

European Alliance Against Coronavirus

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Artificial Intelligence at the Edge

Working format is based on “Gilles Rules”:

1. conceptual framework
2. needs and disruptions
3. solutions

Speaker:

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[Link to the session's recording](#)

1. CONCEPTUAL FRAMEWORK

How do we want to interact with machines?

Artificial Intelligence (AI) concerns the development of a computer system able to imitate human capabilities and apply them to different fields like data management, product improvement and decision making. AI is developed exploiting **Machine Learning** (ML) algorithms which shift the traditional programming approach. While in the traditional approach data and predefined rules are given in input together to obtain a specific data output, Machine Learning algorithms take data as input returning rules in output; the result is a computer system that is able to recognize specific data without writing specific code for the machine, creating an environment that is able to learn data processing and categorization autonomously.

Thinking about systems of connected devices, it is possible to integrate AI within sensors **on the edge** of the network (hence, integrating **Machine Learning** and **Artificial Intelligence** algorithms downstream on the single devices, rather than accessing them through cloud computing). This type of action generates three kind of **advantages**:

- **Low latency**: because there are fewer cloud structures and data is processed into the sensor (computation take place in a local environment)
- **Data security**: reduces trust issues and risks of security breaches linked to the storage and computation of data enter in the cloud
- **Energy efficiency**: since there is a lower amount of data transfers that consumes energy in terms of electricity and computational power

The main **challenges** are related to **combining technologies with other sectors**, such as automotive, and **finding solutions for energy efficiency, green economy application and the digital sector**.

Advantages of Edge AI

Since Europe has lost the cloud market competition in terms of chips and software, the **European market** still holds a solid position placed in the global context, but not in a leading place. It is crucial to **keep the technology developments in Europe**. Europe can embrace the opportunity to specialise in Edge AI, as it **fits with a decentralised and privacy-driven European policy**.

Looking at European policies, AI is closely connected with the **Green Deal** in terms of energy efficiency: this type of technologies can be a proper solution for the environmental issue and for this reason is important to invest now in future developments, making funds available.

Talking about the future, AI is a technology that can be connected with other strong sectors and industry in order to **improve the innovation process and decision making**.

About Infineon

Bernd Waschneck is the expert invited to share its framework. He is the Team Leader of System Innovation from the German company Infineon. **Infineon Technologies AG** is a leading company in semiconductor solutions that make life easier, safer, and greener. They act to connect AI with sensors and their mission describes how they are helping to solve the technological, economic, and social challenges the world is facing today. They are working with technology that achieves more, consumes less and is accessible to everyone.

IDENTIFICATION OF NEEDS

Artificial Intelligence application has cross-sectorial impacts, especially regarding the European industrial ecosystem. The main limitations to the design and widespread application of AI are still slowed down due to different reasons:

- **Moore's Law validity:** Moore's law states that the average number of transistors per Area unit increases year by year, keeping computational power equal or higher and reducing the cost for single transistor; the curve representing this law has almost reached a steady phase. This means that there is no more an exponential trend in transistor increase inside components and that transistor price is likely to increase over time, which has led to parallelization of tasks management for CPUs (working then on efficiency rather than pure computational power).

In this paradigm, Artificial Intelligence applications require chipsets with great computational power that are now characterized by higher development and implementation costs. This is particularly true in order to implement AI solutions on local devices (sensors, IoT, etc) since the number of transistors needed is higher than pure cloud computing solutions.

- **Upskilling/Reskilling:** Building systems like AI based on Machine Learning is not the same process as traditional programming. Although languages used to code may be similar, the core task is to build an environment that has self-learning characteristics; this means that the system must be led, through proper data preparation, ingestion and validity check, by a path of continuous update, until its self-sufficiency in handling the task required.
These peculiarities demand different skills level, not only for employees that are not expert in coding, but also for the ones with basic programming knowledge, who have to develop code following different procedures.

- **Knowledge and Ethics:** AI topic is very critical in terms of trust, for two main reasons:
 - (1) It is a subject that has not a diffused and standardized knowledge basis, meaning that there are different theories on its application, that do not contribute to give a definition uniquely accepted in the business field.
 - (2) AI is subject to ethical issues, on two different fronts: first, data privacy and treatment, since AI devices take in input huge amount of data of different types (structured and not structured) in a way that is not so transparent to the user. Secondly, regarding the practical application, there are issues in some sectors, like automotive (i.e. an autonomous driving car could be put in this emergency condition, choosing between two options: hit a vehicle on the road or hit a pedestrian; in this case, programming the car system response in such situations is still object of discussion since both choices would bring damages to the driver or to the pedestrian).

Possible solutions identified

- Training to integrate machine learning programming
- Vehiculation of the business opportunities enabled by AI technologies, especially in the industrial ecosystems
- Define transparent rules for data processing with AI projects
- Working on instances parallelization and on-demand execution in order to reduce the need of pure computational power