organisation of associates must work to establish an equitable method that has a significant impact on the entire planet (Wang et al., 2015).

4. Data Analysis in food industry

There are numerous well-known companies in addition to food outlets in the food-based economy. Because of intense demand, this industry is becoming less popular. In the food sector, leveraging technology, particularly operation research, is the sole way to stay ahead of the competition.

4.1 Customer satisfaction

Gobble's, Ooshma Garg, founding father, expressed the idea that the food sector can be compared to a software company. For the remainder of the globe, it was a debatable assumption, but there was some truth to it. Machine learning has become a requirement in today's world raising and manipulating businesses powered by technology (Hasan et al., 2020).

Gobble is an excellent example of a company that completely depends on big data to forecast supply and demands from its customers. It provides clients with ten-minute meal kits and has a big number of loyal customers, liking a variety of menu options. It collects data from multiple time frames, such as buying record, consumer habits, feedback, and food preferences, to assure readiness to meet demand. Gobble is a wonderful example of a food related firm that incorporates artificial intelligence, and it could likely be a model for other businesses in its field.

4.2 Introducing New Recipes

By combining the ingredients, a single meal can be cooked in a variety of ways. Furthermore, those elements can be used in a wide range of ways, resulting in a profusion of culinary options. Multiple recipes are accessible via the internet, and they comprise a vast dataset that enables for the analysis of components in diverse cuisines by everyone from the average person to professionals. Western European cuisines and North American, for example, are entirely reliant on items that contain the same flavour components that Southern European cuisines and East Asian reject (Lu et al., 2015). Finally, technologists can analyse when food types are flavourful and uncover a cuisine that is well-known in a few provinces. This fundamental understanding also enables artificial-intelligence-based algorithms to offer various types of component combinations to chefs, thereby expanding the menu and increasing the profitability of the food sector.

4.3 Reinventing Food Delivery

Uber-eat, Zomato, and Swiggy, for example, contain a vast quantity of data based on their customers' ordering behaviours and dish preferences. Foodservice professionals can employ machine learning and artificial intelligence (AI) to develop more outlay easily and techniques of distributing products that saves time. AI is providing some established sectors with legitimate opportunities for market dominance (De et al., 2016). Nevertheless, it remains in its adolescence in the food business, necessitating more skilful efficiency by food firms in order for customers to get their food with enhanced healthcare.

5. Guidelines on Choosing the Appropriate AI Method

When constructing an AI model, selecting the suitable algorithm is critical since it can help the user achieve accurate, quick, and cost-effective outcomes. The very first step of the selection procedure is for users to establish and finalise their purpose for implementing AI in their research or study. Classification, Prediction, allergen identification, quality control, and estimate are some of the frequent goals of AI applications within the food industry. Following that, a choice should be taken depending on whether devices such like, NIRS, E-tongue, CVS, and E-nose are needed whether or not to acquire sampling data. Integration with those instruments is typically performed to get the parameters and features of the sample to be incorporated in the AI algorithms for specimen testing purposes. Clients should evaluate and choose the most appropriate algorithm for their study after assessing the necessity for detectors. The ANFIS, ML, ANN, and FL approaches have been among the most often used AI algorithms. ANFIS has demonstrated greater accuracy, but the model's complexity makes it less advantageous when matched to the other algorithms. Before selecting the ideal algorithm for their investigations, users should determine the difficulty of the research. The information and communication technology are associated with the Ai technologies again when the method has been selected. Ultimately, R2 and MSE analysis and verification are performed to assess the model's performance. Once the verification is accepted, the AI algorithm has been successfully generated; otherwise, users need to repeat the preceding example and reassign the algorithm.

6. Artificial Intelligence Compensation and Future application in the Food Industry

Almost all food processing businesses have certainly adopted AI in recent years to create data modelling, cautious logistics, and demand-supply chain management, as well as to enhance system precision (Machleb et al., 2020). Digital revolution of logistics and inventory management systems eventually compels refunds which provides a more complete picture of the issue (Melander et al., 2015). Artificial intelligence can analyse large volumes of data in ways that humans cannot. AI supports the sector in lowering speed to value and enhancing client agreement (Imran et al., 2020). Automatic ordering will save labour expenses, speed up manufacturing, and improve product quality. A survey of the food industry research indicates that there is a huge requirement for growth in the food processing and production industries. Methods that use AI can discover numerous challenges in food production more easily than human made systems (Nadian et al., 2015). Researchers have also been noted to be deeply involved in this sector. Gayama, a Swiss Agrotech company, is a good example of such a company, having won $3.2 million for an arbitrary initiative. The technique is based on multispectral cameras, which can detect minor variations in agricultural yields, nutrition, pests, and demand. The artificial intelligence computer then detects possible intimidation and gives alert signals to farmers, allowing them to plan accordingly (Shi et al., 2018). The machine intelligence technique will also provide convincing actions that farmers must do in order to maximize the most of the available resources. Landsat images can also be employed to assess the surface of the Earth. The main purpose is to identify places in which the management or its owners may aid in agricultural production. It was also discovered that farming in many places of the world is static and obsolete. Smart farming may be able to eliminate it in the near future.

AI has the ability to revolutionise precision agriculture and eventually address the current situation. If applied correctly, smart farming has the potential to raise yields by at least 60% (Huang et al., 2019). Although ML as well as AI are promising tools, one will have to produce proliferation of solutions to reduce waste in food production businesses. For example, numerous Labs have built sophisticated robots capable of selecting real food out from plant, making manual labour redundant. Many self-assisted pickers have existed in history, but these beautiful bots employ machine vision or learning techniques to estimate the maturity height of each fruit, distinguish fruits from distinct crops in a safer manner, and manage fruits more precisely (Fan et al., 2020). So, these are the future prospects for farming and food processing sectors.

Table 1- Application of Artificial intelligence expert system in food industry

Application	Category in the industry	Objective	Outcomes	References
Taro	Agriculture/raw material	To assess the quality of the taro according to the industry demand	The developed ANFIS model combined with response surface methods can be used to optimise the extraction efficiency of antioxidants from taro four. The developed model's prediction values were verified by comparing them to experiment data, and the findings were nearly consistent with the developed model's prediction values	Tao et al., 2020
Orange	Agriculture/raw material	To detect the maturity of the fresh orange	The created ANFIS model was capable of predicting the orange flavour and outperformed the multiple regression model	Wang et al., 2020
Fish oil	Processing/sustainability	To identify the diseases in oil	The oxidation parameters were estimated using three different algorithms: ANFIS, multilinear recurrent neural networks, and multiple regression, and it was discovered that the Proposed method had the best precision in predicting the parameters	Yost et al., 2021
Banana	Raw material/agriculture	Identifying banana illness and ways for overcoming it	The method was able to assess problems in plant samples on the stems, leaves, and roots, which aids in disease prevention	Bucher et al., 2021
Corn	Agriculture/raw material	To identify corn diseases and pests	The system detected pests and diseases with an efficiency of 76.6% and also provided methods to control them The proposed method was able to provide facility explanations regarding the diagnosis results	Tripathi et al., 2020
Fresh food	Sustainability	To improve the fresh food distribution networks	The suggested expert system, Food Distribution Planner, was able to generate the most effective distribution technique, which decreases carbon dioxide emissions by 9.6%, increases operating costs by 2.7%, and produces no waste during the delivery period due to the preservation method used during shipment	Rary et al., 2020
Food additives	Food safety	Determine the halal safety rating of food additives	The created Halal Food Additive with ES gives consumers with a safety assessment key based on their previous food consumption record experience	Bunger et al., 2021

7. Conclusion

AI has played an important role in the food industry for a range of objectives such as simulation, forecasting, process controls, quality control, sensory attributes, product drying, and addressing complex difficulties in food industry. Aside from that, AI is capable of enhancing business strategies because of its capacity to conduct sales, forecasting and yield increase. In the food sector, AI is generally known for its simplicity, precision, and cost-saving strategy. Currently, the food business is applying the most basic level of artificial intelligence. Because of its potential to enhance sanitation, waste collection systems and food safety artificial intelligence has become increasingly significant. In the future, artificial intelligence will transform the food processing business because of its capacity to provide consistent and safer efficiency for customers and employees. Reduced shipping and delivery costs, increased customer happiness, speedier operations, voice queries, and more customized orders are all possible with artificial intelligence. These economic gains can also be utilised by huge food enterprises, culminating in a clear long-term gain.

Declaration of Interest

There is no competing interest between the authors

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No animal of human studies has been conducted

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