



Artificial Intelligence Storytelling by Mitsubishi Electric

The advent of artificial intelligence has revolutionized the world as we know it, new paradigms became part of our private and professional life, profoundly changing the dynamics of the industrial world and beyond. *"Every aspect of intelligence can be described so precisely that a machine can be created to simulate it"*. Starting from this assumption, let's explore the complex world of Artificial Intelligence together.



Artificial intelligence is a scientific discipline, like mathematics or chemistry, which means it is a collection of concepts, problems and methods. AI is defined as the branch of information technology that studies the development of hardware and software systems with typical human skills and capable of pursuing a defined purpose, making decisions autonomously.



In the 1950s, the first problems with artificial intelligence were games, before then the only goal had been to crack the Nazi codes during the war. Alan Turing is considered one of the pioneers of AI and father of the well-known test, in a famous paper (Computing machinery and intelligence) published in 1950 he wondered if a machine could think. The term was coined by John McCarthy, chosen as the topic of a summer seminar: the Dartmouth conference, organized in 1956.



Today we unconsciously enjoy the benefits of artificial intelligence, AI algorithms are present in many of the services we use every day, such as email spam or e-commerce purchase suggestions. And the applications continue to increase every day: speech recognition, natural language and image processing, data interpretation, prediction of consequences, cognitive modeling and instruction processing under uncertain conditions are just some of the activities that make up the domain of AI. .

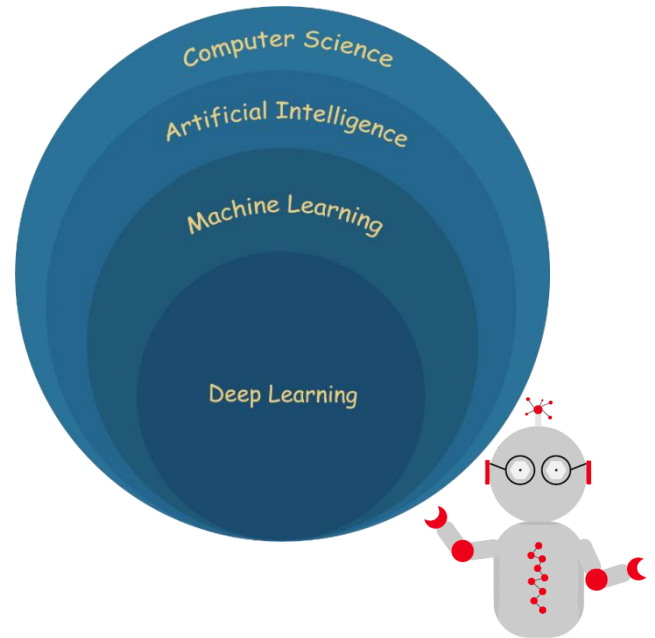
The development of AI has introduced new and important terms in the industrial world, from Artificial Intelligence to Deep Learning, let's try to clarify:

Computer Science: is the science that studies the sorting, treatment and transmission of information by means of electronic processing. It encompasses all the other branches.

Artificial Intelligence: refers to autonomous and adaptable systems. Includes the ML and DL.

Machine Learning: is a sub-field of AI, it develops systems that can improve their performance with more and more data or experience.

Deep Learning: refers to certain types of Machine Learning in which different levels called "layers", composed of simple processing units are connected in a network.

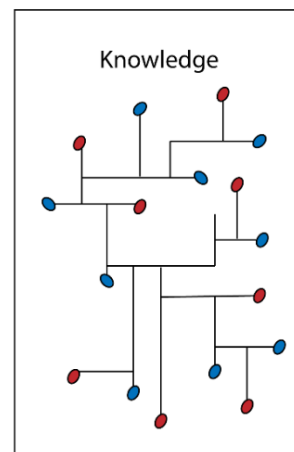
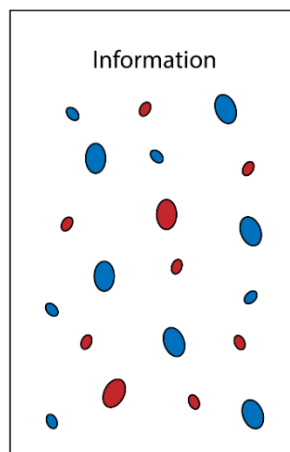
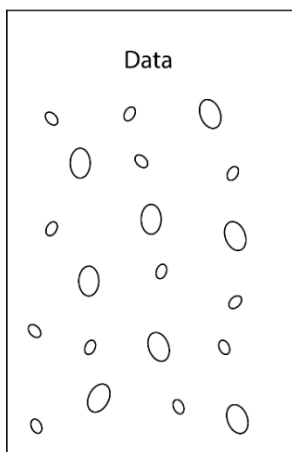


A system is intelligent if it has the following capabilities:

Autonomy: the ability to perform tasks in complex environments without constant guidance from the operator.

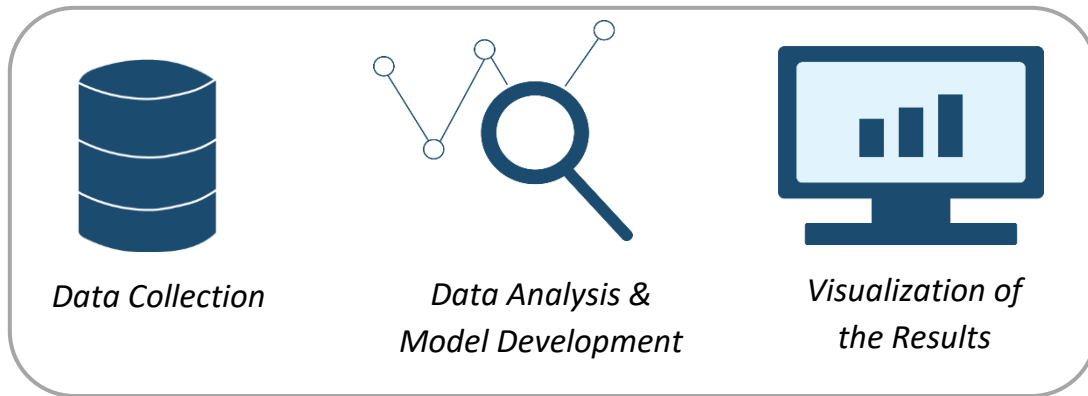
Adaptability: the ability to improve performance by learning from experience.

But the road to intelligent systems is long and winding and begins with the collection of data.



Data represent the digital coal of the new factory 4.0 and the processes become the subject of deep analysis in order to extrapolate an increasing amount of information.

The data are collected in the raw state and are subsequently refined, thanks to the synergistic work of **Data Scientists and Process Engineers**, with the final goal of structuring the information according to intelligent models.

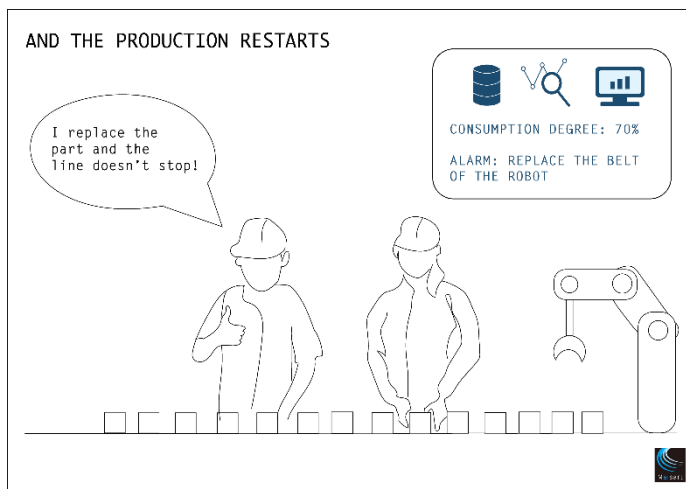


The rigorous and engineering vision of the process expert allows to eliminate non-relevant data, highlighting the significant variables for the process. Subsequently, the semi-finished data are **analyzed and modeled**, according to the most adequate relational hierarchies.

The extrapolated models identify the historical trends of the variables and feed the Artificial Intelligence algorithms that allow the **visualization of the results**.

The relationships between the historical data highlighted by the model allow Artificial Intelligence to develop:

Prediction System



Predictive Maintenance

The cumulative data from the robot is analyzed.

From the analysis, a characteristic waveform is extrapolated and it describes the dynamic model of the robot.

Artificial intelligence calculates the degree of consumption, predicts potential failures and displays the results with a notification.



MAISART Mitsubishi Electric's AI creates the State-of-the-ART in Technology, is the brand that embodies the latest developments in research on Artificial Intelligence technologies.

It is the Mitsubishi Electric's response to the new state of the art in the industrial world and it offers a complete range of intelligent solutions:



[Learn more](#)

ROBOT MELFA FR and MELFA Smart Plus

Artificial intelligence enables predictive maintenance functions, based on the real absorption of the robot axes. The MELFA FR family, characterized by high performances in terms of speed and repeatability, is able to predict potential failures, before they happen. Intelligence, Integration and Safety also define the pillars of the product range and embody the vision of robotics according to Mitsubishi Electric.



[Learn more](#)

Inverter FR-E800 and Fault Diagnosis

The new intelligent functions allow to identify in advance potential faults of inverter and external parts and identify the causes, minimizing the system down-time. The new family of FR-E800 inverters with on-board Ethernet and advanced Safety functions also allows data collection and real-time monitoring of consumption variables, even remotely.



[Learn more](#)

Servo MR-J5 and Predictive Maintenance

Thanks to the new functions, the servos of the MR-J5 family monitor the operating status of the machine and are able to detect possible anomalies in advance. In addition, the new servos with a 3.5 kHz bandwidth and battery-less absolute encoders (26-bit resolution), with over 67 million pulses per revolution, ensure high performance and cycle times of only 31.25 μ s.



MELIPC and Real-Time Quality Control

The new industrial PC, thanks to Statistics and Machine Learning tools, guarantees real-time control of production, providing continuous feedback to the operator and optimizing quality control management. The integrated algorithms allow the analysis and diagnostics of data coming from the system, according to a predictive formula that ... We will find out in the next edition!

Mitsubishi Electric represents a technological partner with a complete range of automation solutions and know-how that goes beyond the single products.