

Use of Artificial Intelligence in Kitchens and Its Future: An Assessment from the Perspective of Industry 4.0

[CITATION]

Doğan, M. (2023). Use of Artificial Intelligence in Kitchens and Its Future: An Assessment from the Perspective of Industry 4.0. [English Extended Summary], *Ufuk University II. International Congress of Social Sciences, 3-5 May 2023, Ankara, Türkiye.*

Murat Doğan¹

¹**Istanbul Gelişim University, Faculty of Fine Arts,
Gastronomy and Culinary Arts, İstanbul, Türkiye, ORCID
ID: 0000-0001-6391-4887,
mdogan@gelisim.edu.tr,**



Use of Artificial Intelligence in Kitchens and Its Future: An Assessment from the Perspective of Industry 4.0

Abstract

Artificial intelligence (AI), one of the most critical components of smart technologies today, finds many applications, especially in smart kitchen systems. These systems have become one of the cornerstones of kitchen technologies both today and in the future by incorporating all the functional features of AI. Social trust in the potential of innovative technologies to increase the quality of life is rising, and this directly affects the rate of adoption of smart kitchen applications.

Today, in some kitchens operating in the food and beverage sector, devices such as ovens, stoves, refrigerators, and dishwashers are equipped with smart technologies. These devices can be accessed remotely via a Wi-Fi connection and can be controlled by users via computer or smartphone applications. The innovative approach brought by Industry 4.0 supports the tendency to replace human power with machine power, and AI supported by smart technologies forms the basis of this transformation.

The components of Industry 4.0 play a critical role in the formation of the smart kitchens of the future. These components can be listed as follows:

1. Internet of Things (IoT),
2. Simulation technologies,
3. Big data and analytics,
4. Autonomous robots,
5. Horizontal and vertical system integration,
6. Additive manufacturing (3D printing),
7. Augmented reality (AR),
8. Cloud computing,
9. Cybersecurity.

These elements aim to support the development of AI and maximize automation and efficiency in kitchens. It is predicted that AI will be the most important component of the kitchens of the future, and robotic systems supported by specific software will revolutionize kitchen processes thanks to their autonomous working capabilities.

AI integrated into kitchen devices will enable communication between devices, minimize human intervention, and ensure that processes are optimized on their own. Although the use of AI in the food and beverage sector is limited today, applications such as monitoring temperature changes in cold storage facilities with AI software and instant intervention via smartphones reveal the potential of this technology. In addition, AI-supported smart ovens automatically determine the cooking time and temperature of food, significantly improving the user experience.

The examples mentioned above provide strong indications that AI will completely dominate kitchens in the future. With the support provided by Industry 4.0, AI will not only radically change the functioning of kitchens but will also create radical transformations in areas such as menu planning and flavor optimization. These developments will shape the future of the food industry and bring new dimensions of human-machine interaction.

Artificial intelligence and Industry 4.0 components are redefining the future of the industry by offering efficiency, automation, and user-friendly solutions in kitchen technologies. Although this transformation aims to minimize human needs, it will also bring with it a search for a balance where human elements such as taste and creativity will be preserved.

Introduction

Artificial intelligence (AI) technologies are causing radical changes in the kitchen sector, as in many other sectors today. As part of smart technologies, AI used in kitchens has a wide range of effects, from food preparation processes to inventory management. This article aims to address the current applications of AI in kitchens, its relationship with the components of Industry 4.0, and its future potential from an academic perspective. In addition, the role of robotic systems in kitchens and the importance of the human factor in this process will be discussed.

The Role of Smart Technologies and Artificial Intelligence in Kitchens

Smart kitchens are developing based on Industry 4.0 components such as the Internet of Things (IoT), big data analytics, and cloud computing. Thanks to these technologies, kitchen appliances (ovens, refrigerators, stoves, etc.) can communicate with each other and can be controlled remotely by users. For example, AI-supported ovens automatically determine the cooking time

and temperature of food, minimizing human intervention. Similarly, temperature changes in cold storage can be monitored with AI software, and instant interventions can be provided.

Robotic Systems and Autonomous Kitchens

Robotic systems are the harbingers of a significant transformation in kitchens. Especially in developed countries, autonomous robots have begun to be used in food preparation processes. These robots, supported by specific software, can perform complex tasks instead of humans. For example, the "Robot Sous Chef" developed by Dexai Robotics can successfully perform certain operations, such as serving ice cream. However, it is also a fact that these systems cannot fully meet human-specific elements such as flavor. Therefore, the role of robotic systems in kitchens should be designed to complement human skills.

Industry 4.0 and the Future of Kitchens

Innovative approaches brought by Industry 4.0 have the potential to replace human power with machine power in kitchens. In this process, components such as simulation, augmented reality, and cybersecurity will increase the effectiveness of AI in kitchens. However, it does not seem possible for the human factor to be eliminated in the food and beverage sector. Although artificial intelligence and robotic systems will play an important role in increasing the quality and diversity of food, the human dimension of food culture cannot be replaced by these technologies.

Conclusion

Artificial intelligence and robotic systems are important technologies that increase efficiency in kitchens and provide a healthy and controllable production process. Supported by the components of Industry 4.0, these systems will radically change the functioning of kitchens in the future. However, due to the elements of the human factor, such as creativity and taste, the profession of cooking is not expected to disappear completely. On the contrary, AI and robotic systems will contribute to the development of the sector by working in cooperation with people. In this context, it is recommended that future studies continue by taking into account the human dimension of technological advances.

References

- Beetz, M., et al. (2007). Cognitive technical systems—what is the role of artificial intelligence? *KI 2007: Advances in Artificial Intelligence*, 19-42.
- Blasco, R., et al. (2014). A smart kitchen for ambient assisted living. *Sensors*, 14(1), 1629-1653.
- Doğan, M. (2023). Mutfaklarda Yapay Zekânın Kullanımı ve Geleceği. *II. Uluslararası Sosyal Bilimler Kongresi*.
- Minh, V. T., & Khanna, R. (2018). Application of Artificial Intelligence in Smart Kitchen. *International Journal of Innovative Technology and Interdisciplinary Sciences*, 1(1), 1-8.
- Roy, R. J. (2020). A Futuristic Kitchen Assistant—Powered by Artificial Intelligence and Robotics. *IEEE Integrated STEM Education Conference (ISEC)*, 1-5.
- Rusu, R. B., et al. (2008). Robots in the kitchen: Exploiting ubiquitous sensing and actuation. *Robotics and Autonomous Systems*, 56(10), 844-856.
- Shapey, J., et al. (2019). An artificial intelligence framework for automatic segmentation and volumetry of vestibular schwannomas. *Journal of Neurosurgery*, 134(1), 171-179.