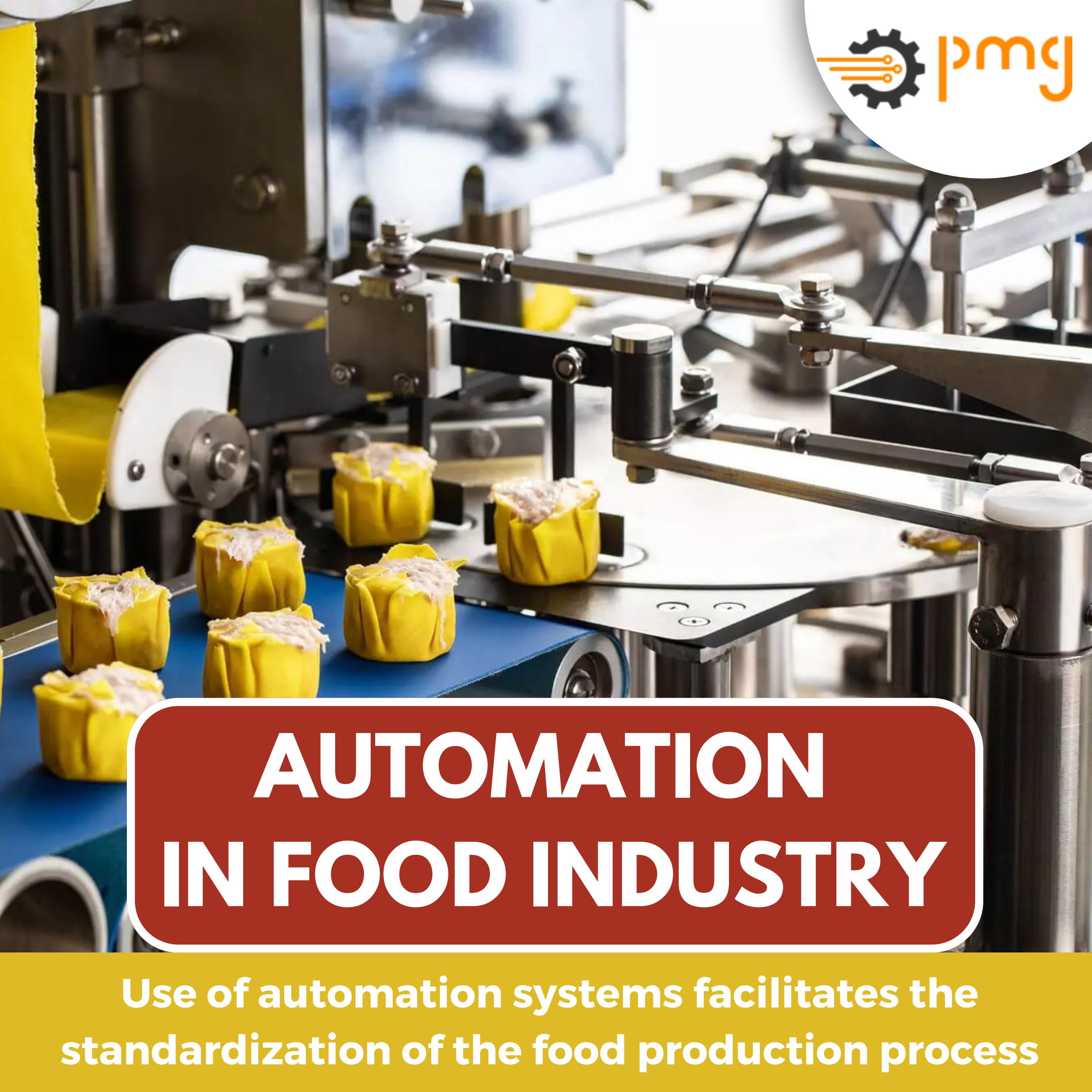


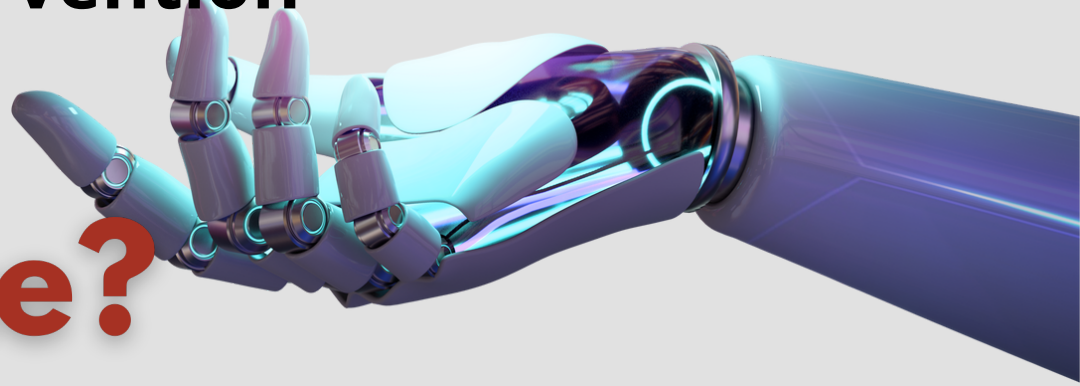
The background of the slide is a photograph of an automated food production line. In the foreground, several yellow, pleated dumplings (likely shumai) are moving along a blue conveyor belt. The machinery is made of stainless steel and includes various rollers, guides, and mechanical arms. The background is slightly blurred, showing more of the industrial environment.

AUTOMATION IN FOOD INDUSTRY

**Use of automation systems facilitates the
standardization of the food production process**

What is Automation?

- The development and use of technology to monitor and control the production and delivery of goods and services while minimizing human intervention



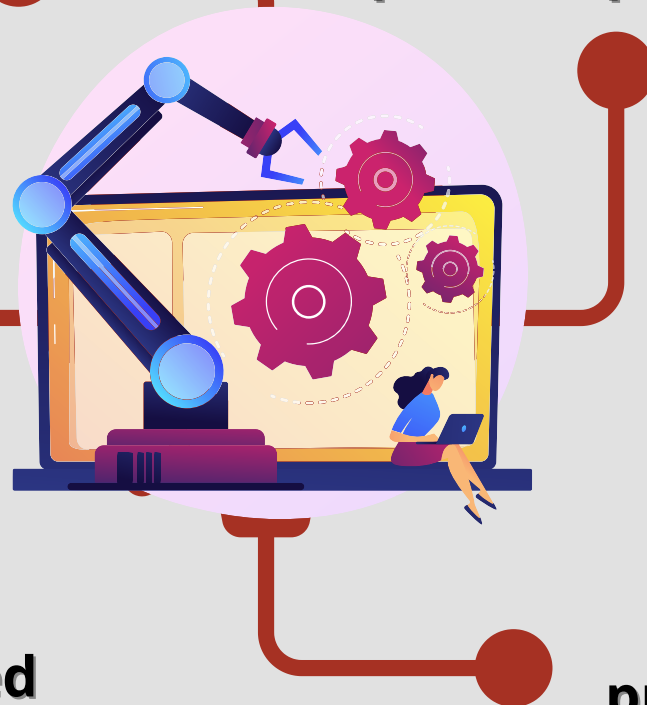
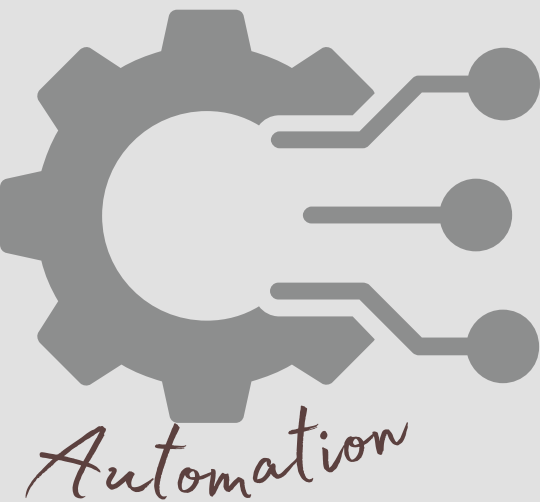
Why Automate?

Improved
production speed

Improved
product performance

Improved
production quality

Lowered
production cost



Requirement



1

Front of line automation

Depalletising, loading, line charging, food packaging etc



2

Automating handling and picking

Automating pick, place or sorting tasks



3

Delicate process automation

Handling including slicing, punching, cutting and fillings



4

Processing

Mixing, blending, steam injection and infusion, frying, boiling, drying, freezing etc



5

End of line automation

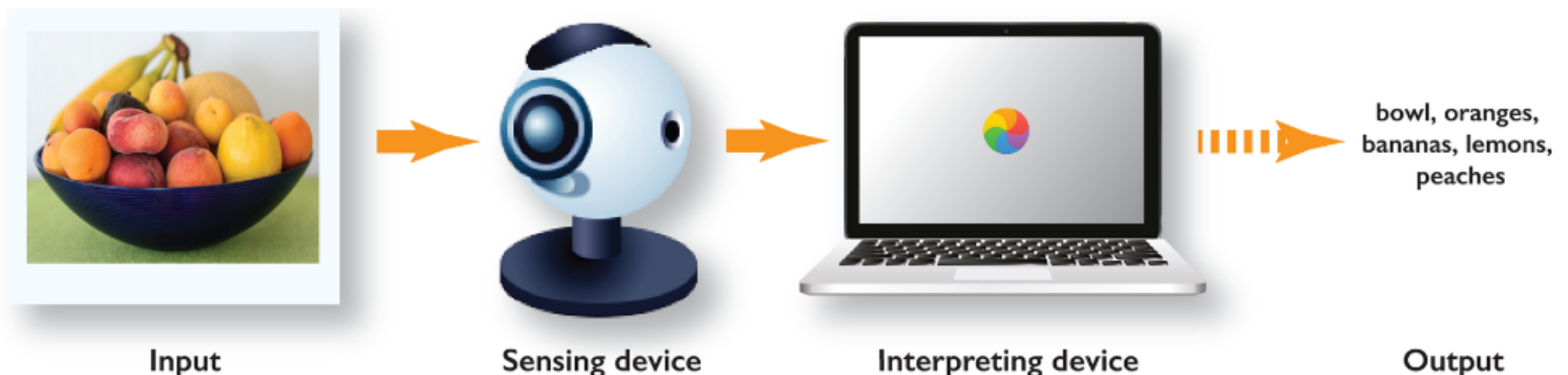
Wrapping, labelling, packing and palletising

Tools of Automation



1. Computer vision system

- Computer vision is an Artificial Intelligence (AI) field that allows computers and systems to **extract meaningful data** from digital images, videos, and certain other visual inputs
- And **act** or **make recommendations** based on that information
- Used for:
 1. Detection of the surface defects and Contamination
 2. Quality inspection
 3. Product grading and counting



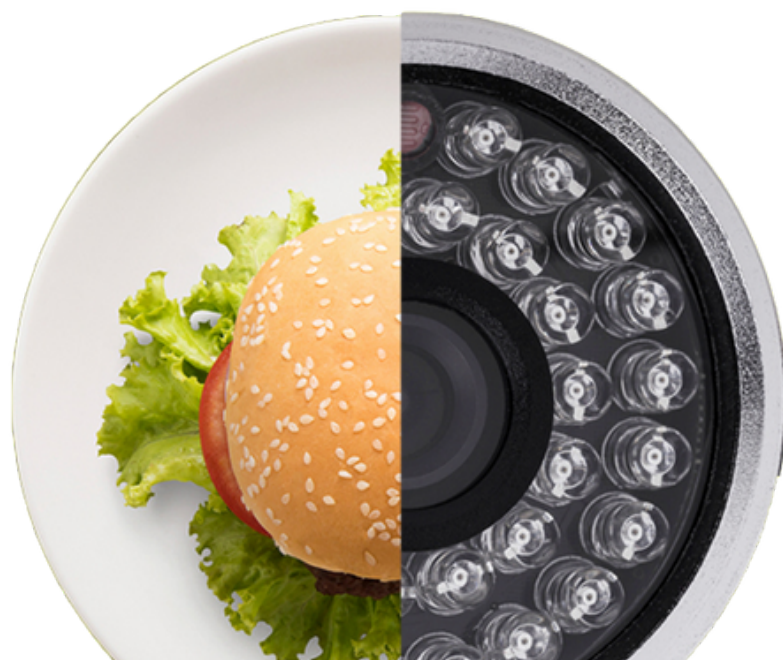
2. Online Sensor



- A sensor is a device that is able to **detect and reacts** to input from the physical environment
- The output is a signal that would be **converted to a human-readable display** at the sensor location or electronically transmitted over a network for further processing

- Used for:

1. Presence of gases: *Gas Sensors*
2. Electronic Noses
3. Detection of Food Aromas
4. Bioelectronic Noses
5. Metal Oxide Semiconductor



Electronic Nose



3. Computer Integrated Manufacturing



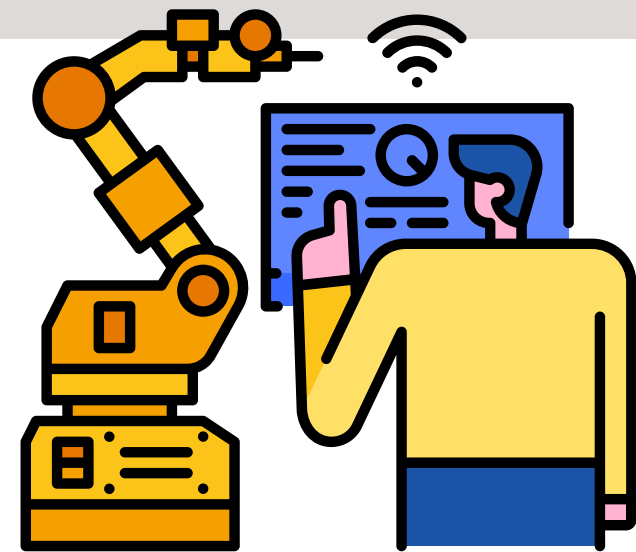
- CIM is a strategy for integrating and supporting all operations in a food production plant, thereby increasing its business opportunities
- This integration facilitates communication between departments including the sharing of manufacturing data



- Used for:

CIM encompasses all production-related functions within an organisation, such as;

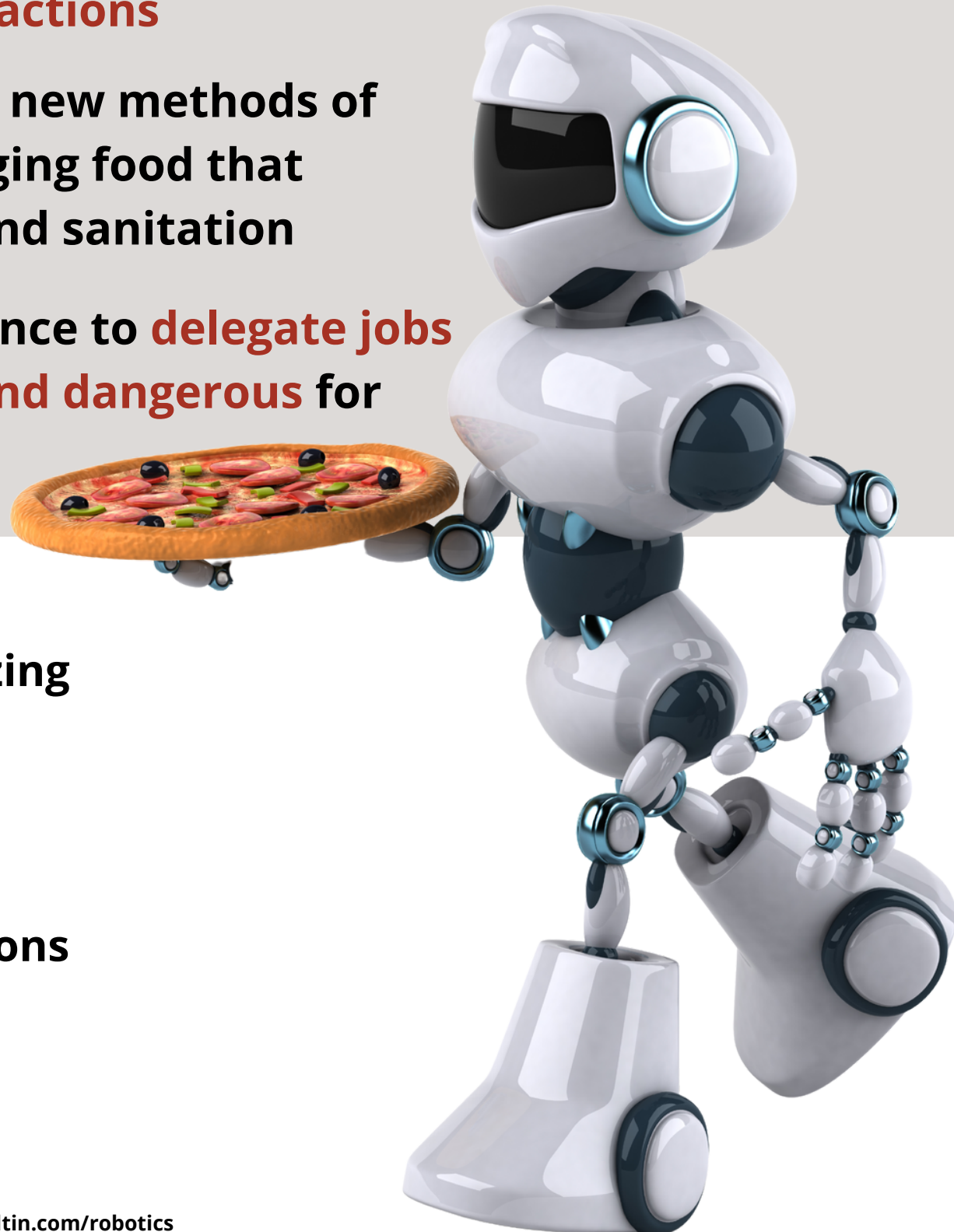
1. Design and engineering
2. Manufacturing and production scheduling
3. Inventory control and materials handling
4. Quality control
5. Order processing and finance



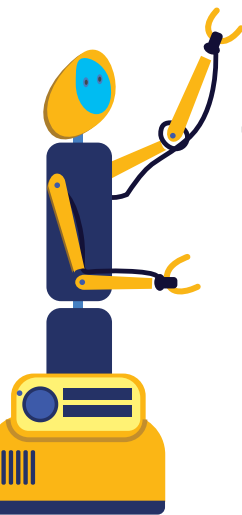
4. Robotic Technology



- Robotics is the application of science, engineering, and technology to create machines called robots that mimic or **substitute for human actions**
- Robots are presenting new methods of processing and packaging food that improve food safety and sanitation
- While offering the chance to **delegate jobs that are challenging and dangerous** for human workers



- Used for:
 1. Packaging and Palletizing
 2. Meat Processing
 3. Dairy Processing
 4. Foodservice Applications
 5. Food Delivery



5. Systems Engineering

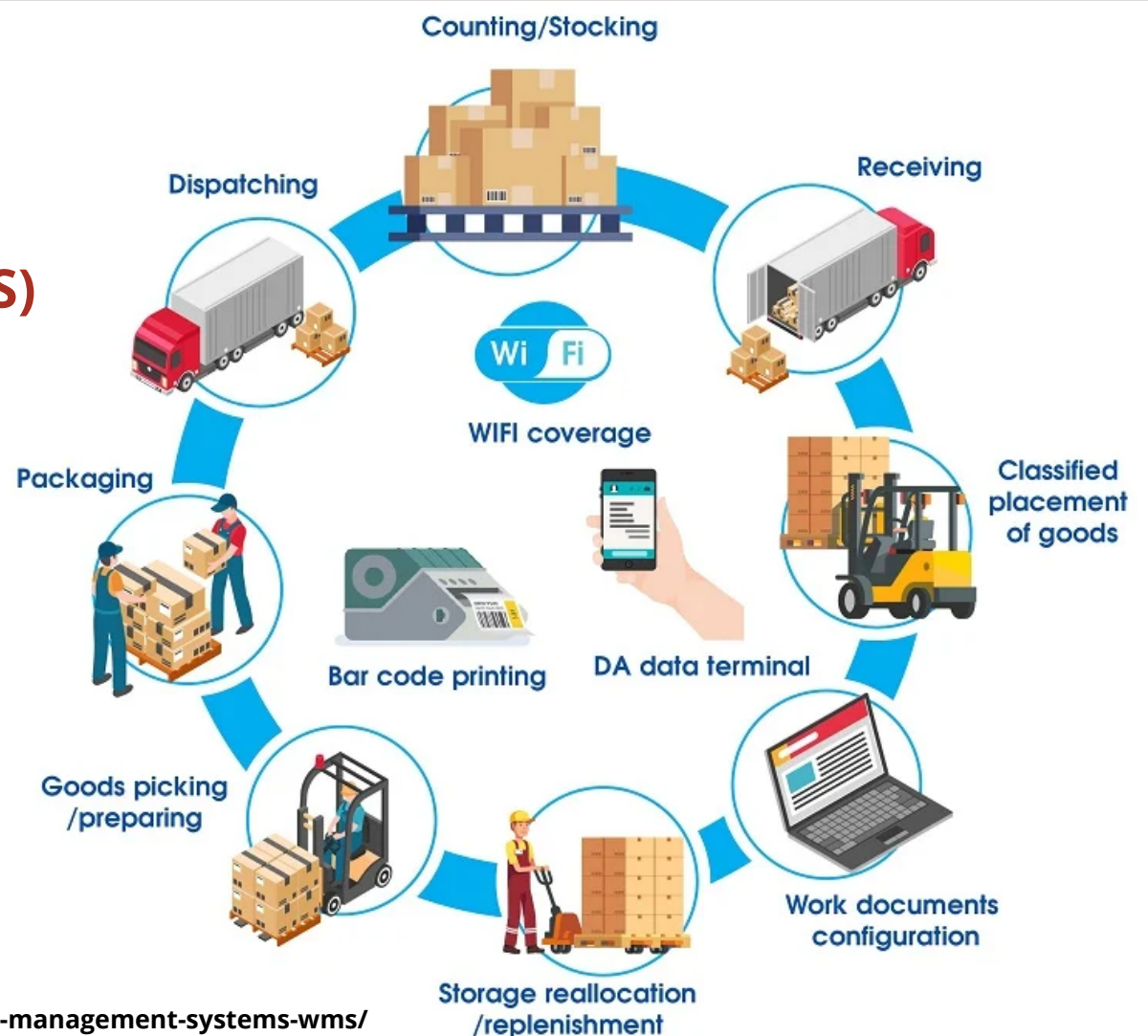


- Systems engineering is an engineering and engineering management interdisciplinary field that focuses on how to design, integrate, and handle complex systems
- To organize this body of knowledge, systems engineering employs systems thinking principles to fit product requirement
- In food industry, these processing technologies are intended to improve the storage period and commercial viability of food products

- **Example:**

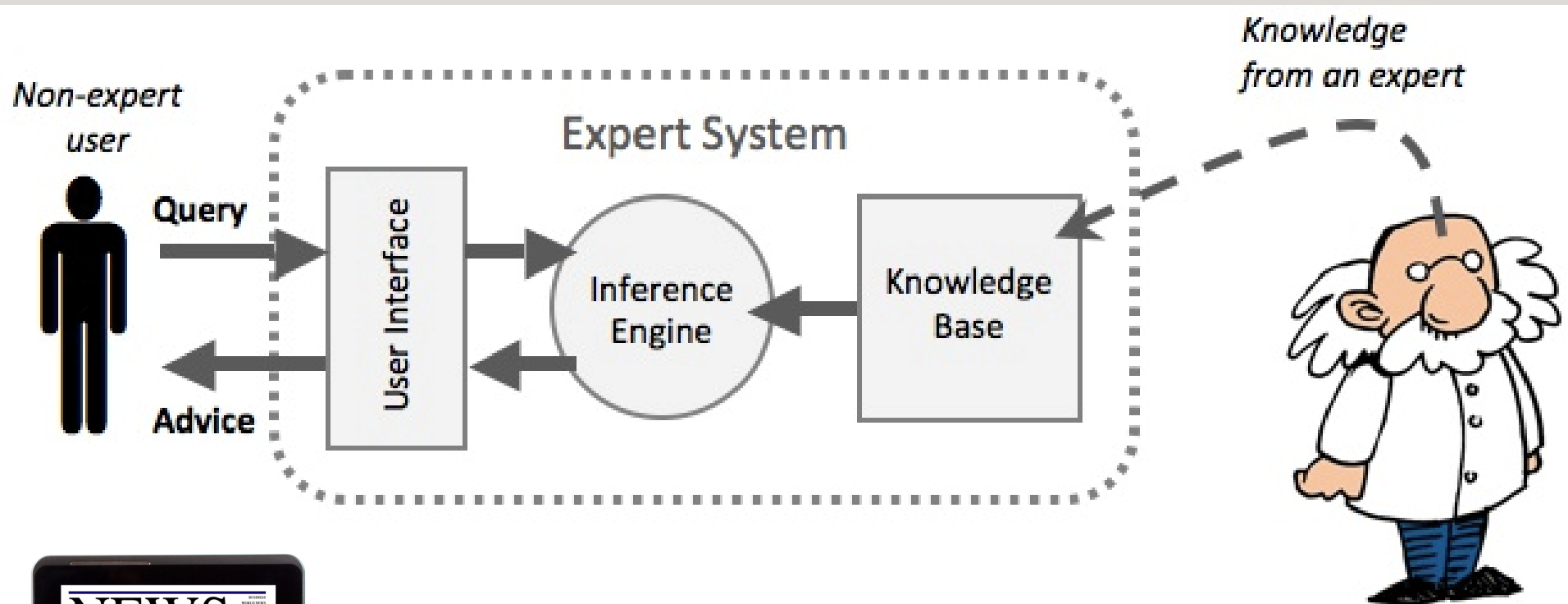
Cloud-based Warehouse Management system(WMS)

- WMS stores data on a cloud host and allows to access it via an active internet connection
- Advantages: Rapid Implementation, Economical, Ease of use and security



6. Expert Systems

- A knowledge-based system is a computer programme that solves complex problems by combining knowledge from various sources, information, and data
- In the field of **food safety**, the integration of experimental data and expert knowledge into user-friendly software tools has been a continuous effort



Expert system Flowchart



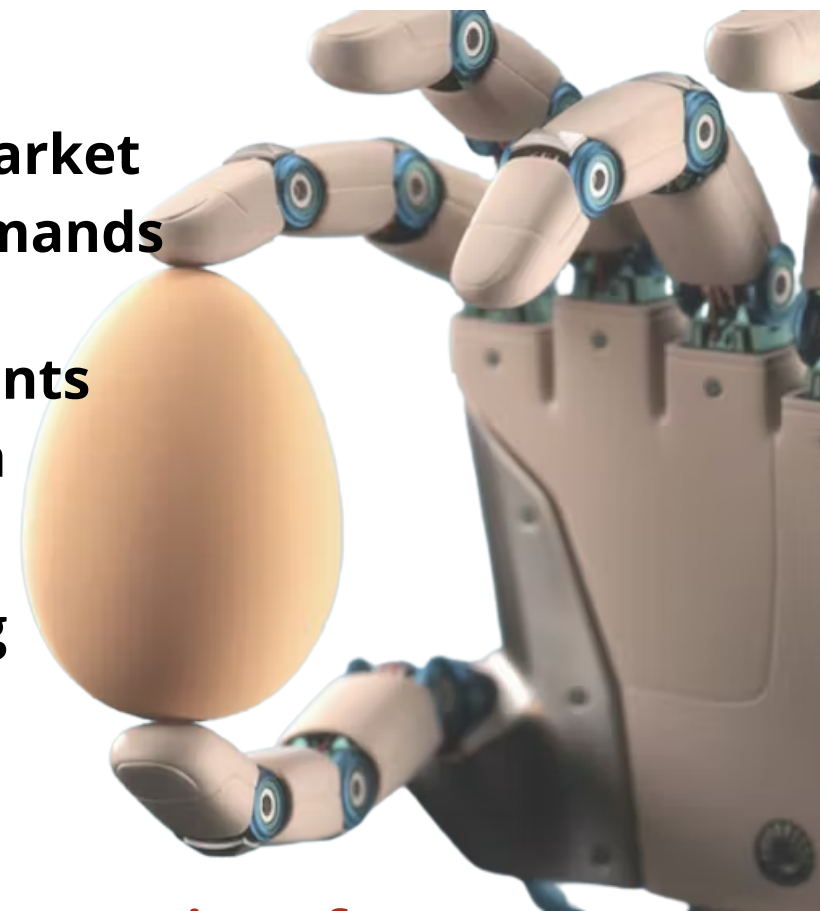


Benefits in Food Industry

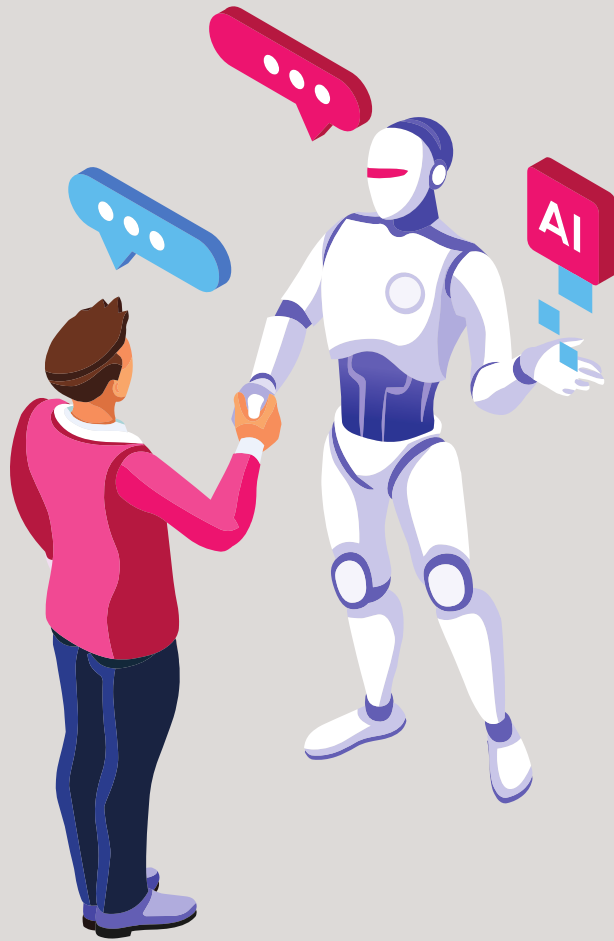


Food companies can fully automate production lines using mechanical, electronic, and computer technologies

- Food manufacturers can access high-quality solutions, faster pick-and-place and handling times, and **quicker production lines**, as well as packaging processes
- Companies are able to **react quickly** to market dynamics and changing food industry demands
- Digitization also addresses the requirements for **real-time traceability** and precise data
- Because of integrated systems, packaging and labelling **errors are reduced**, if not eliminated
- Automation technologies also aid in the **prevention of failures**, resulting in **less downtime** and waste while reducing energy consumption



Current Limitations



- High initial investment
- Long-term investment
- worker displacement
- Need for high maintaince
- Uncertainty about both hardware and software
- Lower degree of flexibility in terms of the possible products



Automation is frequently accomplished in small steps

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