

A Bibliometric Review on Food and Artificial Intelligence

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Abstract

The global population is increasing at a significant rate, both in our country and worldwide. Indeed, it is projected that the global population will reach ten billion by 2050, with the population of Türkiye reaching 105 million. In light of the aforementioned data, it is evident that the significance of food and its derivatives will continue to grow. In this context, it is imperative that existing food resources be utilized in the most efficient manner possible. The quality of food is of great consequence to the maintenance of adequate and balanced nutrition. A substantial body of evidence suggests that nutritional factors play a significant role in the aetiology of numerous diseases. Over the past decade, there have been significant advancements in technology. The use of developing technology in the field of food is increasing. Artificial intelligence (AI) is one such technological application, employed in numerous fields. The term "artificial intelligence" is defined as the imitation of human intelligence by a system or machine. In the field of food, artificial intelligence is employed for a variety of purposes, including the imitation of natural products, the adulteration of foodstuffs, the measurement of toxin levels, and the classification of food items. Furthermore, in this research, bibliometric analysis has been employed to evaluate the applications of food and artificial intelligence. The present review study compiles information on the potential applications of artificial intelligence in the field of food science and technology, as well as an overview of existing studies in the literature.

Keywords: Nutrition, Food, Artificial intelligence, Bibliometric analysis

Gıda ve Yapay Zeka üzerine Bibliyometrik Bir İnceleme

Özet

Küresel nüfus hem ülkemizde hem de dünya da önemli ölçüde artmaktadır. Nitekim 2050 yılında dünya nüfusunun on milyar kişiye ulaşacağı, Türkiye nüfusunun ise yüzbeş milyon olacağı tahmin edilmektedir. Bu veriler dikkate alındığında gıda ve ürünlerinin öneminin daha da artacağı aşikardır. Bu bağlamda mevcut gıda kaynakların en verimli şekilde değerlendirilmesi gerekmektedir. Yeterli ve dengeli beslenme için gıda kalitesi oldukça önemlidir. Yapılan çalışmalar birçok hastalığın oluşumunda beslenmenin önemli bir role sahip olduğunu belirtmektedir. Son on yıllık period boyunca teknoloji inanılmaz derecede gelişim göstermiştir. Gelişen teknolojinin gıda alanında kullanımı giderek artmaktadır. Özellikle bu teknolojik uygulamalardan biri olan yapay zekanın, birçok alanında kullanımı bulunmaktadır. Yapay zeka, insan zekasının bir sistem veya makine tarafından kopyalanması olarak tanımlanmaktadır. Gıda alanında yapay zeka taklit, tağşiş, toksin düzeyi, sınıflandırma gibi çeşitli amaçlar doğrultusunda kullanılmaktadır. Ayrıca gıda ve yapay zeka uygulamaları bibliyometrik analiz işleminde tabi tutulmuş ve değerlendirilmiştir. Bu inceleme çalışmasında yapay zekanın gıda üzerine kullanım olanakları ve literatürde yapılan çalışmalar üzerine bilgiler derlenmiştir.

Anahtar Kelimeler: Beslenme, Gıda, Yapay zeka, Bibliyometrik analiz,

Introduction

Food is the primary component of human nutrition and a fundamental require for maintaining optimal health and well-being. They are of great consequence to adequate and balanced nutrition, given the nutrients they contain (protein, carbohydrates, fat, minerals and vitamins). The current period has seen an intensification of the significance attributed to food, largely as a consequence of the emergence of



epidemics, earthquakes and other widespread phenomena in recent years. Indeed, the application of different processes to foods can result in a range of losses and the formation of various toxic substances (Oz et al., 2021; Savaş, 2024a; Savaş, 2024b; Demir and Gürses, 2022; Ekiz et al., 2023; Binici and Savaş, 2024). In order to minimise these losses, a variety of methods are currently in use. One of the technological methods employed is artificial intelligence.

The term "artificial intelligence" is defined as the replication of human intelligence by a system or machine. The objective of artificial intelligence is to construct a machine that is capable of exhibiting human-like cognitive processes and behaviours, including perception, reasoning, learning, planning and prediction (Nath et al., 2024). Indeed, it is asserted that this artificial intelligence application is capable of making decisions at all levels and contains information pertaining to a vast array of disciplines. (Jadhav et al., 2025). Figure 1 illustrates the various fields in which artificial intelligence is employed.



Figure 1. Areas of use of artificial intelligence in different fields

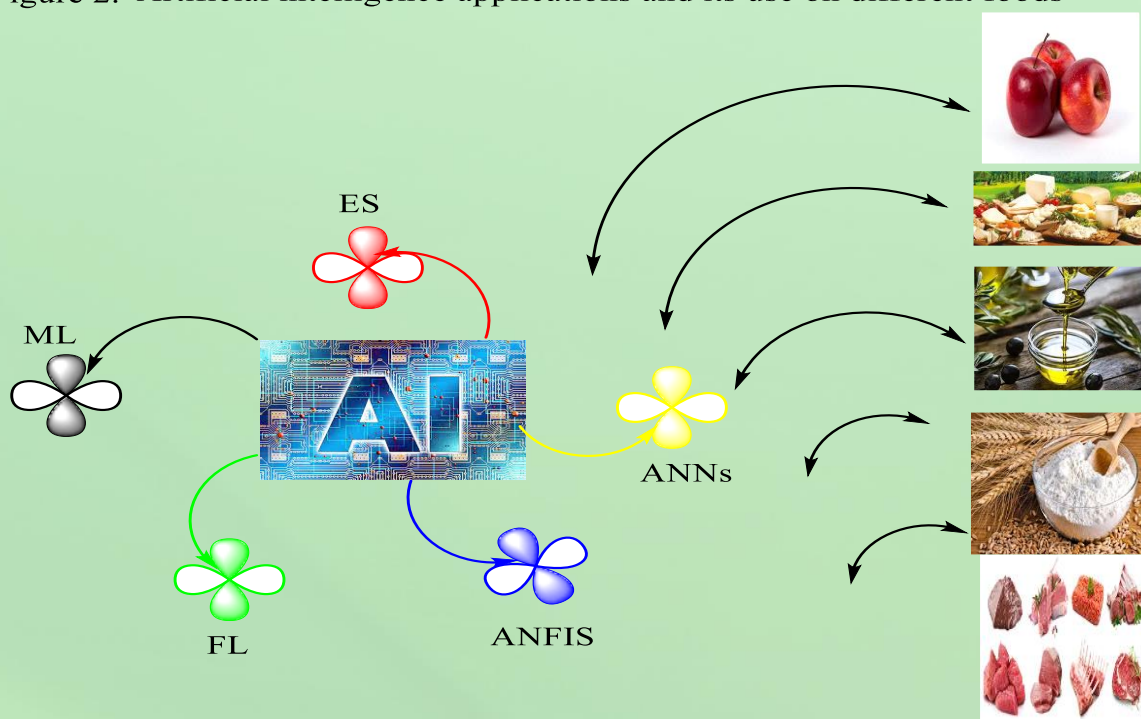
One of the key application areas of artificial intelligence is the agriculture and food processing sector. One of the most significant challenges of our time is to enhance the functionality of our food. It is imperative to ensure comprehensive oversight at pivotal stages of the supply chain, from the harvesting stage to the final product. As a result, rather than conducting this control on an individual basis, it can be accomplished with greater ease and economy through the application of artificial intelligence. In this context, it is hypothesised that the current quality losses of food can be prevented by increasing awareness and prevalence of artificial intelligence. The present review study compiles information about the areas of food application with artificial intelligence that have become quite popular recently.



The Relationship Between Food and Artificial Intelligence

Artificial intelligence, which is quite popular today, is an important information processing technique used in many areas such as food, medicine and cosmetics. Indeed, the most significant underlying rationale for its popularity is that it is capable of performing analytics by evaluating extensive data sets, evaluating them, and subsequently providing results (Manning et al., 2022; Jadhav et al., 2025). Furthermore, a variety of applications can be conducted with the aid of AI-supported systems, including the determination of food quality, the provision of control mechanisms, the categorisation of foods and the formulation of predictions. Additionally, sensors' freshness detection in the food industry, pathogen detection, counterfeiting detection and odour detection can also be carried out with the assistance of such systems (Thapa et al., 2023). It has been asserted that artificial intelligence applications and methodologies, including ES, ML, fuzzy logic (FL), ANNs, and adaptive neuro-fuzzy inference systems (ANFIS), are extensively employed in the food industry (Kakani et al., 2020; Thapa et al., 2023). Figure 2 shows the areas of use of artificial intelligence and food.

Figure 2. Artificial intelligence applications and its use on different foods



There is a literature on the use of artificial intelligence on different foods. These foods include meat and meat products, fruits and vegetables, dairy products, oils, nuts, etc. The purposes of using artificial intelligence applications include quality assessment, detection of imitation and adulteration, classification, and parameters such as the presence of toxins (Zhao et al., 2019; de santana et al., 2019; Gutiérrez et al., 2020; Fan et al., 2022; Jadhav et al., 2024).

Literature data of artificial intelligence and food research

Vosviewer software is a powerful visual analysis tool designed to explore the multidimensional, temporal, and dynamic aspects of scientific literature (Savaş, 2024). In this study, the Web of Science (WOS) database was used as the primary source of information. The Vosview analysis tool was used to determine the current status and identify the main points related to AI and food. Here, we used the Web of Science (WOS) database as the access platform and conducted a literature search using “AI” and “food” as keywords. The search was up-to-date, covering the year 2024. After the scanning process, a total of 361 articles on AI and food were obtained. The selected literature was exported and saved for



further analysis. The Vosviewer software was used to examine and cluster the authors and keywords. In this context, 28 different clusters emerged. In this context, the parameters of artificial intelligence most associated with food are shown in Figure 3.

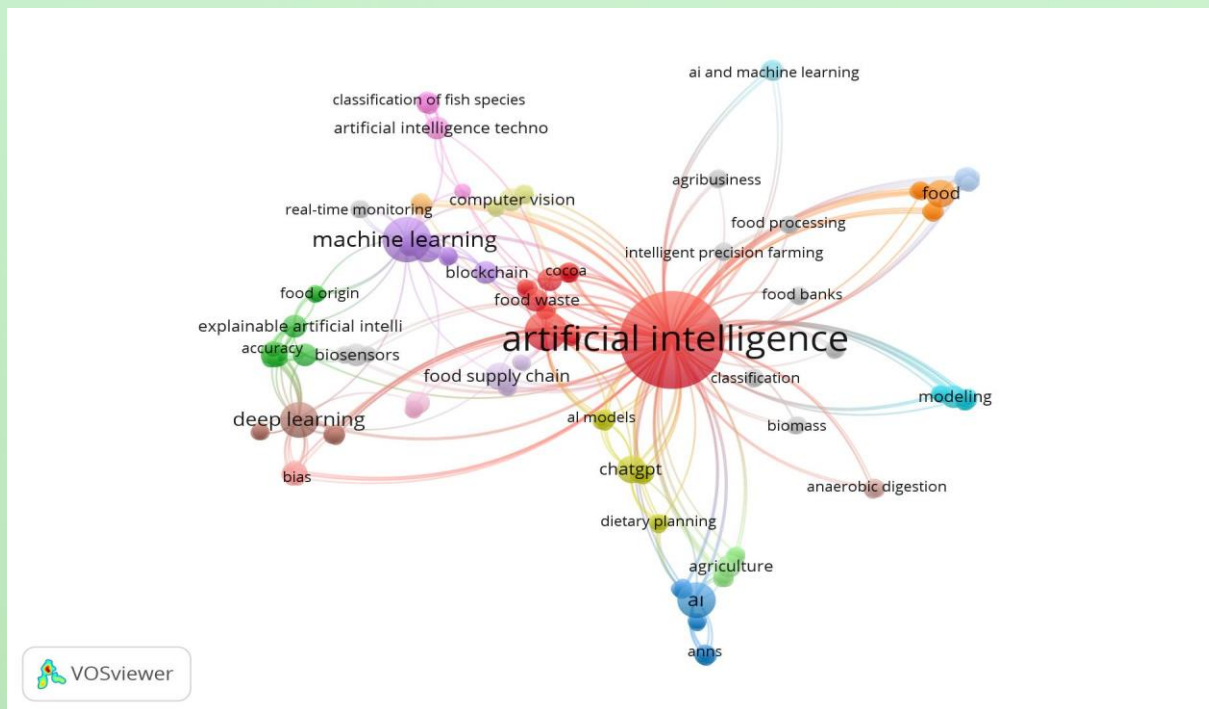


Figure 3. Parameters of AI most associated with food

Conclusion

The global population is increasing significantly. In fact, it is thought that the world population will reach ten billion people in 2050, and the population of Turkey will be one hundred and five million (Anoyomus, 2024). Therefore, the increase in the world population requires the food industry to increase its productivity and improve food safety. In short, with the developing technological conditions, the use of artificial intelligence in the food field should be increased even more. In this way, it is thought that food will be more controlled and nutritional losses will be minimized.

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