



## **A Study on Tackling Food Waste in Supermarkets with AI**

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### **ABSTRACT**

The application of Artificial Intelligence (AI) in addressing the pervasive issue of food waste within the context of supermarket operations. As global concerns about environmental sustainability and resource conservation intensify, supermarkets play a crucial role in the food supply chain, contributing significantly to food waste. This research aims to investigate how AI technologies can be leveraged to mitigate food waste, optimize inventory management, and enhance overall sustainability in supermarket settings. The study adopts a multidisciplinary approach, combining principles from computer science, data analytics, and supply chain management. Through the analysis of historical data, the research identifies patterns and trends related to food waste in supermarkets. Machine learning algorithms are then employed to predict and prevent potential instances of overstocking, expiration, or spoilage.

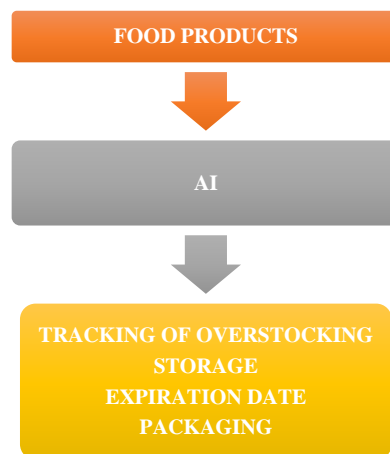
The study also looks at how smart sensors and electric devices can be integrated to monitor perishable commodities in real-time, allowing inventory levels to be dynamically adjusted and waste reduction to be minimized.

### **INTRODUCTION**

Supermarkets, as key hubs in the food supply chain, have come under fire for their role in the problem of food waste, which has gained attention in the recent worldwide conversation on sustainable development. Innovative solutions have emerged from the nexus of technology and sustainability, with artificial intelligence (AI) emerging as a potent tool to combat food waste in supermarkets. This paper explores the use of artificial intelligence (AI) in supermarket environments, emphasizing how it can be used to monitor, control, and lessen the widespread problem of food waste.

Supermarkets are essential to the process from farm to table, yet they can waste a lot of food due to ineffective inventory control, tracking of perishable commodities, and projections of demand. With its ability to analyze data, discover patterns, and create models that predict future events, artificial intelligence (AI) provides an achievable answer to these problems.

Supermarkets can reduce the negative effects of wasteful food production on the environment and the economy through utilizing artificial intelligence to handle inventories in a more proactive and responsive manner. This study is aimed at examining various elements of artificial intelligence (AI) use within supermarkets, looking at how it might transform conventional systems for inventory control and offer real-time insights regarding product.



### **LITERATURE REVIEW**

- The study discovered that cuisines from Southern India, self-serve items, and vegetarian main courses are the most commonly discarded foods.

The research yielded several recommendations for reducing food waste, such as larger serving sizes, regular waste audits, and a greater variety of meal options. Ryan Cooney, Kathryn A. Merritt, and Colleen E. O'Shea (2017)

- Furthermore, according to Zamri et al. (2020), artificial intelligence would significantly affect the UAE consumer market by increasing sales of items with a longer shelf life, reducing freshness loss, and enhancing pricing optimization for both consumers and retailers.
- By finding trends in food waste data and projecting future events based on past patterns, artificial intelligence has the ability to significantly cut food waste (Berezina, 2019).
- Weighing the remaining food before and after the meal is another way that food waste in restaurants is determined. Residents of the United Arab Emirates face the worrying issue of food waste, which needs to be resolved. The population and resources of the United Arab Emirates enable them to address this problem head-on and find a permanent solution, enabling them to develop into a more sustainable nation in the future (Pirani and Arafat, 2016).

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## RESEARCH METHODOLOGY

This study is aimed at examining various elements of artificial intelligence (AI) use within supermarkets, looking at how it might transform conventional systems for inventory control and offer real-time insights regarding product.

The nature of this work is conceptual and descriptive. Secondary data are obtained from books, magazines, websites, journals, and other publications. The objectives of the study:

- To study the role on AI in Super Market.
- To analyze the AI tracking System to reduce the wastage of good in supermarket.
- To study the challenges of AI in reducing the wastage of food.

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## ROLE OF AI IN SUPERMARKET

Artificial intelligence (AI) plays a varied function in supermarkets to reduce food waste by addressing several aspects of inventory management, predictive analytics, and operational efficiency. The following are the main functions that AI performs in addressing and reducing food waste in supermarkets

### Utilizing Predictive Analytics to Forecast Demand

Artificial intelligence (AI) algorithms use past sales information, seasonal trends, and additional variables to precisely forecast future product demand.

Supermarkets may manage inventory levels and lessen the chance of overstocking perishable goods, which could ultimately result in waste, by accurately estimating demand.

### Predicting Shelf Life and Optimizing Inventory

AI models use data from IoT devices and smart sensors in real-time to forecast how long perishable goods will last on the shelf. Through constant monitoring of variables like temperature, humidity, and freshness, supermarkets may avoid waste and maximize inventory levels by spotting products that are getting close to expiration.

### Dynamic Discounting and Advertising

AI algorithms have the ability to dynamically modify prices in response to a number of variables, such as client demand, current inventory levels, and product expiration dates. As products get close to expiration, smart pricing methods encourage consumers to use them quickly, which lowers the chance that unsold inventory will go to waste.

### Monitoring and Reporting on Waste

Artificial intelligence (AI) systems have the ability to monitor and evaluate food waste information giving retailers comprehensive insights into the causes of wastage. Supermarkets may improve their procedures and eventually reduce food waste by using this data to inform their strategic decision-making.

### Machine learning to feed Constant Improvement

AI systems, especially those built on machine learning, have the capacity to grow and change over time as a result of learning from fresh data. Supermarkets can continually improve their tactics for decreasing food waste by using this iterative learning process, which takes changing trends and market dynamics into account.

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## WASTE TRACKING AI USED IN SUPERMARKET

As of January 2022, when I last updated my information, different regions and businesses may implement different AI systems for waste tracking in supermarkets, and these solutions may not be generally standardized.

There are few broad categories and kind of AI technology, though, that you can use to track waste in supermarkets:

### 1. RFID Technology with Smart Shelves

RFID (Radio-Frequency Identification) tags installed on smart shelves allow for real-time goods movement tracking. Supermarkets can now identify slow-moving commodities, keep an eye on stock levels, and lessen the chance of overstocking perishables thanks to this technology.

### 2. Platforms for Reductive Analytics

Predictive analytics tools anticipate future demand by utilizing past sales data, consumer behavior, and outside variables. Supermarkets can minimize waste by optimizing inventory levels and lowering the risk of overstocking by improving their demand prediction.

### 3. Sensors for temperature and humidity

Reduced waste is greatly aided by AI-integrated sensors that keep an eye on storage spaces' environmental conditions, like warehouses and refrigerators. These sensors are capable of detecting changes in humidity and temperature, giving real-time notifications to guard against spoiling and guarantee ideal storage conditions.

### 4. Using Machine Learning to Predict Shelf Life

To estimate how long perishable goods will last on the shelf, machine learning algorithms can examine a variety of data, such as purchase history, storage circumstances, and product attributes. In addition to preventing products from being sold near to expiration, this helps supermarkets manage inventory more efficiently.

### 5. Platforms for Waste Analytics

AI is used by specialized waste analytics tools to track and examine food waste-related data. These platforms might eventually incorporate data on wasted goods, waste causes, and movements by integrating therewith other systems. Decision-making and waste reduction initiatives can be informed by the newfound insights.

### 6. Smart Bins enabled by IoT

IoT-enabled smart trash cans have the ability to autonomously monitor the disposal of unsold or expired goods. These containers have sensors that measure the volume or weight of things thrown away, giving data for waste tracking and analysis.

For the purpose of tracking and analyzing garbage, these bins may employ sensors to determine the weight or volume of things that are thrown away.

### 7. Systems of Dynamic Pricing:

AI-driven dynamic pricing systems can be used to modify product prices according to a number of criteria, such as expiration dates and stock levels. By encouraging the prompt sale of perishable items, this tactic might lessen the possibility of waste.

In order to lower the possibility of waste, this tactic can promote the prompt sale of perishable commodities.

### 8. Platforms for Supply Chain Visibility

The tracking of goods from suppliers to supermarkets is made easier with the use of AI-driven supply chain visibility tools. Supermarkets can find possible inefficiencies and bottlenecks that could lead to waste by keeping an eye on the whole supply chain.

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## CHALLENGES OF AI IN TRACKING WASTAGES IN FOOD IN SUPERMARKET

Using AI to monitor waste in supermarkets comes with a number of difficulties. The main challenges include ensuring the integrity and integration of various data sources, handling client data privacy issues, and making adjustments for the variation in product attributes. Obstacles include the fluctuating nature of market conditions and the upfront expenses associated with implementing AI. Significant hurdles include overcoming employee resistance to change, dealing with the technical complexity of AI systems, and managing ethical issues like fairness and transparency. Adoption of AI for waste tracking in supermarkets is further complicated by scaling challenges and compliance with regulatory norms, particularly in food safety and data privacy. Resolving these issues effectively is essential to maximizing inventory control and reducing food waste.

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## CONCLUSION

In conclusion, Artificial Intelligence (AI) has a revolutionary and critical role in addressing food waste in supermarkets. AI gives supermarkets strong capabilities to improve overall sustainability, minimize overstocking, and optimize inventory management through real-time monitoring, predictive modeling, and advanced data analytics. Proactive steps to avoid wastage are made possible by the accurate tracking of perishable items made possible by the integration of smart sensors and IOT devices.

However, there are certain difficulties in implementing AI in supermarkets. It is necessary to negotiate issues including data quality, privacy problems, and the requirement for employee training. In order to successfully implement AI technology and make the food retail industry more responsive, efficient, and morally responsible, it is imperative that these obstacles be overcome. Ongoing technological developments combined with cooperative efforts from industry players will lead to a more robust and sustainable food supply chain as supermarkets use AI to track and minimize food wastage. AI's beneficial effects on supermarket waste reduction highlight its potential as a major facilitator of the development of a more economically and environmentally responsible food retail industry.

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