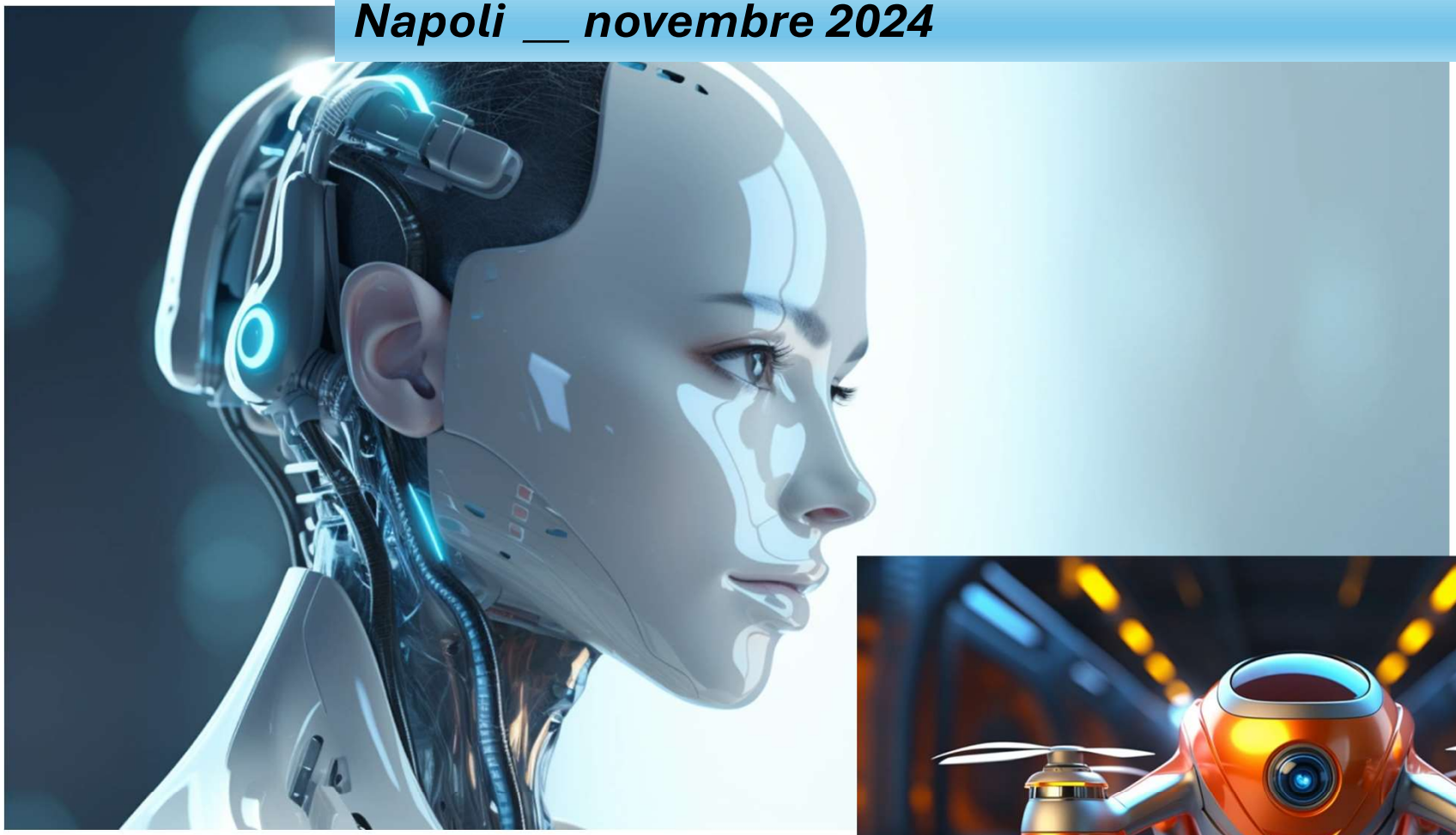
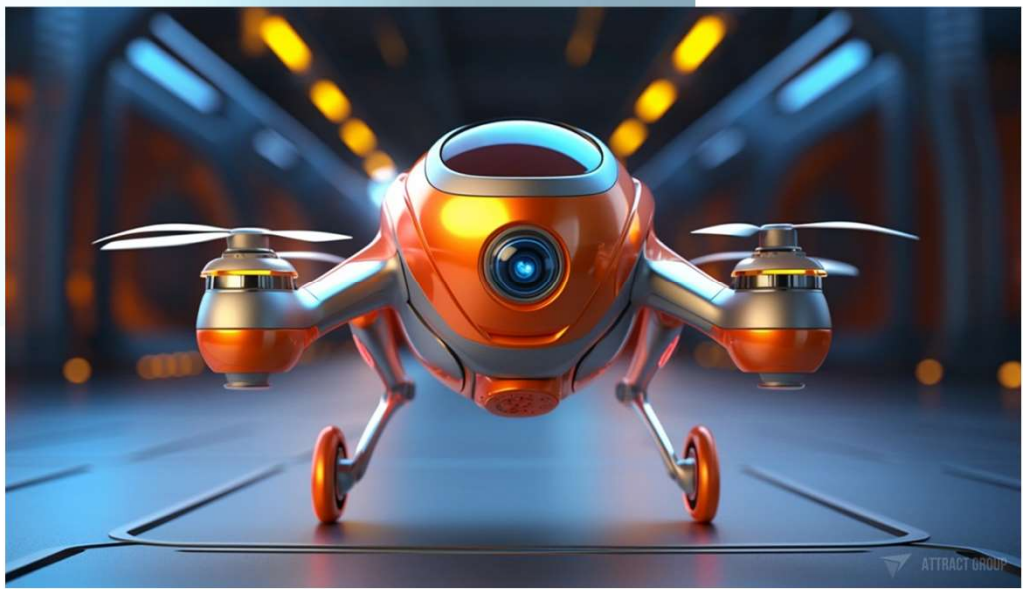
The future of Aviation: the impact of the A.I.

Scuola Politecnica e delle Scienze di Base Federico II
Napoli __ novembre 2024





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What is the Artificial Intelligence?

"the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings" Enc. Britannica

"...anything that makes machines act more intelligently", IBM

"...intelligence exhibited by machines, rather than humans or other animals", Wikipedia

"...getting computers to do tasks that would normal require human intelligence", Deloitte

We can sum them up by saying that Artificial Intelligence is: ***the ability of machines (computers) – that is, non-human entities – to demonstrate intelligent characteristics such as learning, reasoning and problem solving.***

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The 3 main types of AI

There are three main types – or levels – of Artificial Intelligence.

***Level 1 – Basic**: **Narrow AI** or **Weak AI.** This is a form of AI which can only perform a single task or a specific set of tasks, such as playing a game or filtering email. This is, today, the most common and most prevalent form of AI.*

***Level 2 – General Artificial Intelligence** – also known as **Artificial General Intelligence** or **Strong AI.** This is the level of AI which is at the same level as human intelligence. It can think and function like a humans and can be broad and adaptable. This form is still a bit further into the future.*

***Level 3 – Super AI** – or **Artificial Super Intelligence.** This form of Artificial Intelligence exceeds human intelligence in every possible way. However, this form **is far off in the future** and is still a very theoretical field.*

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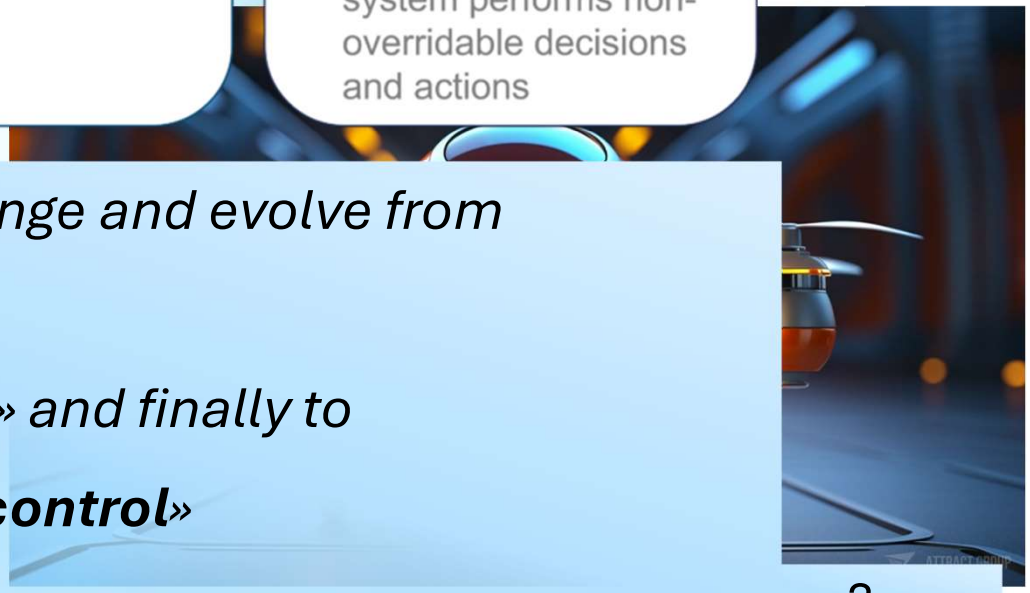
EASA defines 3 different levels of certification requirements dependig on the degree of complexity of the AI Systems:

Level 1 AI: Assistance to human	**Level 2 AI:** Human/machine collaboration	**Level 3 AI:** More autonomous machine
• **Level 1A:** Human augmentation • **Level 1B:** Human cognitive assistance in decision and action selection	• **Level 2:** Human and AI-based system collaboration	• **Level 3A:** AI-based system performs decisions and actions, overridable by the human • **Level 3B:** AI-based system performs non-overridable decisions and actions



The role of the humans will change and evolve from

*«Humans-**in**-the Loop» to*

*«Humans-**on**-the Loop» and finally to*

«Humans-in-control»

Rif. EASA-AI-Roadmap-v1.0

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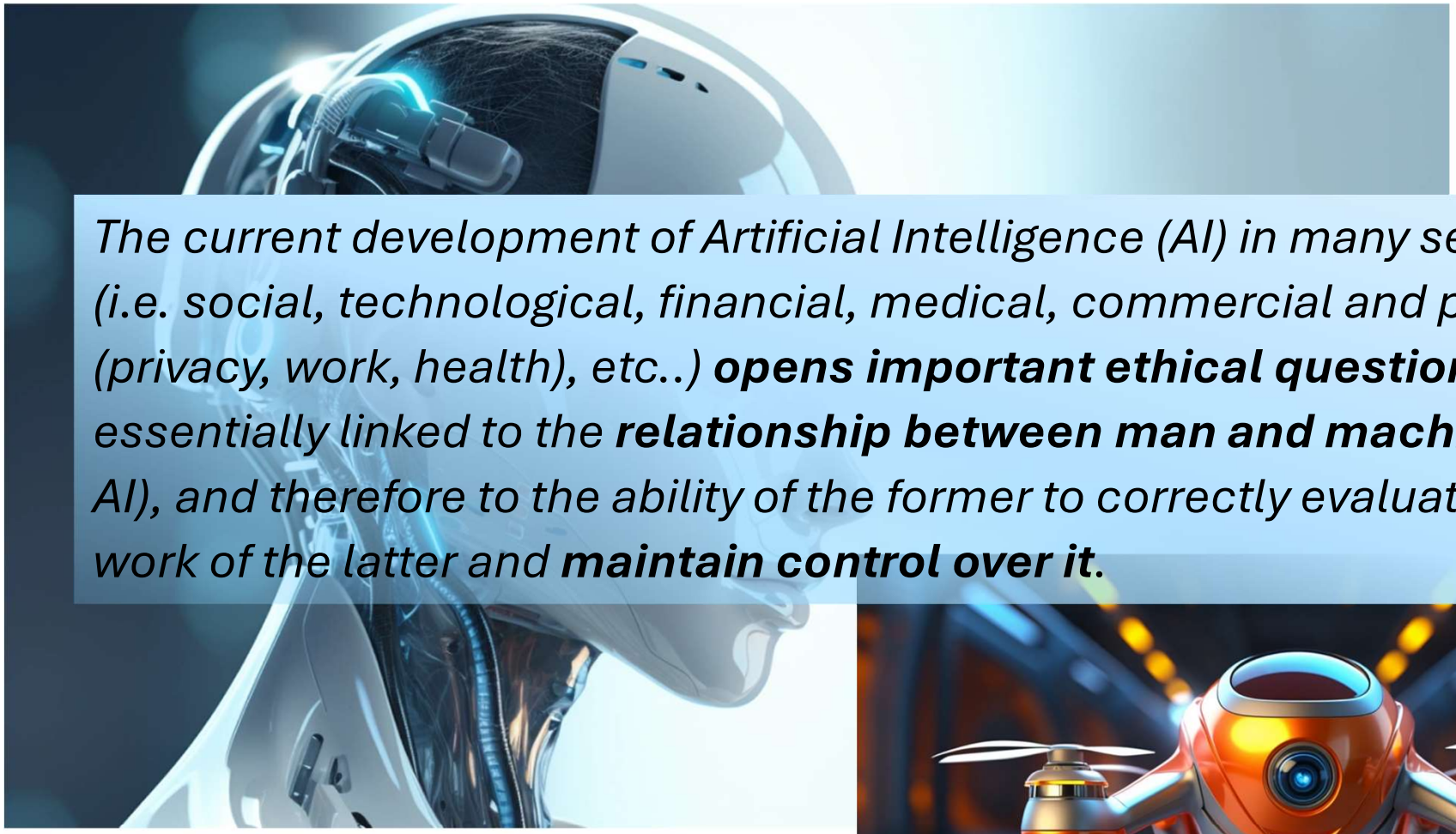
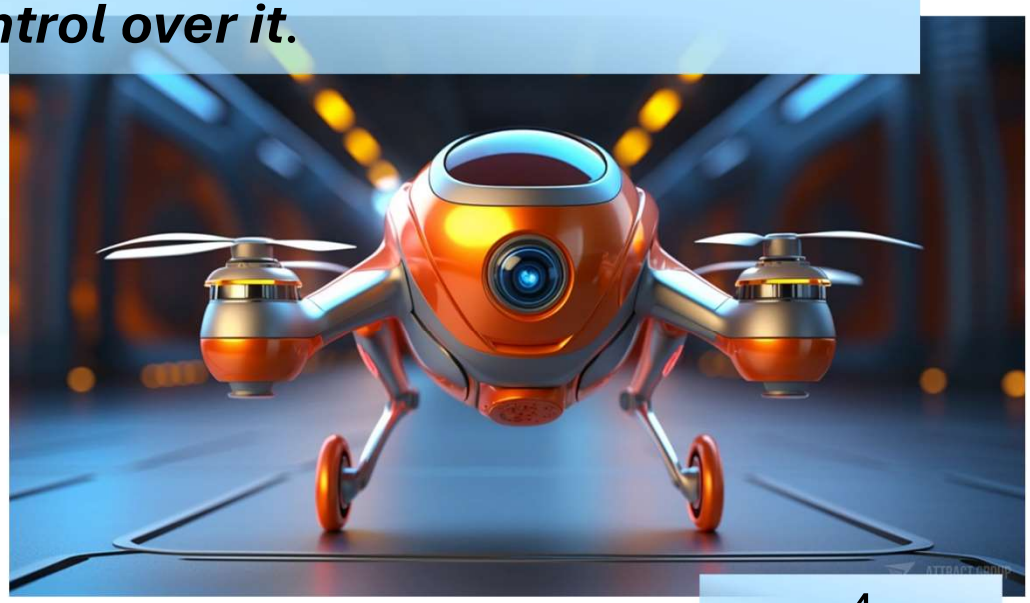


The current development of Artificial Intelligence (AI) in many sectors (i.e. social, technological, financial, medical, commercial and political (privacy, work, health), etc..) ***opens important ethical questions****, essentially linked to the* ***relationship between man and machine*** *(i.e. AI), and therefore to the ability of the former to correctly evaluate the work of the latter and* ***maintain control over it****.*



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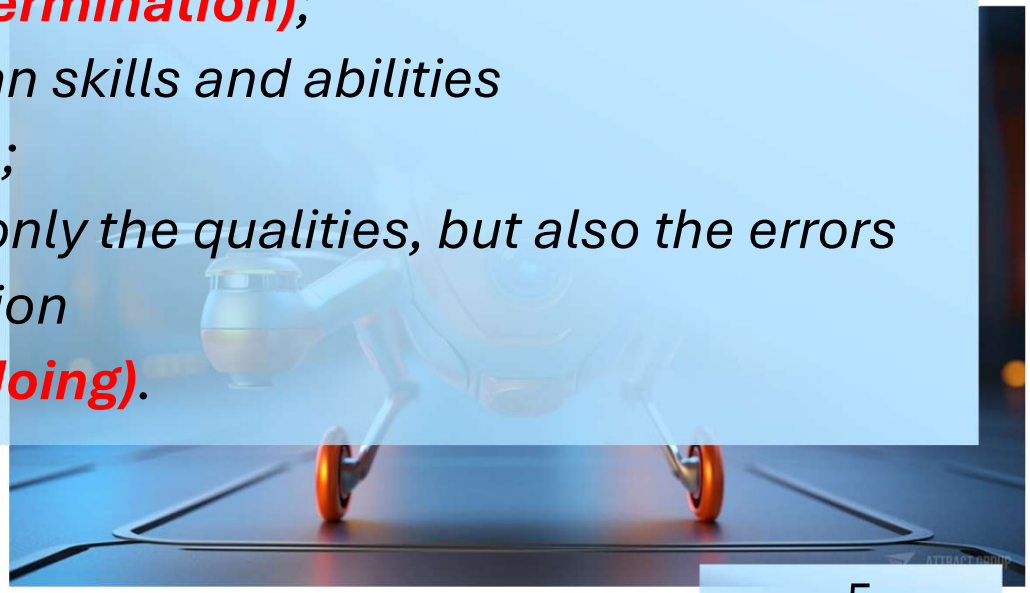
According to many scientists and academics, there are five main ethical challenges posed by Artificial Intelligence, to be faced and solved:

1. *the changing profiles of responsibility* ***(Reducing human responsibility)****;*
2. *the 'replacement' of human activity with AI* ***(Reducing human control);***
3. *the risk of eroding human self-determination and its "free will" (****Eroding human self-determination)****;*
4. *the risk of devaluing human skills and abilities* ***(Devaluing human skills)****;*
5. *the risk of replicating not only the qualities, but also the errors and defects of human action* ***(Enabling human wrongdoing)****.*



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Two more challenges are added to the previous ones, connected to them and essential for the systems trustworthiness , related to security issues:

1. *Aggression **(Escalation)**;*
2. *Lack of control*

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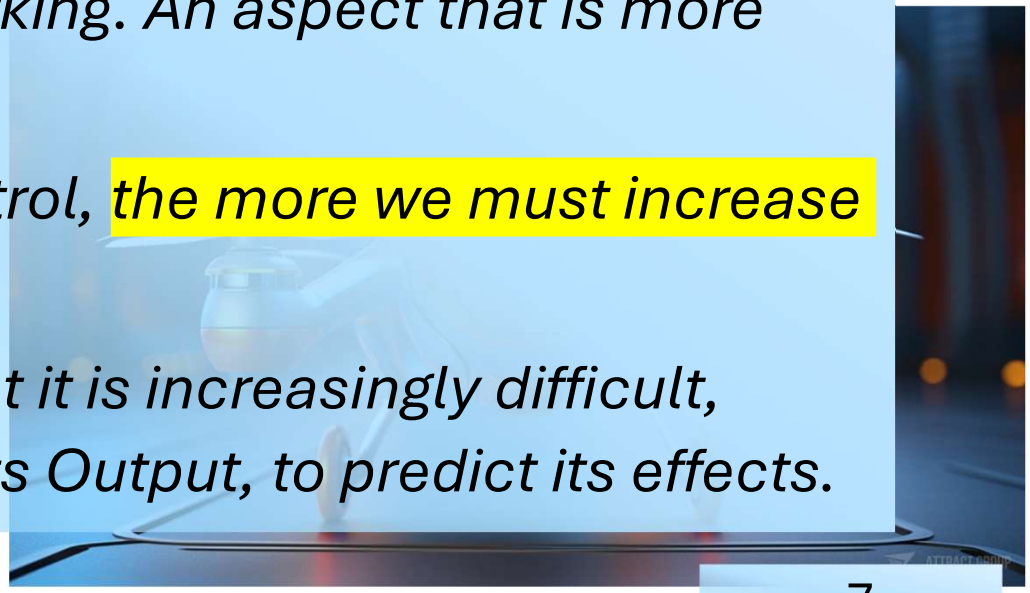
The basic challenge: Humans and AI, trust versus control

The first issue to be resolved in the relationship between Humans and Artificial Intelligence is determining ***the level of trust*** *with which to delegate certain operations to the Machine, and, in a complementary and specular manner****, the level of control*** *to be maintained in hand to verify how this 'programmed' intelligence is working. An aspect that is more delicate the higher the stakes.*

The more we reduce human control, the more we must increase the level of trust towards AI.

To what extent? *Considering that it is increasingly difficult, given a certain Input, to predict its Output, to predict its effects.*



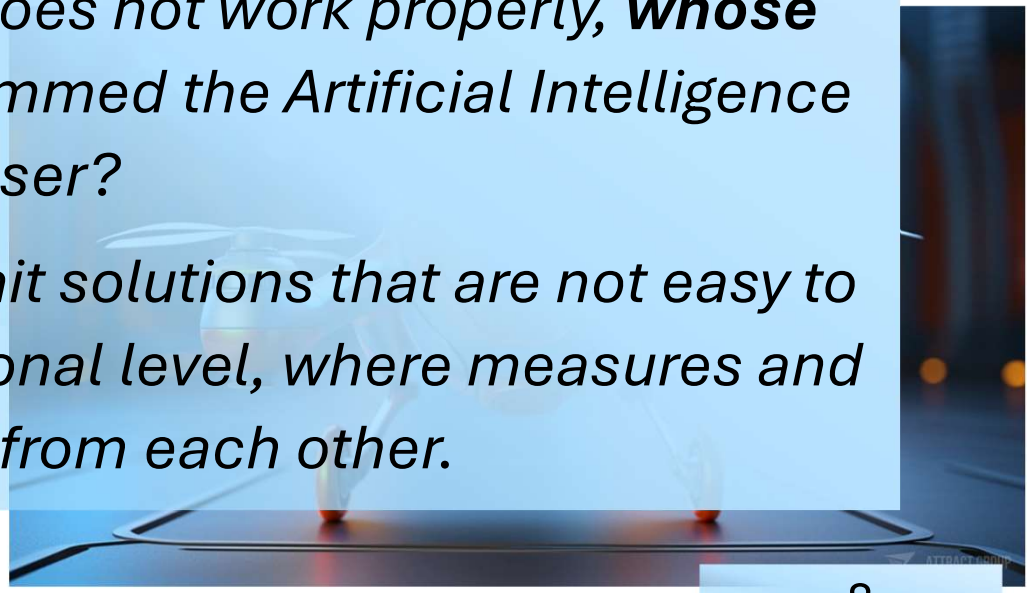
1 The changing profiles of responsibility

(Reducing human responsibility)

The first issue to be faced, due to the rapid growth of AI applications, concerns the ever-increasing replacement of human activity with AI. And therefore, also the ***'removal' of human responsibility****, which passes to an increasingly significant extent to the Machine side.*

But if something goes wrong or does not work properly, ***whose responsibility is it?*** *Who programmed the Artificial Intelligence system? Who produced it? The user?*

Very delicate unknowns that await solutions that are not easy to define, especially at an international level, where measures and regulations can be very different from each other.



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2 The 'replacement' of human activity with AI; Who decides and who should not make decisions

(Reducing human control);

This issue is a consequence strictly connected to the level of trust and delegation that the humans can transfer to technological systems, with ***the risk****, however,* ***of remaining cut off from the decisions*** *that the AI will then be able to take autonomously and automatically, directly, without the need for human intervention.*

Artificial intelligence, in its various forms, is becoming an increasingly widespread and invisible ***Hi-tech 'mediator' for our choices, decisions and activities****. It is necessary for all stakehoders (legislators, technologists and experts) in the field to draw the border line that separates the practicality and usefulness of entrusting tasks and functions to a 'Smart' system, with the counterproductive effect of losing control of actions and operations.*

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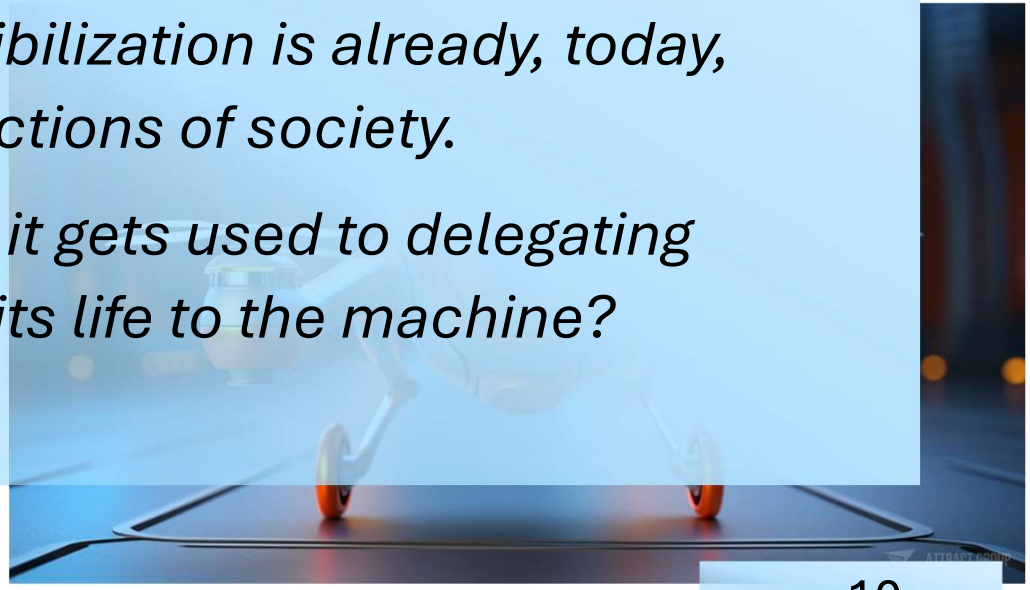
3. The risk of eroding human self-determination and its "free will"

(**Eroding human self-determination**);

Another significant effect of the ongoing evolution concerns, then, the risk of eroding human self-determination and the possibility of deciding by Humans

The convenience of de-responsibilization is already, today, "much appreciated" by large sections of society.

What will happen to humanity if it gets used to delegating decisions that directly concern its life to the machine?

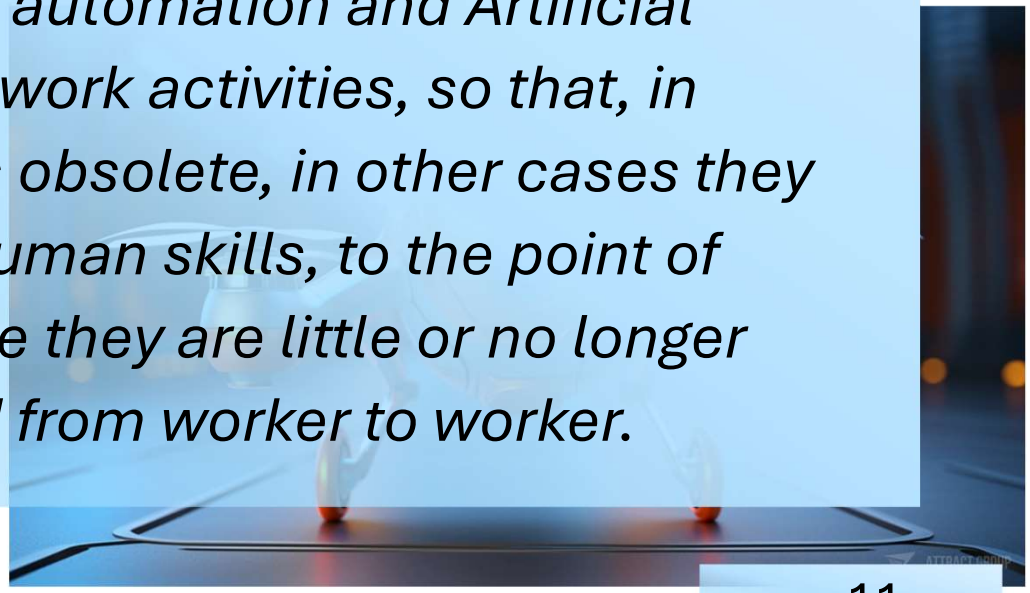


4. The risk of devaluing human skills and abilities

(Devaluing human skills);

The more the levels of automation, trust and delegation towards Artificial Intelligence increase, the greater the possibility that, especially in the long term, human skills and abilities may be devalued or even lost, as they are no longer used as they once were because they have been replaced by technological ones.

This is the classic case in which automation and Artificial Intelligence can replace Man in work activities, so that, in addition to making certain tasks obsolete, in other cases they can reduce the importance of human skills, to the point of risking that they are lost because they are little or no longer used, and no longer transmitted from worker to worker.



5 The risk of replicating not only the qualities, but also the errors and defects of human action

(Enabling human wrongdoing).

Another risk to be kept in mind and avoided concerns the possibility that errors and defects of human action can be transferred, intentionally or not, to Machines and computers.

This is the case, for example, of phenomena of discrimination, of race, gender, religion, or other: if the AI system has received certain Inputs and instructions, it will apply them without ethical, legal or moral filters. For this reason, these filters, guidelines, watersheds between the virtuous and the ruinous, remain in charge of individuals of flesh and blood.

2 Study Cases: 1) AMAZON personnel search algorithm;

2) COMPAS algorithm used by the US Department of Justice.

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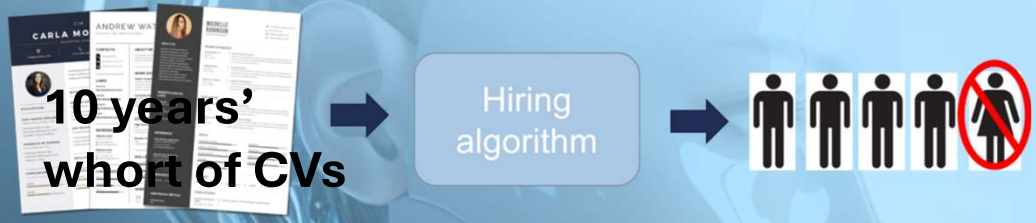
Study Case 1) *- AMAZON personnel search algorithm*



By 2015, the company realized that there was something wrong with this algorithm.

Because the majority of CVs were of male applicants, and because of the low proportion of women working in the company – which reflects male dominance in the tech industry – the algorithm learnt to rate CVs by men higher than CVs by women. The algorithm penalized resumes (curricula) including the word 'women's' and downgraded graduates of two all-women's colleges. The algorithm favoured applicants based on words such as 'executed' and 'captured', which were more common in male resumes. ***The algorithm was essentially biased against women***

Ref.: https://www.imd.org/research-knowledge/articles/amazons-sexist-hiring-algorithm-could-still-be-better-than-a-human/

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Study Case 2) - *COMPAS algorithm used by the US Department of Justice.*

COMPAS, which stands for 'Correctional Offender Management Profiling for Alternative Sanctions', is an algorithm which is used by US courts to predict recidivism, the risk that a defendant will commit future crimes.

This risk score is one of the factors which judges use to decide whether a defendant should go to prison or not. The algorithm takes into account factors such as: age, previous arrests, drug use, and employment. Race is not considered by the algorithm.

Cont. next page

Ref. https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing

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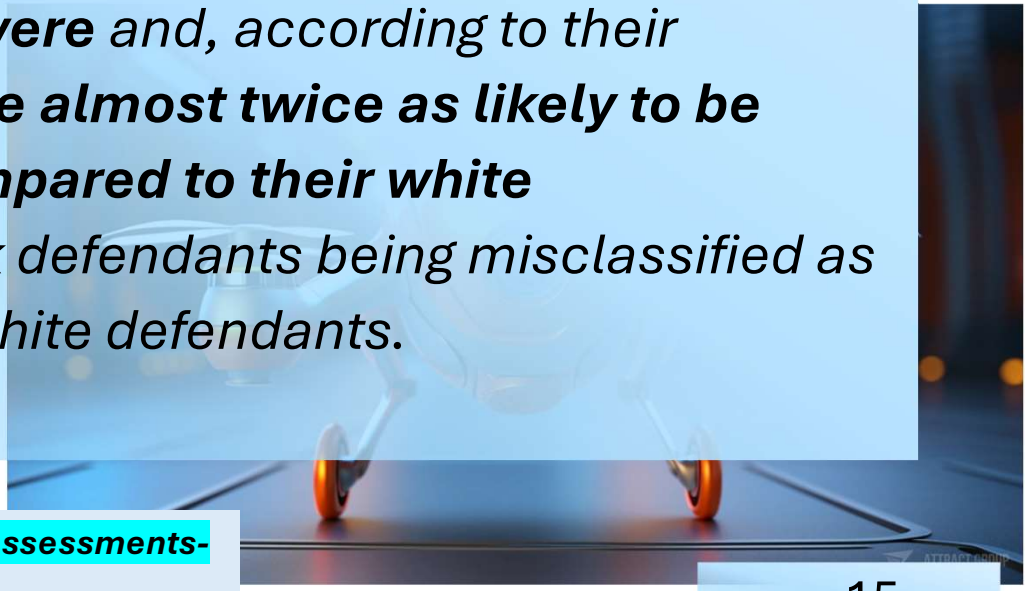
Study Case 2) - COMPAS algorithm used by the US Department of Justice.

A study by ProPublica in 2016 revealed that COMPAS is actually biased against African Americans. ProPublica discovered that ***black defendants were often predicted to be at a higher risk of recidivism than they actually were*** *and, according to their analysis,* ***black defendants were almost twice as likely to be misclassified as 'high risk' compared to their white counterparts****, with 45% of black defendants being misclassified as 'high risk' compared to 23% of white defendants.*



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Reliability and Cybersecurity

These issues are strictly related to the previous themes:

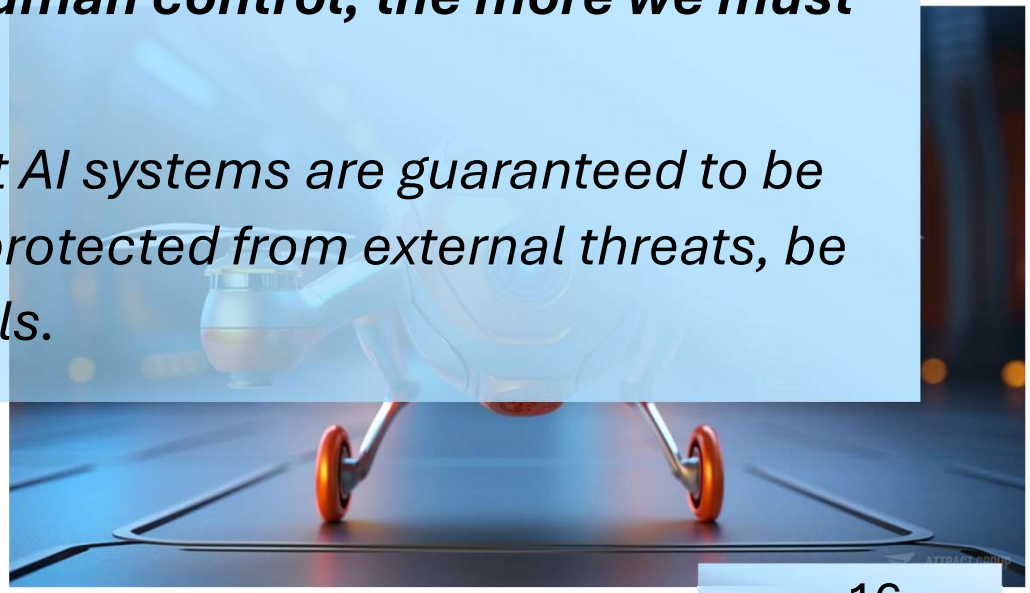
1 Sw Bugs, Dataset incomplete or unbalanced (Bias)

2 Hostile Aggression

3 Lack of control

Artificial Intelligence does not have ideas, intuitions, feelings, but is the execution of a task that, if a human had done it, would be considered intelligent. ***The more we reduce human control, the more we must increase the level of trust in AI.***

For this reason, it is mandatory that AI systems are guaranteed to be safe and reliable in operation and protected from external threats, be they attacks on databases or IT tools.



Conclusion

Ethics and Hi-tech, something is moving

beyond individuals, the management and governance of the digital world and Artificial Intelligence concern much larger scenarios.

At a European level, the first draft of the ***'Ethic Guidelines for Trustworthy AI'*** *has been published; the new guidelines of the ethical code for Artificial Intelligence, which should be adopted by March 2019. The aim is to provide a framework of rules at an ethical level to ensure that an Artificial Intelligence system is "reliable", according to a human-centric vision and fundamental human rights.*

Since these are ethical guidelines, they will not be binding for the countries of the EU. However, the document will become important when legislative policy choices will have to be made within the Union on the subject of artificial intelligence, such as the responsibilities associated with its use and the rights of citizens.

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"The problem is not what we can do with technology, but what technology can do with us"

(Günther Anders)

(Breslavia, 12/07/1902 – Vienna, 17/12/1992)

Thank You for the attention

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