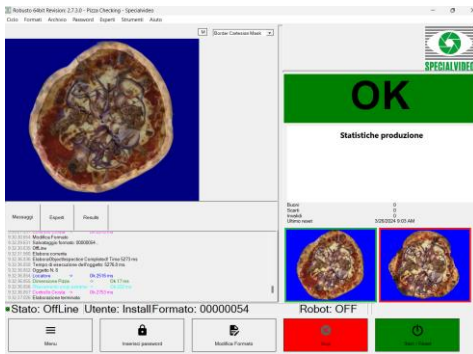




## PIZZA QUALITY CONTROL

with topping ingredient  
count

## KEY BENEFITS



### ✓ Efficiency

enhances efficiency by identifying, rectifying defects and **reducing downtime**

### ✓ Quality Control

ensuring consistent detection of defects, maintaining product integrity, meeting **top quality standards**

### ✓ Cost savings

**early defect detection** minimizing the risk of faulty products reaching the market

## VISION SYSTEM

System to be installed on the production line consisting of:

- High-resolution colour cameras
- Illuminators
- PC with Specialvideo software

## PIZZA INSPECTION WITH INGREDIENT COUNT


The vision system for pizza quality control inspects the topping by returning **the count and extent of ingredients** classified by type, as well as performing classic checks such as:


- ✓ integrity of form
- ✓ conformity of colour
- ✓ detection of possible blue pollutants

# SOFTWARE INTERFACE

Robusto 64bit Revision: 2.7.3.0 - Pizza Checking - Specialvideo
— □ ×

Ciclo Formati Archivio Password Esperti Strumenti Aiuto
[M] Border Cartesian Mask ▾







OK


Statistiche produzione


Buoni	0
Scarti	0
Invalidi	0
Ultimo reset	3/26/2024 9:03 AM






Messaggi	Esperti	Results
<pre> 9:30:27.037: Controllo Crosta -&gt; Ok 2010 ms 9:30:30.654: Modifica Formato 9:32:29.631: Salvataggio formato: 00000054... 9:32:30.635: OffLine 9:32:31.560: Elabora corrente 9:32:36.836: ElaboraObjectInspection Completed! Time 5273 ms 9:32:36.850: Tempo di esecuzione dell'oggetto: 5276.8 ms. 9:32:36.852: Oggetto N. 8 9:32:36.854: Locatore -&gt; Ok 2516 ms 9:32:36.855: Dimensione Pizza -&gt; Ok 17 ms 9:32:36.856: Rilevamento corpi estranei -&gt; Ok 222 ms 9:32:36.857: Controllo Crosta -&gt; Ok 2753 ms 9:32:37.026: Elaborazione terminata                     </pre>		


Stato: OffLine
Utente: InstallFormato: 00000054
Robot: OFF

  
 Menu

  
 Inserisci password

  
 Modifica Formato

  
 Stop

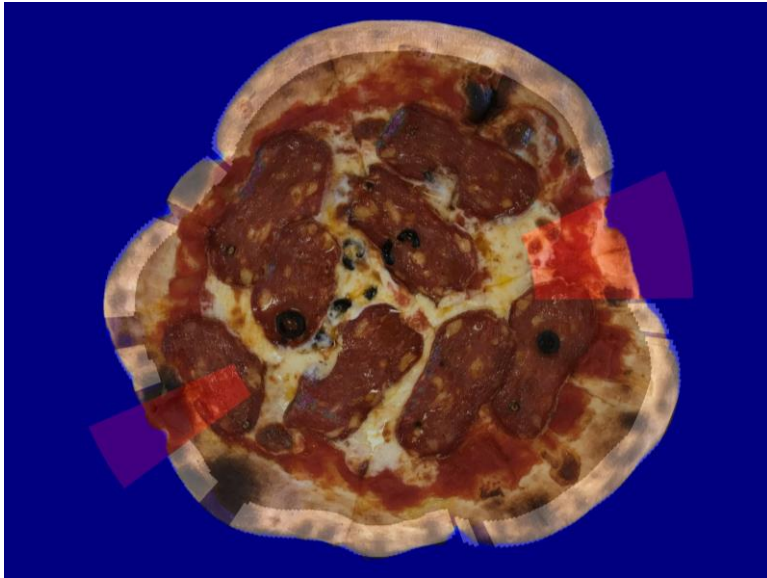
  
 Start / Reset

# SYSTEM FUNCTIONS

The system operates by the use of **classical computer vision combined with artificial intelligence.**

The shape and color inspections are carried out with classical computer vision, while the detection and counting of toppings is done by neural networks.

The application made for pizzas is suitable for other food products that have the ingredients to be checked visibly arranged, e.g., ready-made salad and pasta dishes.



## CLASSICAL INSPECTION OF SHAPE AND COLOUR

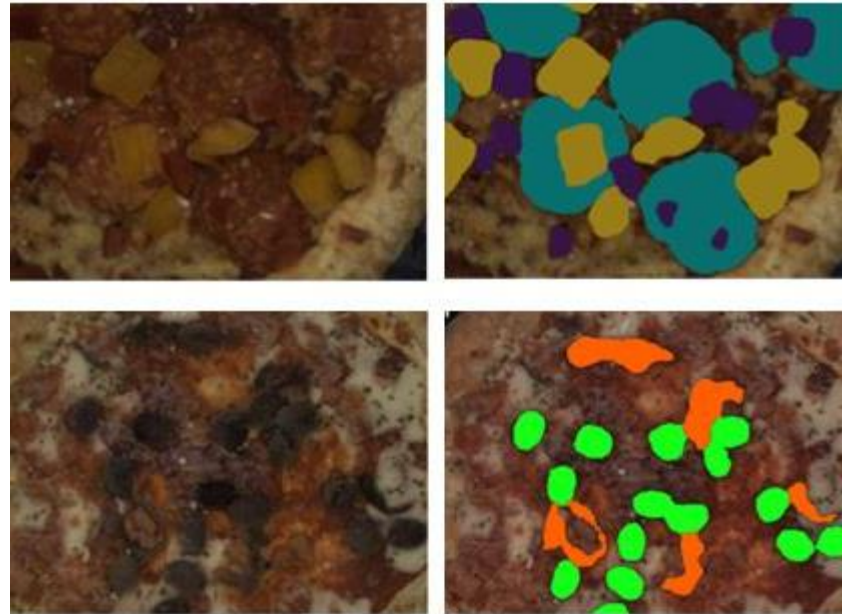
- ✓ Pizza shape: diameter and roundness (round pizzas), ellipse axes (oval pizzas), side lengths (rectangular pizzas)
- ✓ Crust size and topping centering: the width of the crust should be within a predefined range on all 360 degrees
- ✓ Crust baking: crust color should not exceed certain color thresholds (e.g., burns)
- ✓ Uniformity of the contour: the edge of the pizza must not have any pronounced tears or bumps
- ✓ Check for possible blue pollutants

## RECOGNITION OF TOPPING INGREDIENTS USING DEEP LEARNING

The system uses a neural network to accurately identify the topping ingredients on the pizza.

This makes it possible to count and verify the distribution and colours of the toppings.

The system is highly versatile and avoids false positives, such as recognising a burn as an olive on the crust.



Trained with several hundred pizzas per recipe, the system is able to distinguish various ingredients, such as red peppers on top of red salami, and precisely follow the outline of anchovies.

The neural network is able to detect and count ingredients even when they are partially hidden or overlapping.



## APPLICATION FOR PIZZAS OF VARIOUS SHAPES AND SIZES

We tested our system in ingredient recognition on products different from the initial ones, obtaining surprising results.

Some examples in the picture: our system was able to recognise all the olives and salami slices on pizzas that had never been used in training, demonstrating that the network had learnt the visual semantics of the ingredient.

This allows us to offer customers quick adaptations of the system to product variations.

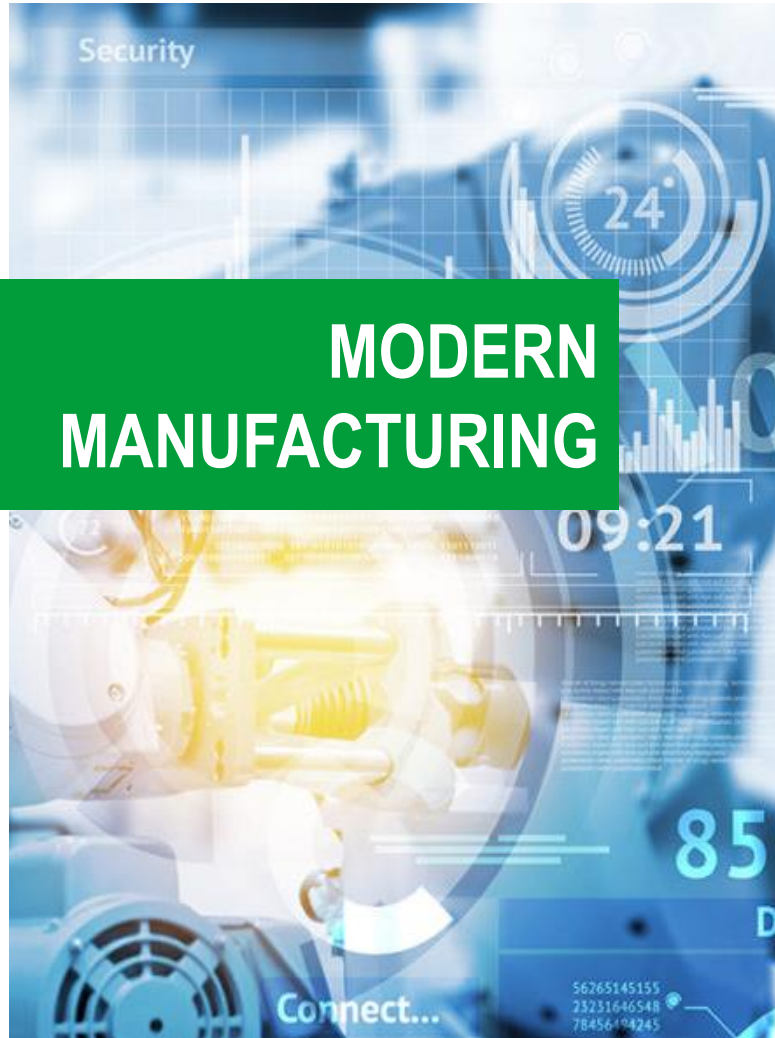


## APPLICATION TO OTHER FOOD PRODUCTS

A promising result regarding the extension of our control system was the **recognition of ingredients even on food products never used during the training** such as salad and pasta.

This gives us a great advantage on new products with common characteristics to the products already seen and the process of dataset construction will be greatly speeded up. For example, we obtained recognition on salad and pasta of various ingredients learned in the context of topped pizzas.





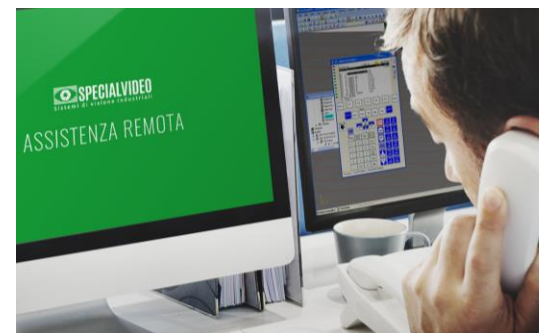
## MODERN MANUFACTURING

# TRACKING OF DATA AND STATISTICS

The vision system is able to record counts and statistics that are **beneficial for modern manufacturing contexts**.

We can integrate into the system into the plant network, providing artificial vision data useful for the customer's specific production tracking needs.

## SERVICES



### ✓ Design

Choice and configuration of the hardware.

Vision software design and development.

### ✓ Test

Testing at Specialvideo.

Commissioning and testing at the customer.

### ✓ Technical support

Remote assistance included for the entire warranty period. Field interventions with specialized technicians.

We're structured to follow our customers all over the world.

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