AI Robustness

in

Horizon Europe

Proposals & Evaluation

Documentation

- Programme Guide
- Work Programme introduction
- Application form (Part A, Part B)
- Evaluation form
- Evaluator briefing
- Guidelines on ethics by design/operational use for Artificial Intelligence Ethics and Research
- Ethics Guidelines for Trustworthy Artificial Intelligence (AI)
- factsheet on gender and intersectional bias in AI
- …. and of course the call topic

- Tools … CAP AI, Ethics by design - roles & responsibilities

IDEAL-IST

Programme Guide

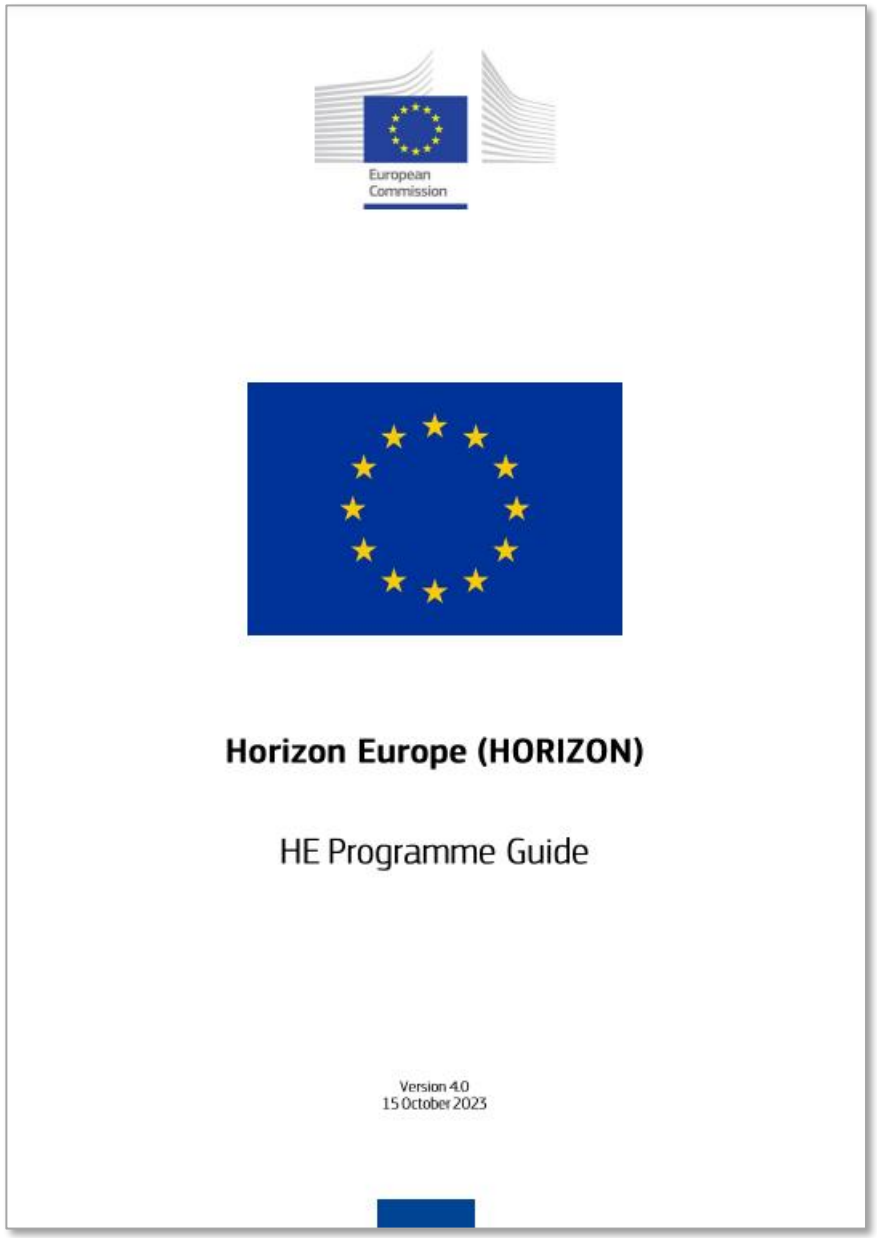
Gendered Innovation

A full policy report has been prepared and is available to support applicants. Entitled *Gendered Innovations 2: How inclusive analysis contributes to research and innovation* and publicly released by the European Commission on 25 November 2020, it is available here, through the Europa website dedicated to gender equality policy in R&I.

The report contains: full definitions of terms; both general and field-specific methods for sex analysis, gender analysis and intersectional approaches; fifteen case studies covering health, climate change, energy, agriculture, urban planning, waste management, transport, artificial intelligence (AI) and digital technologies, taxation, venture funding, as well as COVID-19; and policy recommendations to address the global challenges, targeted impacts and key R&I orientations of the six Horizon Europe Clusters, as well as Mission Areas, and European partnerships.

More information and examples on how to integrate the gender dimension into R&I content in different fields of research and innovation may be found here:

- Website developed by the EU-supported Expert Group on Gendered Innovations, featuring latest material presented in the 2020 EC policy report *Gendered Innovations 2: How inclusive analysis contributes to research and innovation*, as well as previous case studies developed through EC support
- Factsheets:
  - factsheet summarising the EC policy report's contents
  - factsheet on the impact of sex and gender in the COVID-19 pandemic
  - factsheet on gender and intersectional bias in AI
  - factsheet on general provisions for gender equality under Horizon Europe

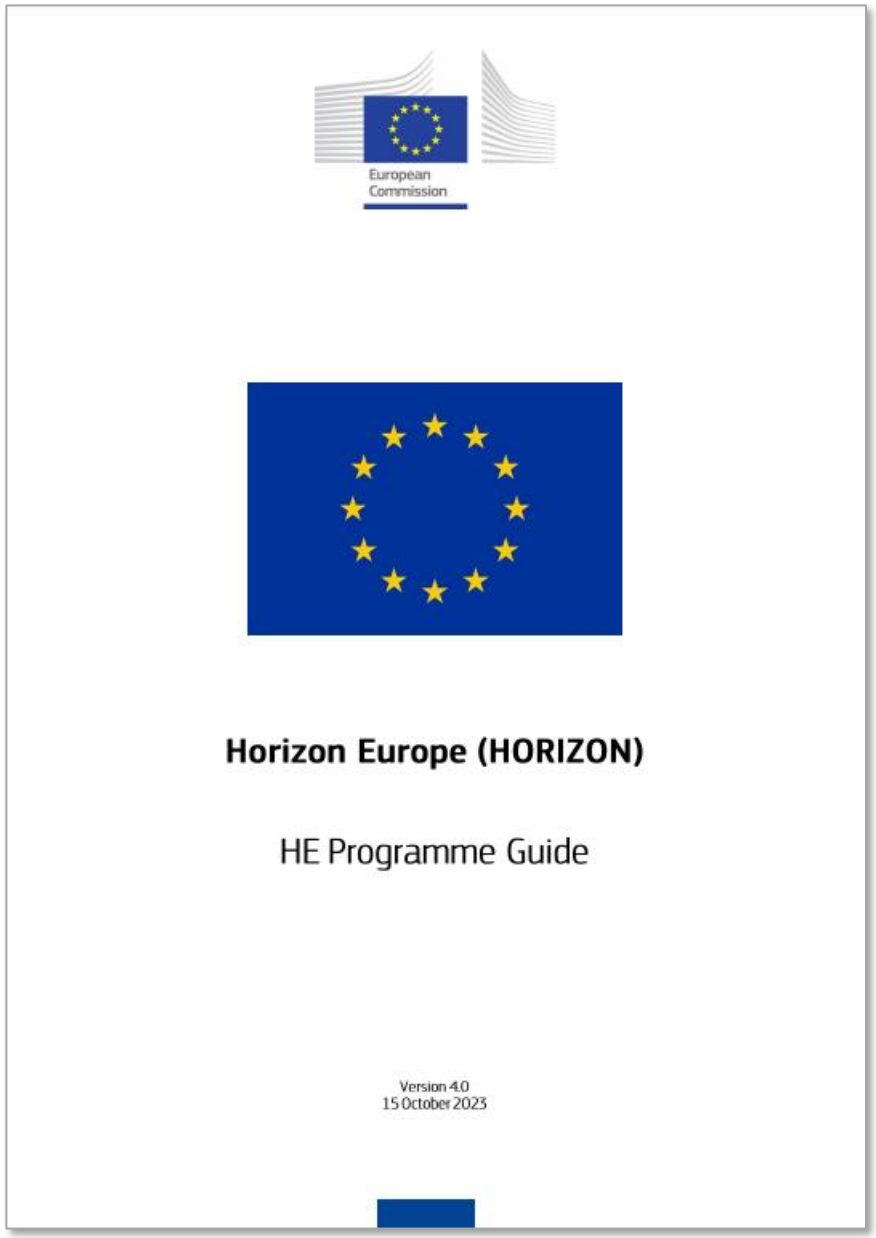


Programme Guide

Ethics Review

The ethics review covers issues as:

- human rights and protection of human beings
- animal protection and welfare
- data protection and privacy
- health and safety
- environmental protection
- artificial intelligence



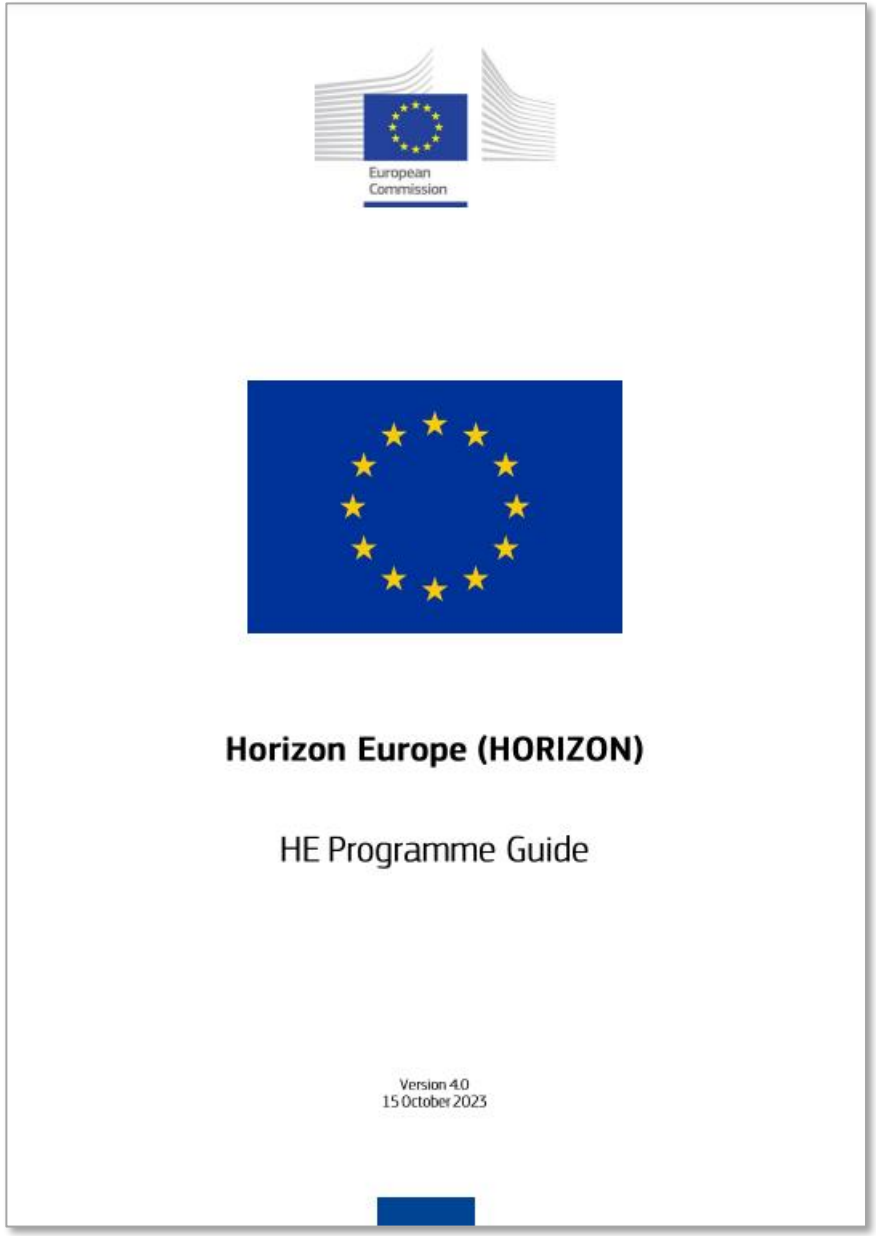
Programme Guide

Key Digital Technologies

Due diligence is required regarding the trustworthiness of all artificial intelligence-based systems or techniques used or developed in projects funded under the Horizon Europe Programme. Wherever appropriate, AI-based systems or techniques must be developed in a safe, secure and responsible manner, with a clear identification of and preventative approach to risks.

To a degree matching the type of research being proposed (from basic to precompetitive) and as appropriate, AI-based systems or techniques should be, or be developed to become (implicitly or explicitly contributing to one or several of the following objectives):

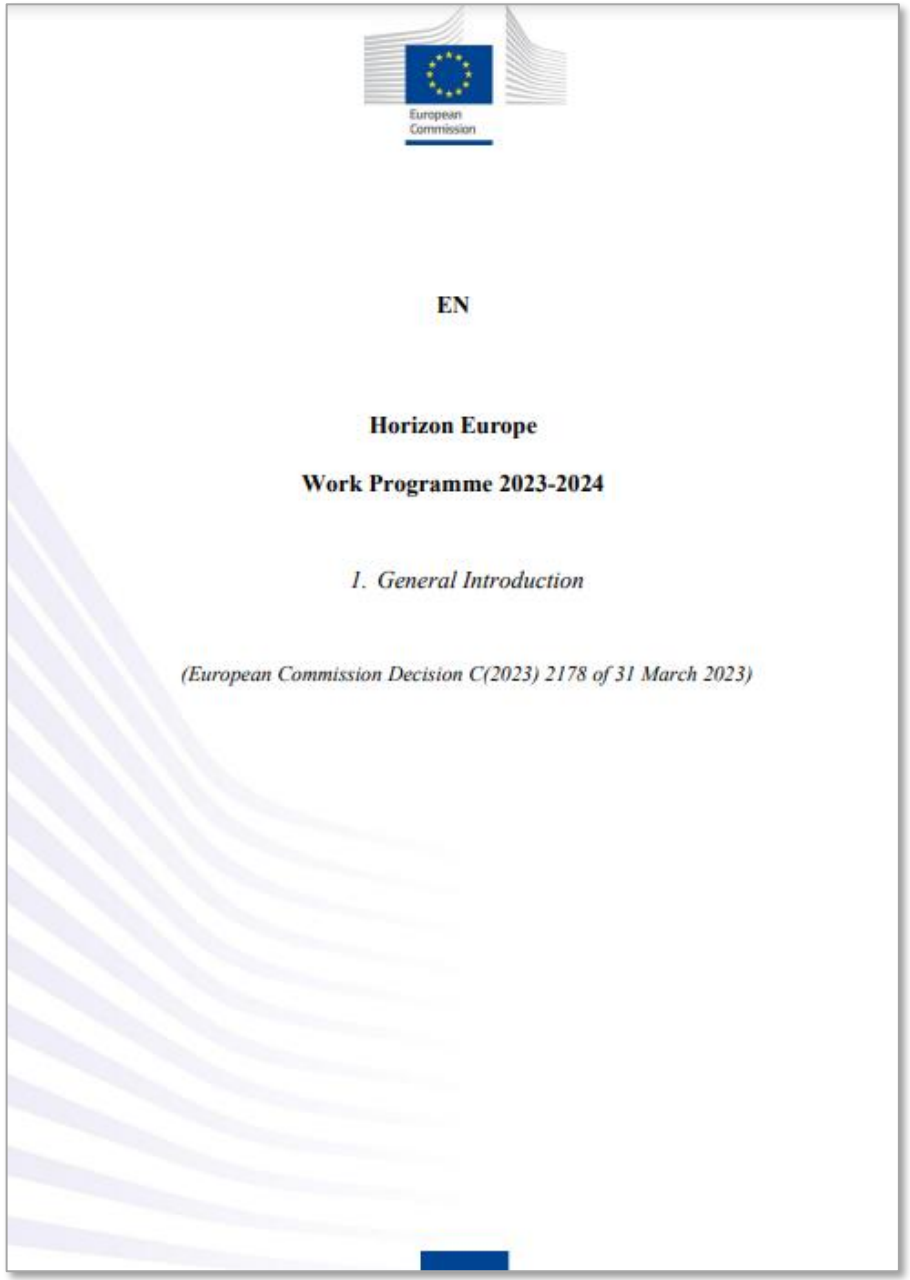
- **technically robust**, accurate and reproducible, and able to deal with and inform about possible failures, inaccuracies and errors, proportionate to the assessed risk posed by the AI-based system or technique
- **socially robust**, in that they duly consider the context and environment in which they operate
- **reliable** and to function as intended, minimising unintentional and unexpected harm, preventing unacceptable harm and safeguarding the physical and mental integrity of humans
- able to provide a suitable **explanation of its decision-making** process, whenever an AI-based system can have a significant impact on people's lives.



Work Programme Intro

Four impact areas

To promote industrial leadership in **key and emerging technologies that work for people**, the co-programmed Partnership on Artificial Intelligence, Data and Robotics will drive the development of **human-centric, trustworthy, safe and robust technologies** that will boost new markets and applications and that are compatible with **Europe's ethical standards** and values. A dedicated action will also examine **humanistic deployment of artificial intelligence and related technologies**.


European Commission

EN

Horizon Europe

Work Programme 2023-2024

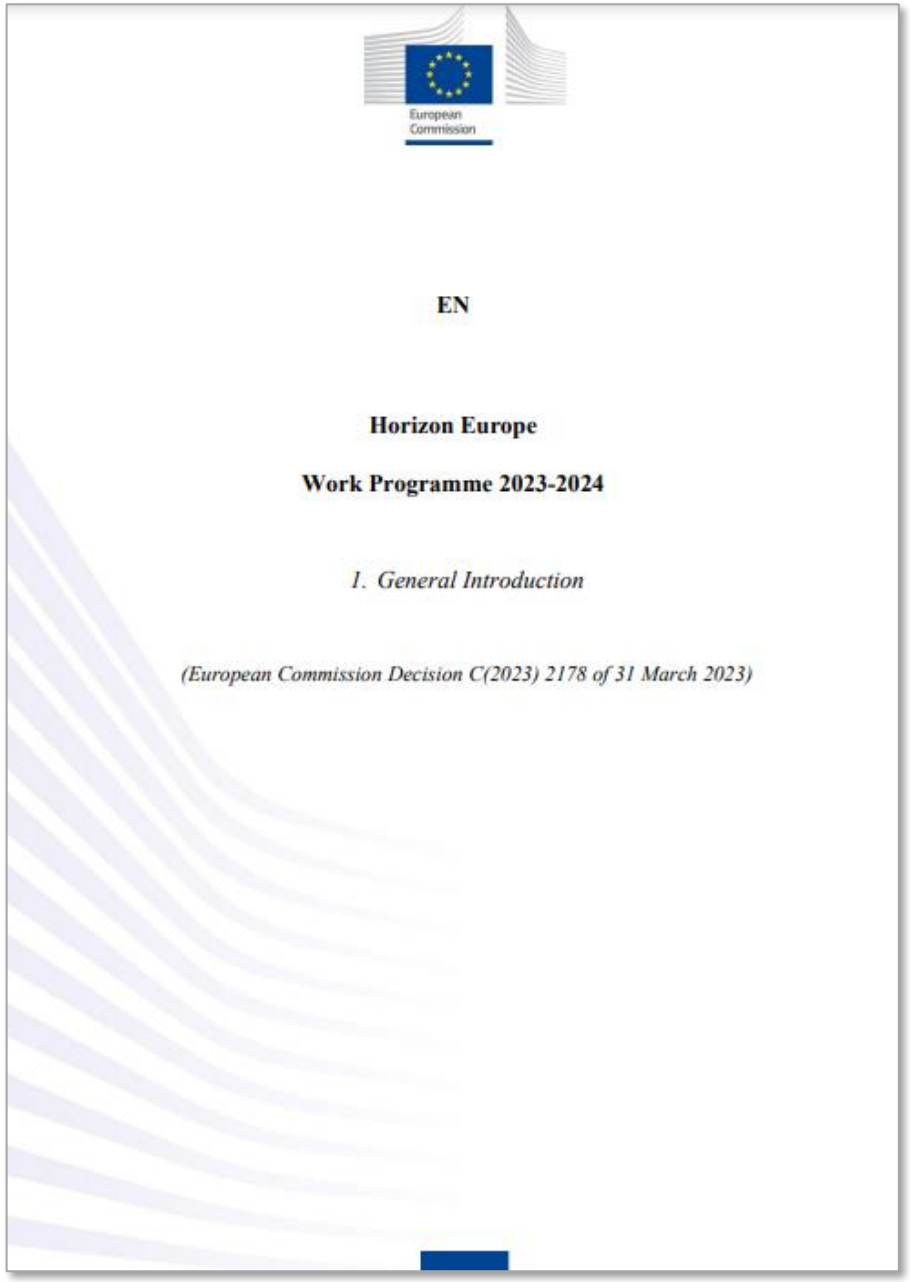
1. General Introduction

(European Commission Decision C(2023) 2178 of 31 March 2023)

Work Programme Intro

Trustworthy technologies

All projects supported by this work programme will be in line with **EU values** and adhere to the highest **ethics and integrity standards**. Horizon Europe is spearheading the artificial intelligence **ethics by design** agenda. Due diligence will be required to make sure all AI-based systems or techniques used or developed will be **trustworthy: ethical, lawful and robust, with particular attention to safety, accuracy, reliability and explainability**.


European Commission

EN

Horizon Europe

Work Programme 2023-2024

1. General Introduction

(European Commission Decision C(2023) 2178 of 31 March 2023)

Application forms

< Budget | Ethics & Security | Other questions >

Table of contents | Validate form | Save form | Save & exit form

Administrative forms

Proposal ID **SEP-211003912**

Acronym **123424412**

Does this activity involve low and/or lower middle income countries, (if yes, detail the benefit-sharing actions planned in the self-assessment)	○ Yes ◉ No	
Could the situation in the country put the individuals taking part in the activity at risk?	○ Yes ◉ No	
7. Environment, Health and Safety		**Page**
Does this activity involve the use of substances or processes that may cause harm to the environment, to animals or plants.(during the implementation of the activity or further to the use of the results, as a possible impact) ?	○ Yes ◉ No	
Does this activity deal with endangered fauna and/or flora / protected areas?	○ Yes ◉ No	
Does this activity involve the use of substances or processes that may cause harm to humans, including those performing the activity.(during the implementation of the activity or further to the use of the results, as a possible impact) ?	○ Yes ◉ No	
8. Artificial Intelligence		**Page**
Does this activity involve the development, deployment and/or use of Artificial Intelligence-based systems?	◉ Yes ○ No	
9. Other Ethics Issues		**Page**
Are there any other ethics issues that should be taken into consideration?	○ Yes ◉ No	

I confirm that I have taken into account all ethics issues above and that, if any ethics issues apply, I will complete the ethics self-assessment as described in the guidelines How to Complete your Ethics Self-Assessment ☐ ?

Application forms

1. Excellence #@REL-EVA-RE@#

#§PRJ-OBJ-PO§#

1.2 Methodology #@CON-MET-CM@# #@COM-PLE-CP@# *[e.g. 14 pages]*

- Describe and explain the overall methodology, including the concepts, models and assumptions that underpin your work. Explain how this will enable you to deliver your project's objectives. Refer to any important challenges you may have identified in the chosen methodology and how you intend to overcome them. *[e.g. 10 pages]*

⚠ *This section should be presented as a narrative. The detailed tasks and work packages are described below under 'Implementation'.*

⚠ *Where relevant, include how the project methodology complies with the 'do no significant harm' principle as per Article 17 of Regulation (EU) No 2020/852 on the establishment of a framework to facilitate sustainable investment (i.e. the so-called 'EU Taxonomy Regulation'). This means that the methodology is designed in a way it is not significantly harming any of the six environmental objectives of the EU Taxonomy Regulation.*

⚠ *If you plan to use, develop and/or deploy artificial intellingence (AI) based systems and/or techniques you must demonstrate their technical robustness. AI-based systems or techniques should be, or be developed to become:*

- *technically robust, accurate and reproducible, and able to deal with and inform about possible failures, inaccuracies and errors, proportionate to the assessed risk they pose*
- *socially robust, in that they duly consider the context and environment in which they operate*
- *reliable and function as intended, minimizing unintentional and unexpected harm, preventing unacceptable harm and safeguarding the physical and mental integrity of humans*
- *able to provide a suitable explanation of their decision-making processes, whenever they can have a significant impact on people's lives.*

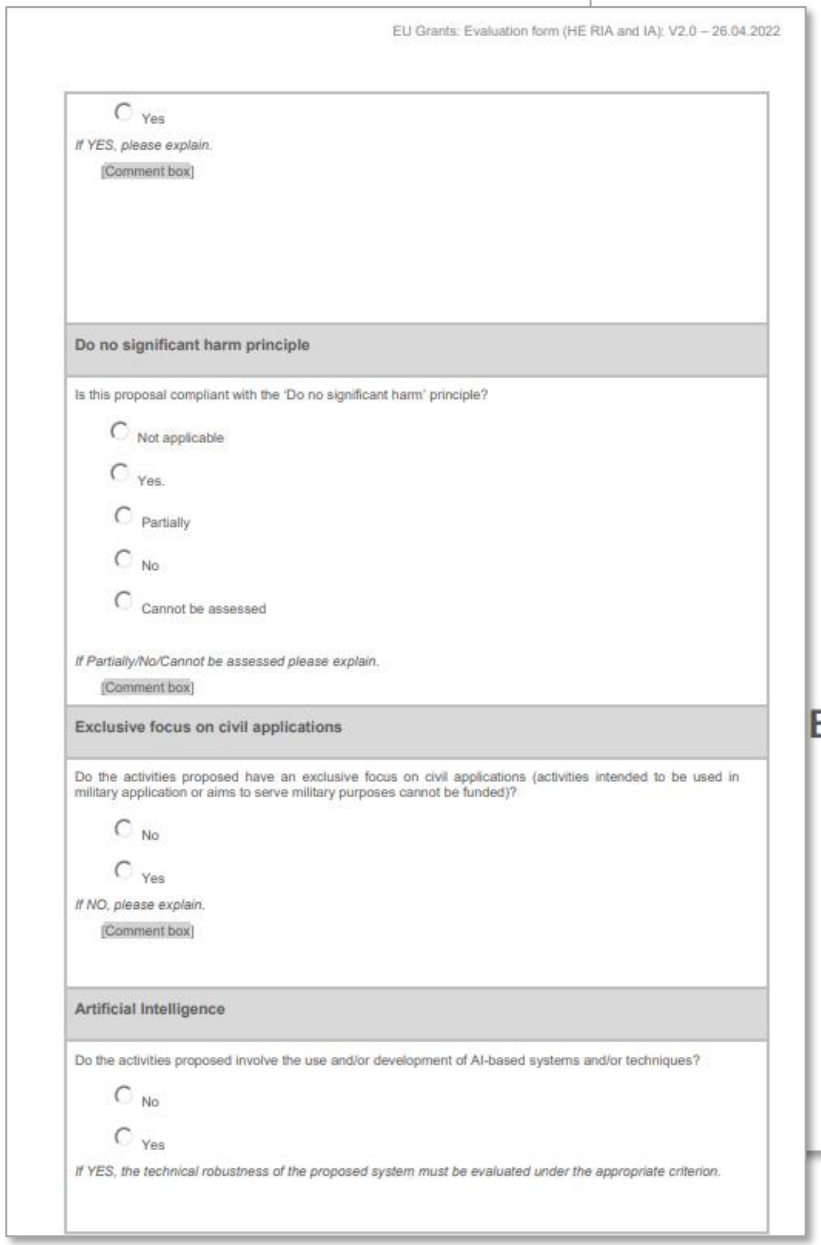
Evaluation forms

Artificial Intelligence

Do the activities proposed involve the use and/or development of AI-based systems and/or techniques?

- No
- Yes

If YES, the technical robustness of the proposed system must be evaluated under the appropriate criterion.


EU Grants: Evaluation form (HE RIA and IA): V2.0 – 26.04.2022

Yes

If YES, please explain.

[Comment box]

Do no significant harm principle

Is this proposal compliant with the 'Do no significant harm' principle?

Not applicable

Yes.

Partially

No

Cannot be assessed

If Partially/No/Cannot be assessed please explain.

[Comment box]

Exclusive focus on civil applications

Do the activities proposed have an exclusive focus on civil applications (activities intended to be used in military application or aims to serve military purposes cannot be funded)?

No

Yes

If NO, please explain.

[Comment box]

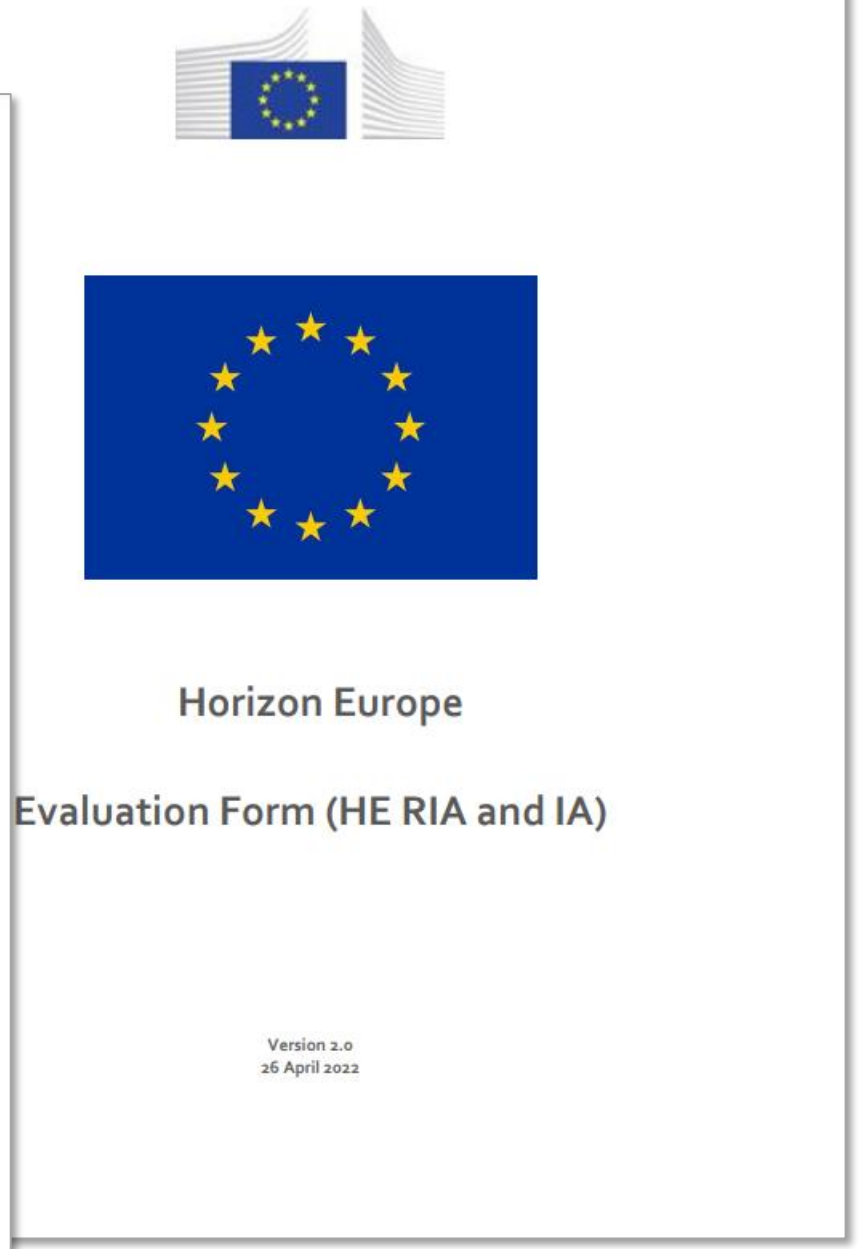
Artificial Intelligence

Do the activities proposed involve the use and/or development of AI-based systems and/or techniques?

No

Yes

If YES, the technical robustness of the proposed system must be evaluated under the appropriate criterion.


Horizon Europe

Evaluation Form (HE RIA and IA)

Version 2.0
26 April 2022

Evaluator briefing

Additional questions in the evaluation form

Evaluation form includes:

- Main part with the three **evaluation criteria** where you give comments and scores
- **Additional questions:** The evaluators are asked to take a position on additional questions linked to the selection procedure or policy considerations.

Additional questions in Horizon Europe evaluations

- Scope of the application
- Additional funding
- Use of human embryonic stem cells (hESC)
- Use of human embryos (hE)
- Activities not eligible for funding
- Exclusive focus on civil applications
- Do not significant harm principle
- Artificial Intelligence

Artificial intelligence

- Experts must answer an additional question as part of their individual evaluations on whether the activities proposed involve the **use and/or development of AI-based systems and/or techniques**.
- If you answer 'yes' to this question, you must **assess the technical robustness** of the proposed AI-system as part of the excellence criterion (if applicable).
- In addition, your answer to this question will help us to with the **proper follow-up** of any aspects related to **Artificial Intelligence** in projects funded under Horizon Europe.

(*) Technical robustness refers to technical aspects of AI systems and development, including resilience to attack and security, fullback plan and general safety, accuracy, reliability and reproducibility.

AI-based systems or techniques should be, or be developed to become:

- **Technically robust**, **accurate and reproducible**, and able to deal with and inform about possible failures, inaccuracies and errors, proportionate to the assessed risk posed by the AI-based system or technique.
- **Socially robust**, in that they duly consider the context and environment in which they operate.
- **Reliable and function as intended**, minimizing unintentional and unexpected harm, preventing unacceptable harm and safeguarding the physical and mental integrity of humans.
- Able to provide a suitable explanation of its **decision-making process**, whenever an AI-based system can have a significant impact on people's lives.

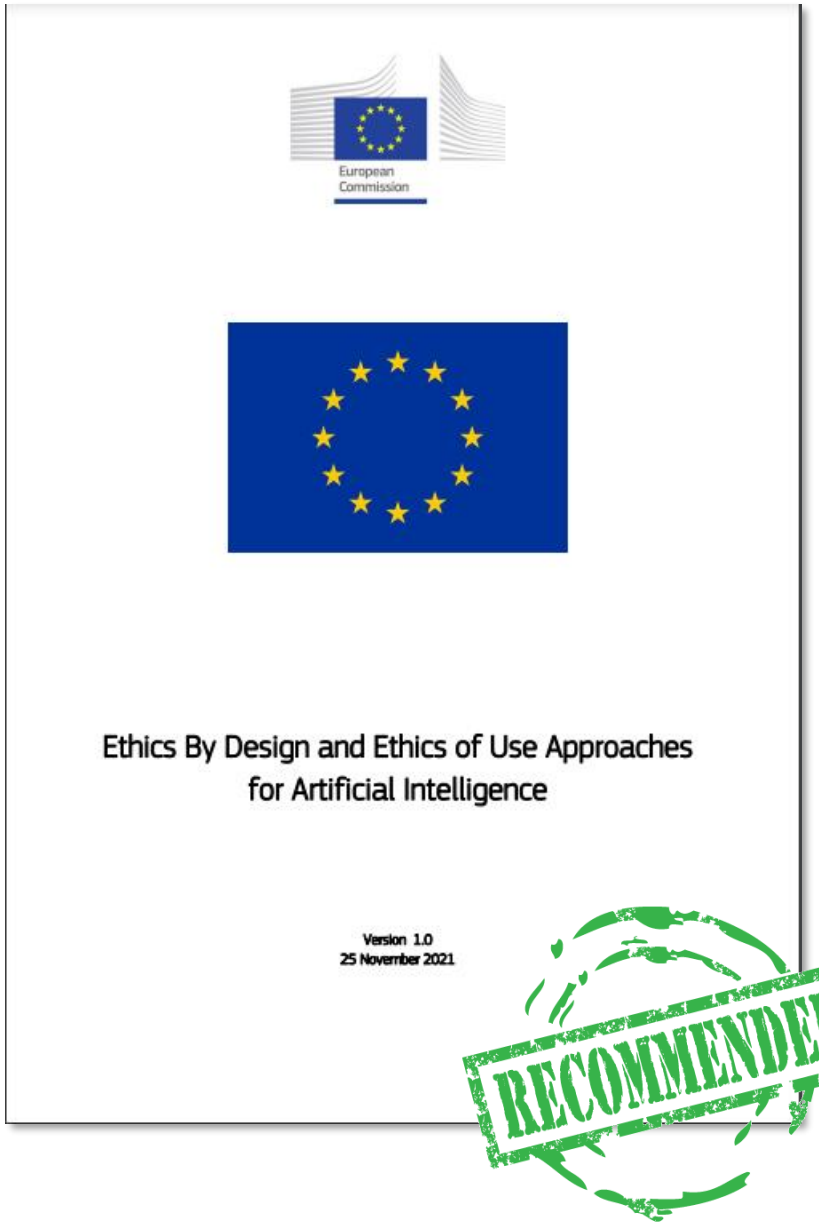
Guidance - Ethics by Design

Guidance for adopting an ethically-focused approach while designing, developing, and deploying and/or using AI based solutions.

It explains the ethical principles which AI systems must support and discusses the key characteristics that an AI-based system/ applications must have in order to preserve and promote:

- respect for human agency;
- privacy, personal data protection and data governance;
- fairness;
- individual, social, and environmental well-being;
- transparency;
- accountability and oversight.

Furthermore, it details specific tasks which must be undertaken in order to produce an AI which possess these characteristics.



Ethical Principles and Requirements

There are six general ethical principles that any AI system must preserve and protect based on fundamental rights as enshrined in the Charter of Fundamental Rights of the European Union (EU Charter), and in relevant international human rights law:

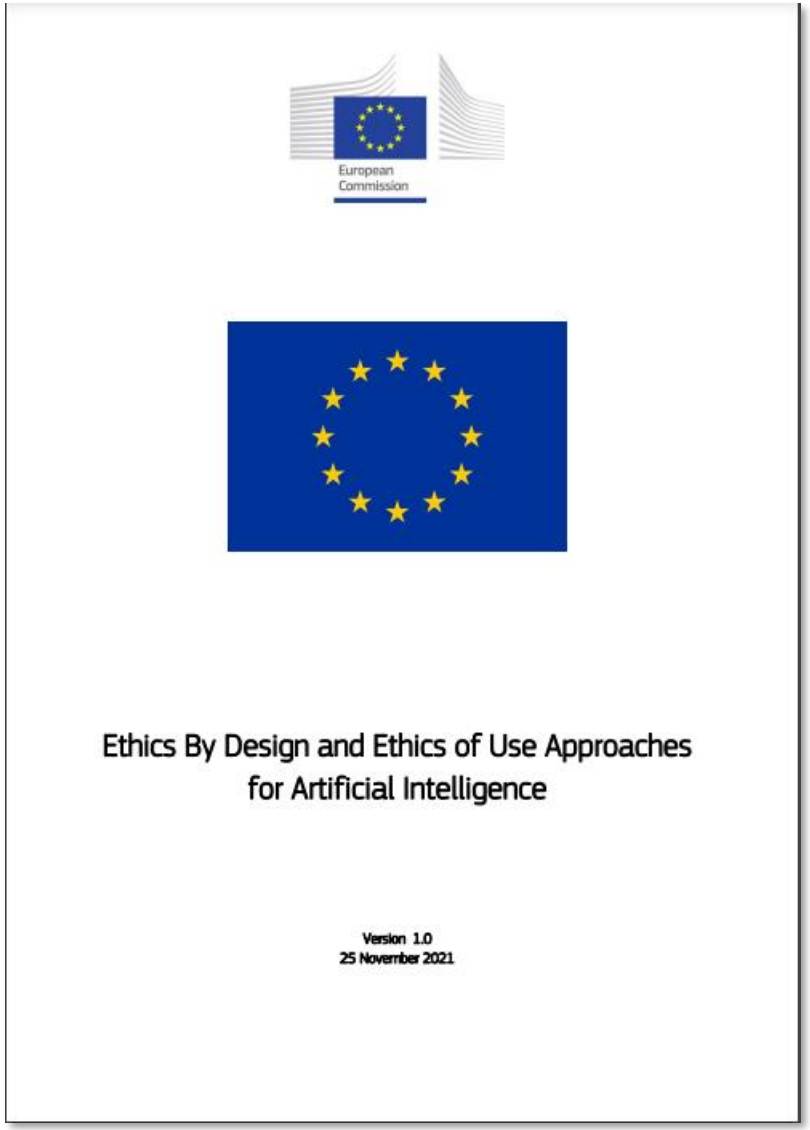
1. **Respect for Human Agency:** human beings must be respected to make their own decisions and carry out their own actions. Respect for human agency encapsulates three more specific principles, which define fundamental human rights: autonomy, dignity and freedom.
2. **Privacy and Data governance:** people have the right to privacy and data protection and these should be respected at all times;
3. **Fairness:** people should be given equal rights and opportunities and should not be advantaged or disadvantaged undeservedly;
4. **Individual, Social and Environmental Well-being:** AI systems should contribute to, and not harm, individual, social and environmental wellbeing;
5. **Transparency:** the purpose, inputs and operations of AI programs should be knowable and understandable to its stakeholders;
6. **Accountability and Oversight:** humans should be able to understand, supervise and control the design and operation of AI based systems, and the actors involved in their development or operation should take respo

Ethics by Design

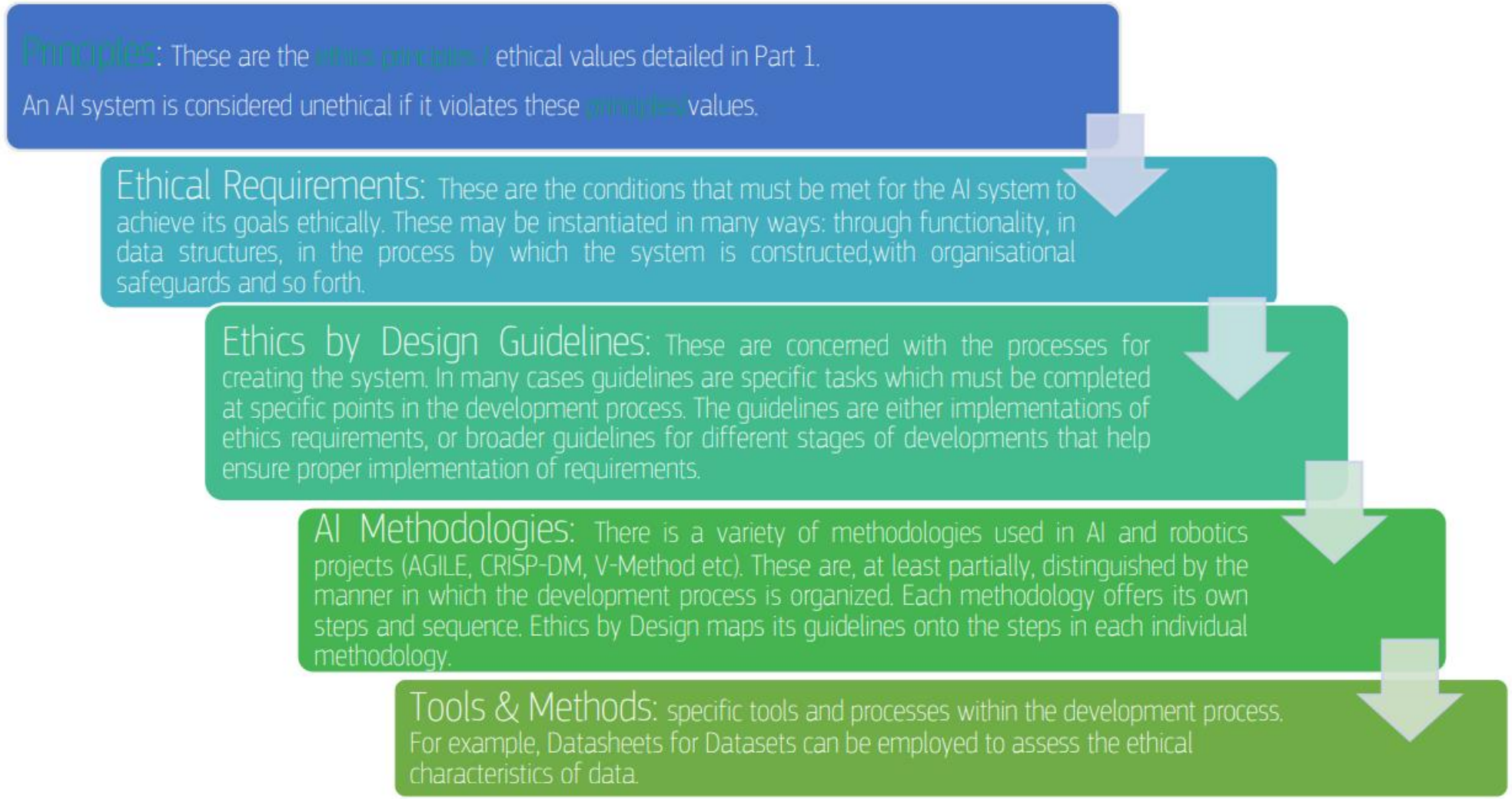
- **Part 1: Principles and requirements:** This part defines the ethical principles that AI systems should adhere to and derives requirements for their development;

- **Part 2: Practical steps for applying Ethics by Design in AI development:** This section explains the Ethics by Design concept and relates it to a generic model for the development of AI systems. It defines the actions to be taken at different stages in the AI development in order to adhere to the ethics principles and requirements listed in Part 1;

- **Part 3: Ethical deployment and use** presents guidelines for deploying or using AI in an ethically responsible manner.



5 layer model of ethical design



Ethical Requirements for AI & Robotics Systems

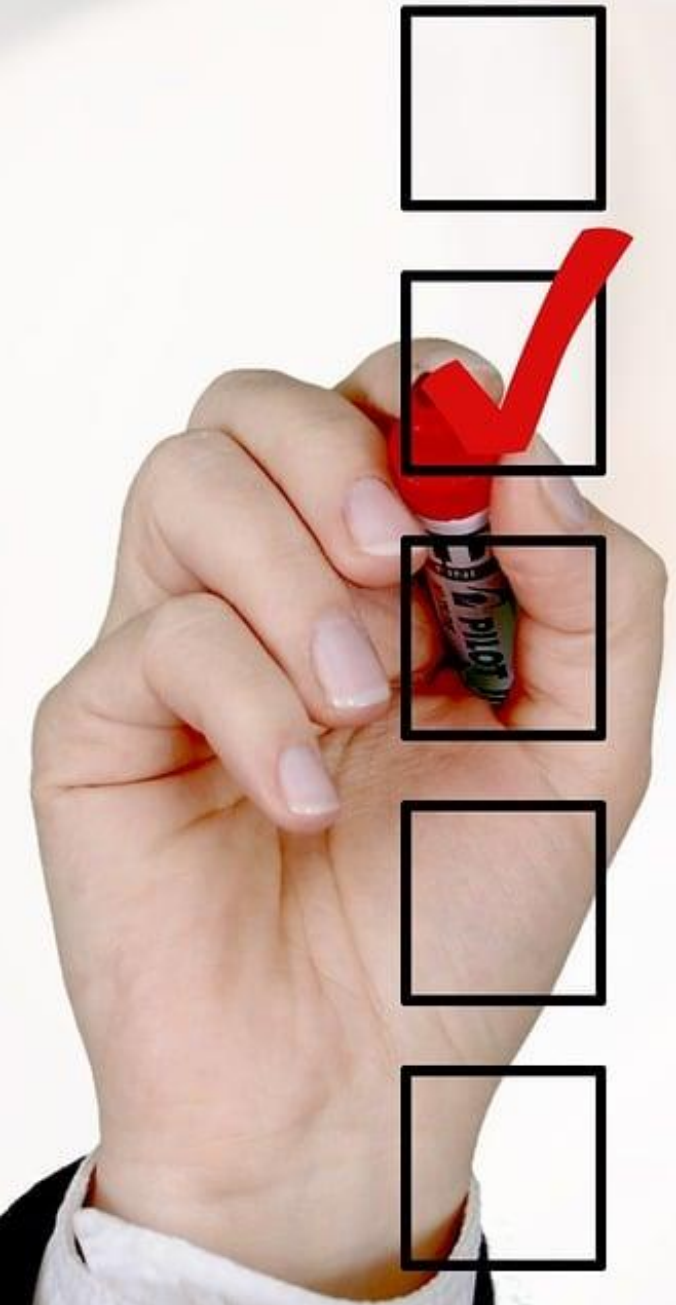
The main ethical requirements for AI and robotics systems above can be summarised as:

- AI systems must not negatively affect human autonomy, freedom or dignity.
- AI systems must not violate the right to privacy and to personal data protection. They MUST use data which is necessary, non-biased, representative and accurate.
- AI systems must be developed with an inclusive fair, and non-discriminatory agenda.
- Steps must be taken to ensure that AI systems do not cause individual, social or environmental harm, rely on harmful technologies, influence others to act in ways which cause harm or lend themselves to function creeps.
- AI systems should be as transparent as possible to their stakeholders and to their end-users.
- Human oversight and accountability are required to ensure conformance to these principles and address non-compliance.

Ethics by Design – Generic Development Model

The six tasks in the generic model are:

1. **Specification of objectives:** The determination of what the system is for and what it should be capable of doing.
2. **Specification of requirements:** Development of technical and non-technical requirements for building the system, including initial determination of required resources, together with an initial risk assessment and cost-benefit analysis, resulting in a design plan.
3. **High-level design:** Development of a high-level architecture. This is sometimes preceded by the development of a conceptual model.
4. **Data collection and preparation:** Collection, verification, cleaning and integration of data.
5. **Detailed design and development:** The actual construction of a fully working system.
6. **Testing and evaluation:** Testing and evaluation of the system.



Annex I Checklist: Specification of Objectives against Ethical Requirements

This checklist is a supporting tool and does not constitute an exhaustive list of all ethics requirement that ma
be applicable to the development of each specific AI system. It has to be used in conjunction with Part 1-3
the current guidelines and applied to a degree matching the type of AI system and the research being propos
(from basic to precompetitive).

Specification of Objectives against Ethical Requirements	Yes	No (how potent risks will mitigated?)
Respect for Human Agency		
End-users and others affected by the AI system are not deprived of abilities to make all decisions about their own lives, have basic freedoms taken away from them,		
End-users and others affected by the AI system are not subordinated, coerced, deceived, manipulated, objectified or dehumanized, nor is attachment or addiction to the system and its operations being stimulated.		
The system does not autonomously make decisions about vital issues that are normally decided by humans by means of free personal choices or collective deliberations or similarly significantly affects individuals,		
The system is designed in a way that give system operators and, as much as possible, end-users the ability to control, direct and intervene in basic operations of the system (when relevant)		
Privacy & Data Governance		
The system processes data in line with the requirements for lawfulness, fairness and transparency set in the national and EU data protection legal framework and the reasonable expectations of the data subjects.		
Technical and organisational measures are in place to safeguard the rights of data subjects (through measures such as anonymization, pseudonymisation, encryption, and aggregation).		
There are security measures in place to prevent data breaches and leakages (such as mechanisms for logging data access and data modification).		
Fairness		
The system is designed to avoid algorithmic bias, in input data, modelling and algorithm design. The system is designed to avoid historical and selection bias in data collection, representation and measurement bias in algorithmic training, aggregation and evaluation bias in modelling and automation bias in deployment		
The system is designed so that it can be used different types of end-users with different abilities (whenever possible/relevant)		
The system does not have negative social impacts on relevant groups, including impacts other than those resulting from algorithmic bias or lack of universal accessibility,		
Individual, and Social and Environmental Well-being		
The AI system takes the welfare of all stakeholders into account and do not unduly or unfairly reduce/undermine their well-being		
The AI system is mindful of principles of environmental sustainability, both regarding the system itself and the supply chain to which it connects (when relevant)		
The AI system does not have the potential to negatively impact the quality of communication, social interaction, information, democratic processes, and social relations (when relevant)		
The system does not reduce safety and integrity in the workplace and complies with the relevant health and safety and employment regulations		
Transparency		
The end-users are aware that they are interacting with an AI system		
The purpose, capabilities, limitations, benefits and risks of the AI system and of the decisions conveyed are openly communicated to and understood by end-users and other stakeholders along with its possible consequences		
People can audit, query, dispute, seek to change or object to AI or robotics activities (when applicable)		
The AI system enables traceability during its entire lifecycle, from initial design to post-deployment evaluation and audit		
The system offers details about how decisions are taken and on which reasons these were based (when relevant and possible)		
The system keeps records of the decisions made (when relevant)		
Accountability & Oversight		
The system provides details of how potential ethically and socially undesirable effects will be detected, stopped, and prevented from reoccurring.		
The AI system allows for human oversight during the entire life-cycle of the project /regarding their decision cycles and operation (when relevant)		

Ethics Guidelines for Trustworthy AI

Ethics Principles - Key guidance:

- Develop, deploy and use AI systems in a way that adheres to the ethical principles of: respect for human autonomy, prevention of harm, fairness and explicability. Acknowledge and address the potential tensions between these principles.
- Pay particular attention to situations involving more vulnerable groups such as children, persons with disabilities and others that have historically been disadvantaged or are at risk of exclusion, and to situations which are characterised by asymmetries of power or information, such as between employers and workers, or between businesses and consumers.
- Acknowledge that, while bringing substantial benefits to individuals and society, AI systems also pose certain risks and may have a negative impact, including impacts which may be difficult to anticipate, identify or measure (e.g. on democracy, the rule of law and distributive justice, or on the human mind itself.) Adopt adequate measures to mitigate these risks when appropriate, and proportionately to the magnitude of the risk.

Ethics Guidelines for Trustworthy AI

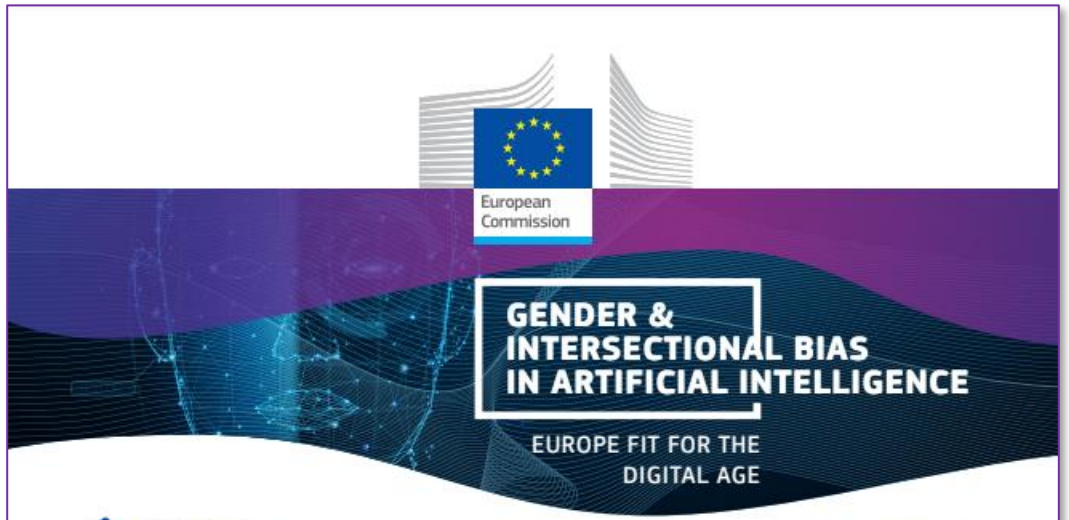
Requirements - Key guidance:

- Ensure that the development, deployment and use of AI systems meets the seven key requirements for Trustworthy AI: (1) human agency and oversight, (2) technical robustness and safety, (3) privacy and data governance, (4) transparency, (5) diversity, non-discrimination and fairness, (6) environmental and societal well-being and (7) accountability.
- Consider technical and non-technical methods to ensure the implementation of those requirements.
- Foster research and innovation to help assess AI systems and to further the achievement of the requirements; disseminate results and open questions to the wider public, and systematically train a new generation of experts in AI ethics.
- Communicate, in a clear and proactive manner, information to stakeholders about the AI system's capabilities and limitations, enabling realistic expectation setting, and about the manner in which the requirements are implemented. Be transparent about the fact that they are dealing with an AI system.
- Facilitate the traceability and auditability of AI systems, particularly in critical contexts or situations.
- Involve stakeholders throughout the AI system's life cycle. Foster training and education so that all stakeholders are aware of and trained in Trustworthy AI.
- Be mindful that there might be fundamental tensions between different principles and requirements. Continuously identify, evaluate, document and communicate these trade-offs and their solutions.

Ethics Guidelines for Trustworthy AI

Assessment list - Key guidance:

- Adopt a Trustworthy AI assessment list when developing, deploying or using AI systems, and adapt it to the specific use case in which the system is being applied.
- Keep in mind that such an assessment list will never be exhaustive. Ensuring Trustworthy AI is not about ticking boxes, but about continuously identifying and implementing requirements, evaluating solutions, ensuring improved outcomes throughout the AI system's lifecycle, and involving stakeholders in this.



@EUScinceInnov

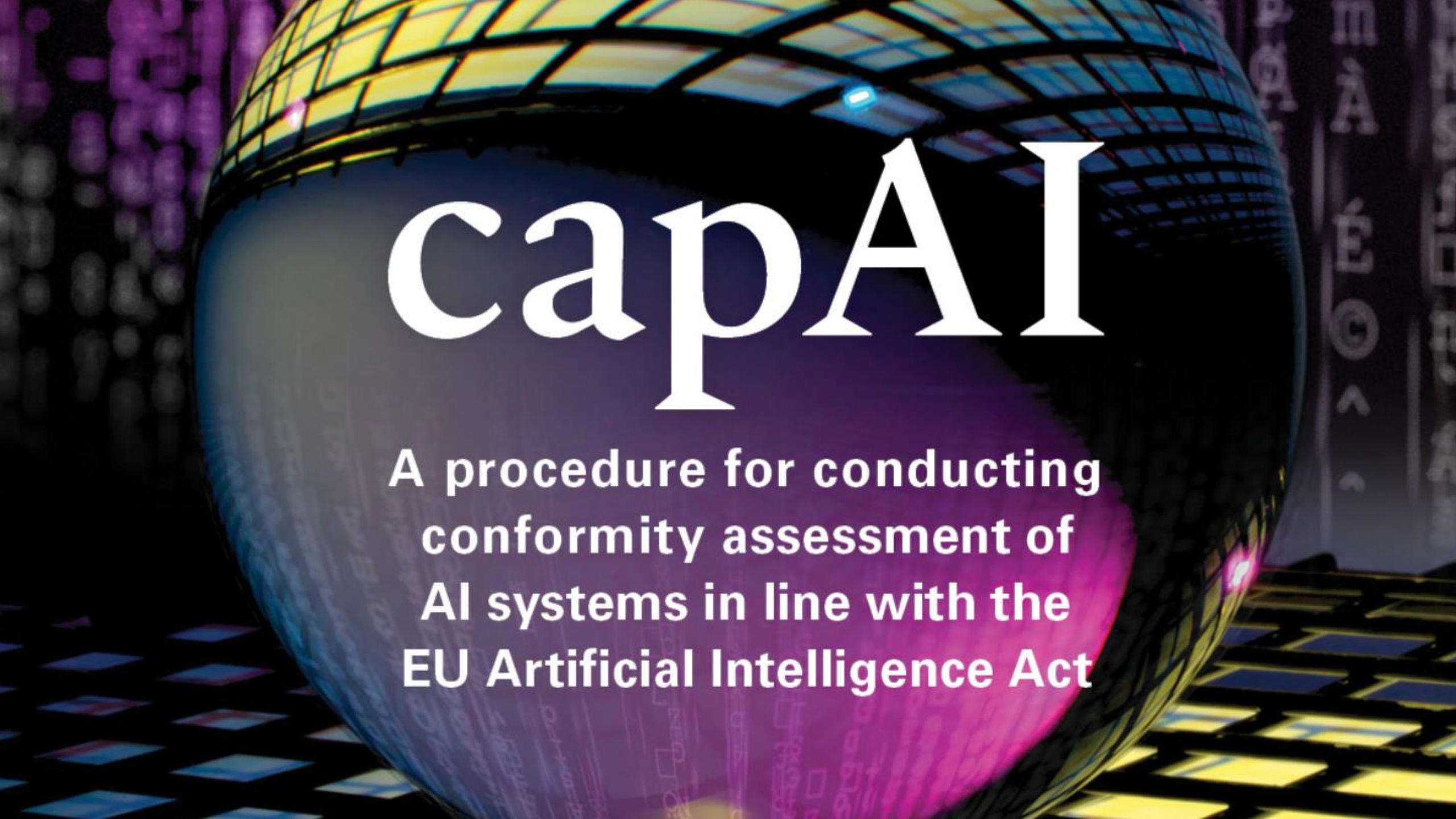
#DigitalEU #UnionOfEquality

September 2020

Digital transformation and artificial intelligence (AI) are an integral part of the 4th Industrial Revolution, transforming our jobs and lives. But, while AI could well be a key driver for innovation, there are challenges and risks that cannot be ignored. This is why the Commission's White Paper on AI stresses the importance of building an AI 'ecosystem of trust' with 'rules that put people at the centre', as President von der Leyen stated in her 2020 State of the Union address.

DID YOU KNOW THAT:

- **Facial recognition systems perform better on men's faces than on women's, and on lighter skin than darker skin?** Error rates vary from 35% for darker-skinned women, to 12% for darker-skinned men, 7% for lighter-skinned women, and less than 1% for lighter-skinned men. So, these systems need to be checked for bias and the people operating them trained accordingly[1].
- **Virtual assistants (e.g. chatbots) are often subjected to sexual harassment?** Virtual assistants, e.g. Siri and Alexa, are usually programmed to respond to harassment with flirty, apologetic or deflecting responses. Research suggests that such responses perpetuate the stereotype of subservient women in service roles and may promote a culture of violence against women by presenting indirect ambiguity as a valid response to harassment. To address this issue, some companies have started developing software that is less tolerant of abuse[2].
- **Women are more likely to feel unwell when using virtual reality (VR), a technique which can be enhanced by AI?** The symptoms experienced include i) pallor, ii) sweating, iii) increased heart rate, iv) drowsiness, v) disorientation and vi) general discomfort. So, it is important to test VR technologies on women, as well as men, and to promote gender balance in teams developing and designing VR and AI applications[3].


capAI
A procedure for conducting conformity assessment of AI systems in line with the EU Artificial Intelligence Act