The use of AI in the food industry

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Abstract. One of the pending issues in the modern time is food security. Food safety is under a great threat with the unstable weather conditions, environmental disasters and overpopulation. Therefore, the main aim of the work is to illustrate that there are tools that can positively influence food industry. The so-called tool is artificial intelligence, which is well integrated in various industries. Food industry is no exception when it comes to artificial intelligence. Artificial intelligence is used in different areas in food industry to maximise the production rate, cut the overall time of the processes, reduce errors and waste and more. The work will briefly go through the basics of artificial intelligence. The work will examine the following areas: food inspection, classification and prediction of the parameters, quality control, food safety, navigation. At the end drawbacks of the technology will be covered.

1 Introduction

Efficacy of use of new technology in various fields is under no doubt. The main idea behand embedment of new technologies in different industries is to optimize the processes for the best outcomes. The latest breakthroughs in the technological world opened various doors for different ideas to be implemented. It is hard to imagine life without modern technology and yet new innovative ideas is required.

The main focus of this work will be shine upon food and its productions and the technologies utilized. The most promising and the one that is already utilized not just in food industry, but almost in every field is artificial intelligence. This technology use is vast and its capabilities are accumulating daily. The of this technology is not new, but not that old too. with the modern environmental issues, the food safety must be prioritized. Global worming and overpopulation play against stable safety of food production. Unstable weather conditions that make hard to apply old methods to produce food in the same amount as previous. The use of some chemicals also harmfully effects the land and yield consequently. Overpopulation requires more food to be produced. Even slightest effect on the food industry can disturb the chain of supply. Which is essential part to some of the people that depends on these supplies. Therefore, the first and most important area is food and its production. It must be under focus to keep its stability with the use of new methods, technology and so on.

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Automatization for the industry plays in the positive ways. However, there are many stages and unknown steps that will require time and patience. For the new technologies to be implemented into the industry it will require some changes or shut dawn the system partially or fully. Meaning that the industry will lose some revenue in the phase of translation. However, the new implementation does not mean it will work as intended. In papers it might be brilliant, but in reality, could give absolutely different results. There are other aspects to it too. for instance, workforce must be retrained, changed or completely fired. Some automatization requires no human involvement in the processes but few crews of operators. The expenses, unknown factors, unsuitability and so on.

One thing is clear that there must be a stable growth of food productions directly proportional to the overpopulation and its demand. We surpassed the mark of 8 billion and moving toward new higher number. According to United Nation (UN) the global global population projected to peak around 10.4 billion in the 2080s [1].

The technology described in this work will be artificial intelligence. Its capabilities to automate any industry or any field is unimaginable. However, one must keep in mind that this technology is not operated as a single technology, but works in a combination of other technologies. Nonetheless, the technology showed a great transformation in different areas including food industry. The following work will focus on how artificial intelligence is transforming food industry [2, 3].

2 Application of artificial intelligence

As it was mentioned earlier one of the challenging areas is food security. The need for the increase food production and transform agricultural and related sectors is essential and inevitable. The one technology that promises the necessary changes and increase in food production is artificial intelligence. However, it is needs to be understand that the technology works with other approaches and technology, but not by itself. Therefore, this section will be devoted to artificial intelligence and its use in food industry.

Artificial intelligence is a cleverly written and complex algorithms that tries to mimic human brain. This technology can be used in a various way with its capabilities. Similar to human brain it can recognize different patterns, analyses and classify the data, recall to the previous task, accumulate information, improve its algorithmic structure for better adaptation to the chosen task etc. Different scientists classify the technologies stages differently. However, commonly it is divided into three stages. The first stage is the stage that we have right now. It is strong, but cannot go beyond human capabilities. Most definitely in some tasks it is well adapted and can exceed human capabilities. However, these tasks can be counted easily. Meaning that they fall for minority. The second stage of the technology is where its capabilities are somewhat similar do humans' brain. And the third stage is where the technology exceeds the capabilities of human brain. It is believed that we will see that rise of the second stage in the nearest future, approximately in the next few decades.

In the food industry the technology is already in a great use. Its application is embedded to almost all processes in this sector. The main purpose of artificial intelligence is to automate the processes by increasing all the necessary parts and decreasing those that are negatively affecting the sector. This technology provides the full autonomy if required and can also provide partial autonomy leaving some operators for control over the processes which are enhanced by the technology. This article will look into the following areas where artificial intelligence is used. The following areas: food inspection, classification and prediction of the parameters, quality control, food safety, navigation etc [4, 5].

2.1 Classification

Artificial intelligence is well equipped with other technology that it can easily sort various products and goods. It is capable of sorting products into different specified categories. The technology recognizes different patterns that are essential to categorise these products and objects. Well written algorithm through different sensors can detect the item, whether its food or any other product, and then it can signal to mechanism to manipulate with it. By manipulating it means moving the item to a specific devoted area or class. Therefore, artificial intelligence plays a crucial role in the separation process by being capable of recognising different patterns in the item and then moving to designated area or group. The advantages of such technology are related to it precision and time of operation. For instance, the technology can detect and classify into different group without being distracted or tired. It can work without rest throughout the day and night without rest. It is less prone to errors and making wrong decision. Of course, the overall results depend on the quality of the algorithms and its suitability for a chosen task and from other nuances [6].

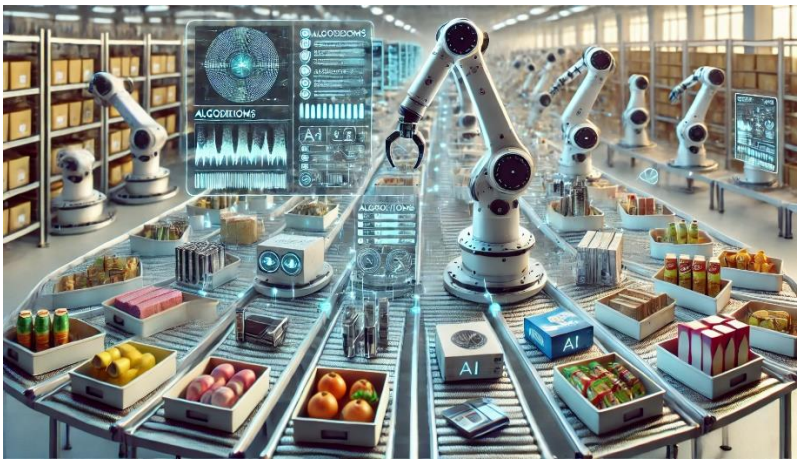

Fig. 1. A mere representation of Classification of food and goods.

2.2 Quality inspection and throughout control

The main aspect of any goods or food products is its quality. Similar to the previous application, which was classification, this technology can be used for defect check and for the overall check of the product. Products quality plays a significant role in the eyes of consumer. It is the quality that holds the name of the company of the industry that produces some outcomes. Artificial intelligence can be used for the check of food contamination, expired products, chemical disbalance, miscarriage of the products and many more. If comparing with the real workforce this technology will never loose focus and hence miss some of the defected products, always be more precise due to its sensors. Consequently, this technology helps to recognise defected product and thus saves reputation and helps to reduce consumer annuitisation [7].

One thing is the inspection in one particular stage of the production, and other is the continuous checks throughout the whole process. The technology is used from the beginning of the products and up to the consumers doors. It is necessary to look out for the defects throughout the whole process, but not is one particular part. This approach ensures that the end product in the hands of consumer will be of the best quality. Again, different approaches, technologies, sensors and other apparatus are used to quality check the production processes and the product that is produced [8].

2.3 Standards, regulations and predictive analysis

It is hard to imagine how artificial intelligence can be used in standards and regulations. However, the technology is used a lot lately due to its improvement and new features. The technology can detect whether the safety is carried out correctly in the workspace. To identify any hazardous or dangerous situations and immediately to alert personnel or operators. It analyses the data input from sensors and cameras such as temperature, humidity, leakage of various substances including hazardous gasses, any discrepancies that do not fall into the protocol. In simplest form it regulates over the whole process to ensure safe environment for production and personal.

This technology can be used for the prediction of certain aspects. the most obvious used of the technology for foreseeing the future state is the use in product life span. Although, food differs from other goods in its lifespan. It has no mechanical worn issues, weak spots that will deteriorate over the time and so on. However, the tool can be used to predict the damage of the packaging, imperfection in food products due to the various reasons that can be traced by the sensors [9, 10].

2.4 Navigation

If previously technology was considered most of the time from the static viewpoint, it is also fair to say that there is also other mechanism that uses artificial intelligence and have application in food industry while dynamically moving in the changing environment. In the food sector different vehicles are used to perform various task with the build-in artificial intelligence. Artificial intelligence helps it to analyses the environment around itself by the information received from cameras and other sensors. Most of the time these vehicles are used in planting, irrigation, chemical or fertilizer distribution, collection of yield and many more [11].

2.5 Trends analysis

This area of use of artificial intelligence is not directly related to the production or of its safety, but selling. For the producers to be in demand it is essential to listing consumers ideas, demands, and needs. Artificial intelligence is a great toll for the use for extraction of important information from massive data. In modern time, footprints of consumer are left in various platforms and the data is collected by outside organization that can provide the junk of massive data or classified data. In both ways the technology is used to extract the necessary information that will dictate the direction of the production rate and the changes it requires [12, 13].

3 Drawbacks of the technology

Similar to any other technology artificial intelligence has some issues that needs to be addressed. It is obvious that this technology brings numerous benefits if applied correctly. Some of the issues are depending on the area of its application and some are general. The following issues will be discussed in this section: cost, complexity, ethics, autonomy,

The first issue is related to the cost of implementation and its maintenance. This technology is still expensive to apply in some areas. It is also expensive to control and maintain. Although its use can be integrated gradually by introducing into the processes without further delay [14].

The other problem is the complexity of the technology. It gets harder when the complexity to renew the old approaches can be a bit tricky. Not all processes are the same and hence the

adjustment adds new complication. It is hard to maintain in certain circumstances. Its components like sensors can bring some issues as well. The process well being is directly related to its components. If one component stops functioning the other processes will be influenced. The other issues are related to the technology' reliance. The technology has been around not so long and the possibility of unknown outcomes are likely. Not all of its issues are well studied and might negatively effect the whole process [15].

It is also not a secret that this technology carries some ethical issues. For instance, the technology is some kind of representation of a human and hence its replacement is not a secret in various fields. This technology is a number one technology that flushes jobs and replaces in most of the field's human workforce.

The introduction of this technology into the processes one opens the space for data insecurity. The technology is not fully secure to the outer threats, and, hence a safety procedure must be carried out to at least lower the chance of data breach. The are a lot of other issues with the technology, but as time passes some of them are disappearing, but similarly some might occur. Therefore, one must understand that the technology has its awn unique issues and be ready to face them once it is applied [16].

4 Conclusion

In this work the following aspects of the use of artificial intelligence were considered: food inspection, classification and prediction of the parameters, quality control, food safety, navigation. the work illustrated that the technology is well embedded in the food sector and in similar fields. The shown areas of the technology use present a clear evidence that this technology is driving the industry in the right direction and further integration of the technology into the processes will lead to the better outcomes in various areas. Although the technology is evidentially illustrating it usefulness there are some issues with its application. Therefore, some of the common drawbacks of the technology were considered in this work.

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