



# The sixth sense for Industry 4.0: Spectroscopy and Hyperspectral Imaging

European Photonics Roadshow: New Technologies in agriculture & food industry  
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Alejandro Rosales  
IRIS Technology Solutions S.L.



# Industry 4.0 as defined by its authors

- Term first use at **Hannover Messe 2011** by Prof. Wolfgang Wahlster (Director of the German Research Center for Artificial Intelligence).
- At **Hannover Messe 2014**, Prof. Detlef Zühlke (Scientific Director of Innovative Factory Systems [IFS] of the same institution) identified 4 key paradigms of the Industry 4.0 concept, with Intelligence (the rational management of information) at the core:



**Industry 4.0 is about converting process data into economic value**



# Role of **Process Analytical Technologies** in Industry 4.0

Process Analytical Technology (PAT): Controlling a process based on the **functional aim of the process**, as opposed to supervising and maintaining the assumed optimal conditions based on traditional recipes.

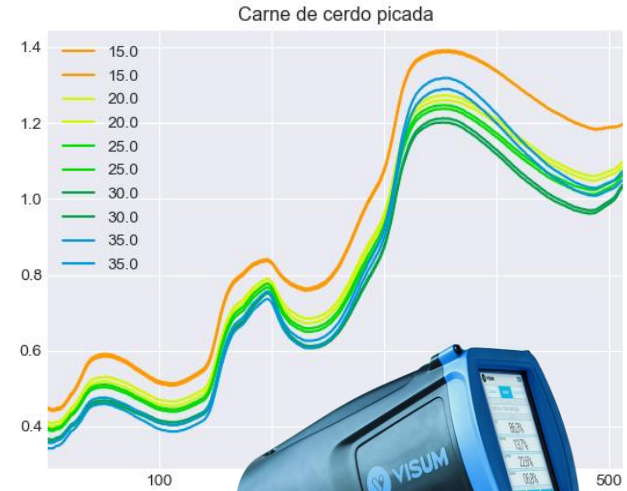
## **PAT within the Industry 4.0 framework:**

- ❖ Availability of a sufficient quantity of informative and reliable data not only on the external conditions of the process, but also about what is going on in the process itself, i.e. a combination of sensory and PAT data.
- ❖ Unveil hidden relevant information from the data via ICT resources founded in Artificial Intelligence in order to build Decision Support Systems that are free from cognitive bias and prejudice.



# IR Spectroscopy + Machine Learning: the cornerstones of PAT

- Real-time analysis- inline and in continuous mode- automatic and instant correction of process parameters to guarantee a standardised product.
- Highly qualified operators not required.
- One instrument can determine multiple parameters simultaneously.
- Potentially determinable parameters is practically limitless.
- Mature, robust & accessible technology- suited to use in production lines.





# Lab2Line: Let the product do the talking

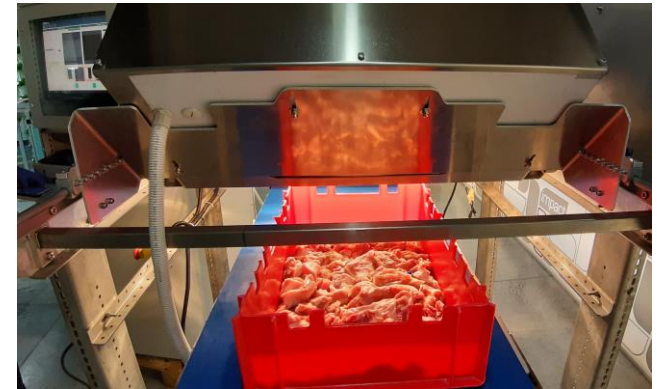
- Product quality is not solely dependant on a proven recipe or a stable process, but also on **varying circumstances**.
- PAT Tools inform us about how these varying circumstances influence on the product and they indicate how we should adjust the recipe or the process in order to always obtained the desired result or outcome.
- **New revolutionary paradigm in food safety: Early Anomaly Detection (EAD)**, irrespective of type, via a combination of PAT probes and AI. If there is a foreign body or undesired quality, the PAT probes generate an alarm and the problem can be corrected before the batch is packed and distributed.





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# Transforming your business to Industry 4.0

## IRIS Technology Solutions S.L:

- ✓ More than 10 years of growing and success
- ✓ Facilities and offices in Barcelona, Madrid and Dublin
- ✓ 80 highly qualified multidisciplinary staff
- ✓ First among the top SMEs with H2020 granted R&D projects in Spain
- ✓ Industrial-grade NIR analyzers and hyperspectral imager proprietary product line
- ✓ Advanced engineering services for undertaking novel applications and integrating turn-key solutions
- ✓ Developers of tailor-made cloud-based software platforms with built-in AI tools





# IRIS

## What we are expecting from this meeting:

- ✓ Clients for long term co-creational partnerships
- ✓ Distributors and prescriptors in the European area
- ✓ ... and stimulating your **imagination** for ideating new business opportunities

[arosales@iristechnologygroup.com](mailto:arosales@iristechnologygroup.com)

+34 93 554 2508

### BARCELONA

Parc Mediterrani de la  
Tecnologia Avda. Carl  
Friedrich Gauss n° 11 08860  
Castelldefels – Spain

### MADRID

C/Velázquez, 94, 1º Planta  
28006 Madrid – Spain

### DUBLIN

NexusUCD, University College  
Dublin, Blocks 9 & 10, Belfield  
Office Park, Belfield – Dublin 4

[www.iristechnologygroup.com](http://www.iristechnologygroup.com)