



# Impact of AI and Curriculum Arrangement of the Module on AI

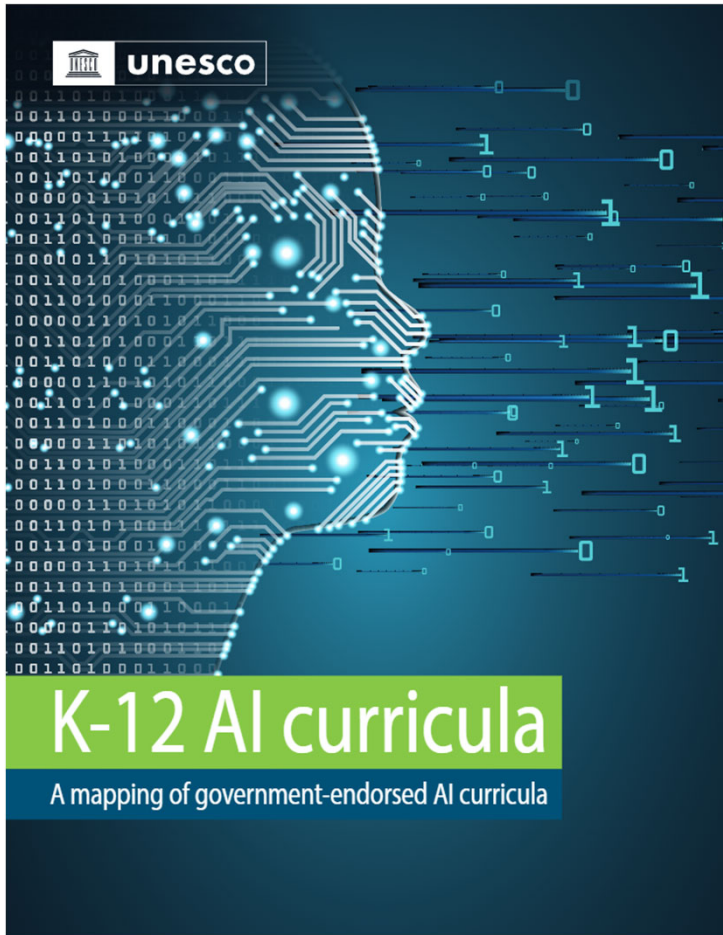
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Patrick Huen Wing Ming Professor of  
Systems Engineering & Engineering Management  
The Chinese University of Hong Kong

# Outline

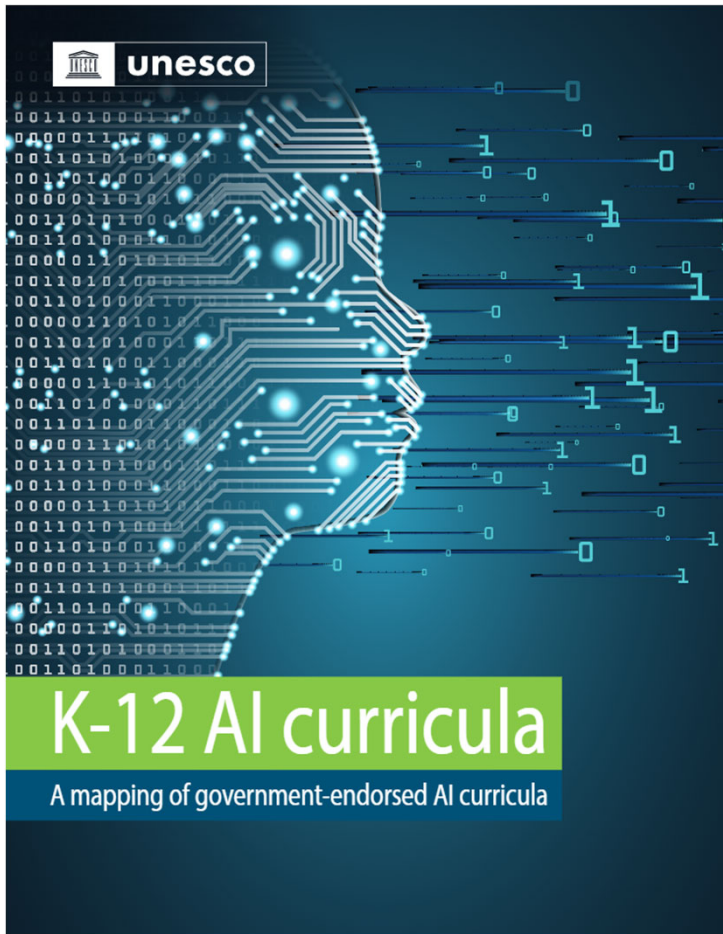
- Importance of AI education
- AI ethical principles
- AI and the future of work
- Curriculum arrangement of Module on AI
- Summary and Conclusion

# Importance of AI Education



- Published by the United Nations Educational, Scientific and Cultural Organization, 2021
- AI is permeating our world and changing how we live and work
- Spurred urgency to equip our next generation with **AI literacy**, i.e. understanding:
  - what AI is and how it works
  - what AI can do and cannot do
  - when is AI useful and when should its use be questionable
  - how to steer AI towards the public good

# Importance of AI Education



*“All citizens need to be equipped with some level of competency with regard to AI. This includes the knowledge, understanding, skills and values to be **‘AI literate’** – this has become a basic grammar of our century.”*

- Stefania Giannini  
Assistant Director-General for  
Education of UNESCO  
(Opening Speech, 2021 Int.  
Forum on AI and Education)



# Background – CUHK Faculty of Engineering

**B.Eng. In AI: Systems & Technologies**

**FIRST** in HK, since 2019



EDUCATION

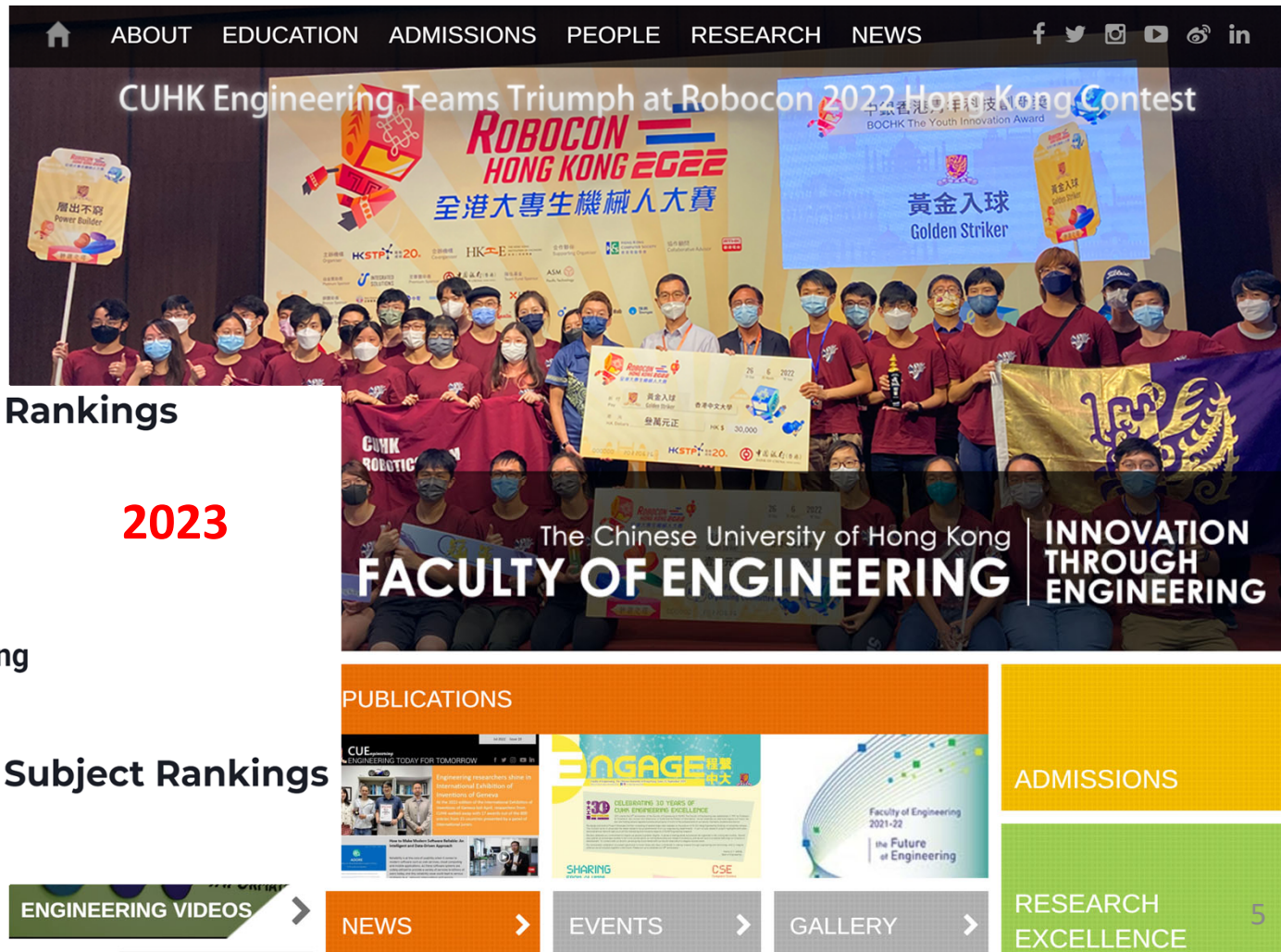
## Chinese University of Hong Kong Rankings

- #53 in Best Global Universities
- #5 in Best Global Universities in Asia
- #1 in Best Global Universities in Hong Kong

2023

## Chinese University of Hong Kong Subject Rankings

- #3 in Artificial Intelligence (tie)



# Creation and Evaluation of a Pretertiary Artificial Intelligence (AI) Curriculum

Thomas K. F. Chiu<sup>ID</sup>, Helen Meng, *Fellow, IEEE*, Ching-Sing Chai, Irwin King<sup>ID</sup>, *Fellow, IEEE*, Savio Wong, and Yeung Yam<sup>ID</sup>, *Senior Member, IEEE*

**Abstract—Contributions:** The Chinese University of Hong Kong (CUHK)-Jockey Club AI for the Future Project (AI4Future) co-created the first pretertiary AI curriculum at the secondary school level for Hong Kong and evaluated its efficacy. This study added to the AI education community by introducing a new AI curriculum framework. The preposttest multifactors evaluation about students' perceptions of AI learning confirmed that the curriculum is effective in promoting AI learning. The teachers also confirmed the co-creation process enhanced their capacity to implement AI education.

**Index Terms—**Artificial intelligence (AI) education, co-creation process, curriculum design, pretertiary education, teacher education.

## I. INTRODUCTION

**T**HE EXPLOSIVE growth of artificial intelligence (AI) is increasingly transforming the way we live, learn, and work. To inspire more students to pursue AI in their



Hong Kong

Primary Education  
(6 Years)

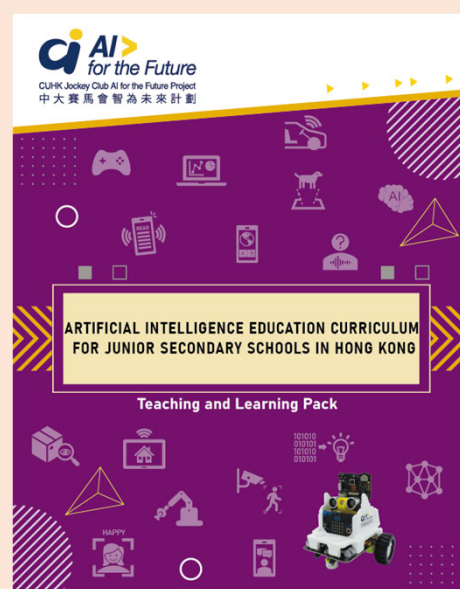
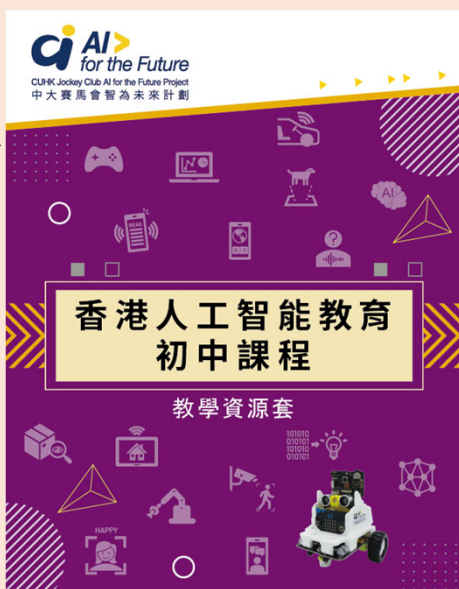
Junior High School  
(4 Years)

Senior High School  
(2 Years)

College/ University  
(4 Years)



**Published the first Pre-tertiary AI Teaching and Learning Pack co-created by CUHK and Secondary Schools, entitled “Artificial Intelligence Curriculum for Junior Secondary Students in Hong Kong - Teaching and Learning Pack” in September 2021**



**First Bachelor’s degree program on AI by CUHK introduced in 2019**



**CUHK Jockey Club AI for the Future Project launched in 2019**





Hong Kong

CUHK-Jockey Club AI4Future Project launched in 2019

First Bachelor's degree on AI by CUHK introduced in 2019,



India

The board of education has published a syllabus to introduce AI for Class 11 from 2020/21



European Union

A 3-year education program to develop an AI curriculum to European High School. Five countries, namely, Spain, Italy, Lithuania, Slovenia and Finland have participated the Project



Singapore

AI Singapore (AISG) established in 2017 by National Research Foundation and to put forth AI for Kids and AI for Students incentives to educate students from P4 to university, plus career planning and career-based trainings







China

China started in 2019 introducing AI literacy for primary and secondary schools, including not only programming but also machine learning, big data applications, image recognition, algorithms, etc.

REVIEW

Open Access

# AI literacy in K-12: a systematic literature review

Lorena Casal-Otero<sup>1</sup> , Alejandro Catala<sup>2,3\*</sup> , Carmen Fernández-Morante<sup>1</sup> , Maria Taboada<sup>2</sup> ,  
Beatriz Cebreiro<sup>1</sup>  and Senén Barro<sup>3</sup> 

## Abstract

The successful irruption of AI-based technology in our daily lives has led to a growing educational, social, a interest in training citizens in AI. Education systems now need to train students at the K-12 level to live in a where they must interact with AI. Thus, AI literacy is a pedagogical and cognitive challenge at the K-12 level study aimed to understand how AI is being integrated into K-12 education worldwide. We conducted a success following the systematic literature review method using Scopus. 179 documents were reviewed, and 1 groups of AI literacy approaches were identified, namely learning experience and theoretical perspective. The first group covered experiences in learning technical, conceptual and applied skills in a particular domain of interest. The second group revealed that significant efforts are being made to design models that frame AI literacy proposals were hardly any experiences that assessed whether students understood AI concepts after the learning experience. Little attention has been paid to the undesirable consequences of an indiscriminate and insufficiently thoughtful application of AI. A competency framework is required to guide the didactic proposals designed by educational institutions and define a curriculum reflecting the sequence and academic continuity, which should be personalized and adjusted to the conditions of the schools. Finally, AI literacy can be leveraged to enhance the of disciplinary core subjects by integrating AI into the teaching process of those subjects, provided the curriculum co-designed with teachers.

**Keywords** Secondary education, Teaching/learning strategies, Twenty-first century skills, Cultural and social implications



**Table 3** Most active institutions

Institutions	Papers
The Chinese University of Hong Kong (Hong Kong)	19
University of Eastern Finland (Finland)	11
MIT (USA)	10
North Carolina State University (USA)	8
Beijing Normal University (China)	6
Carnegie Mellon University (USA)	6
Indiana University (USA)	5
University of California (USA)	5
University of Florida (USA)	5
University of Southern California (USA)	5
Graz University of Technology (Austria)	4
South China Normal University (China)	4
Austrian Computer Society (Austria)	3
Georgia Institute of Technology (USA)	3
Korea University (South Korea)	3
18 institutions with 2 papers, and the rest with 1	9
	–

# Government Implementation of AI Curricula

Country	Status	Primary School	Middle School	High School
Armenia	Endorsed and Implemented		✓	✓
Austria	Endorsed and Implemented			✓
Belgium	Endorsed and Implemented			✓
China	Endorsed and Implemented	✓	✓	✓
India	Endorsed and Implemented		✓	✓
Kuwait	Endorsed and Implemented	✓	✓	
Portugal	Endorsed and Implemented	✓	✓	✓
Qatar	Endorsed and Implemented	✓	✓	✓
Serbia	Endorsed and Implemented		✓	✓
South Korea	Endorsed and Implemented			✓
United Arab Emirates	Endorsed and Implemented	✓	✓	✓
Bulgaria	In Development	✓	✓	✓
Germany	In Development	✓	✓	✓
Jordan	In Development		✓	✓
Saudia Arabia	In Development	✓	✓	✓
Serbia	In Development		✓	✓

Source: UNESCO 2022, Stanford HAI AI Index Report 2023

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- Importance of AI education
- AI ethical principles
- AI and the future of work
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# AI Ethics

- **AI Ethics** is a system of moral principles to guide the development and use of AI technologies
  - **Good** versus **Bad**
  - **Right** versus **Wrong**
  - **Rights** and **Responsibilities**
  - Be **considerate** of others
  - Ethical considerations are often **not black and white**



# AI Ethical Principles

Principles	For Human Collaboration Share Fairness Transparency Privacy Security Safety Accountability Long Term AI										
Smart Dubai 2019	13	3	1	4	4	6	6	7	2	6	
Beijing 2019	14	2	5	3	5	3	2	3	2	4	
FLI 2017	9	2	4	1	4	4	2	6	2	4	
NGCNGAI 2019	11	4	5	6	3	6	1	7	4	1	
ITI 2017	11	5	3	3	1	3	8	6	12		
SHAIISEAC 2019	1	1	1	2	2	4	11	7	3		
OECD 2019	9	2	6	8	3	5	3	7	7		
Google 2018	4	1	1	8	1	5	2	7	1		
G20 2019	10	2	6	8	3	5	3	7	8		
Telia 2019	3	3	2	6	4	1	1	4	5		
EGE 2018	16	3	5	9	2	10	5	8	6		
Nadella 2016	8	2	1	2	2	1	1	1	3		
Internet Society 2017	1	3	1	2	4	3	7	10	7		
Cabinet Office 2018	28	5	5	12	2	13	6	4	3		
MIC 2017	6	4	2	4	4	15	12	23	3		
MIC 2018	7	8	3	5	7	17	13	4	5		
Montreal 2018	9	2	7	3	4	8	2	5	7		
AIIA 2019	12	1	3	7	7	4	6	10	4		
Montreal 2017	5	1	2	4	2	9		1	6		
Intel 2017		1	1	4	2	8	5	6	3		

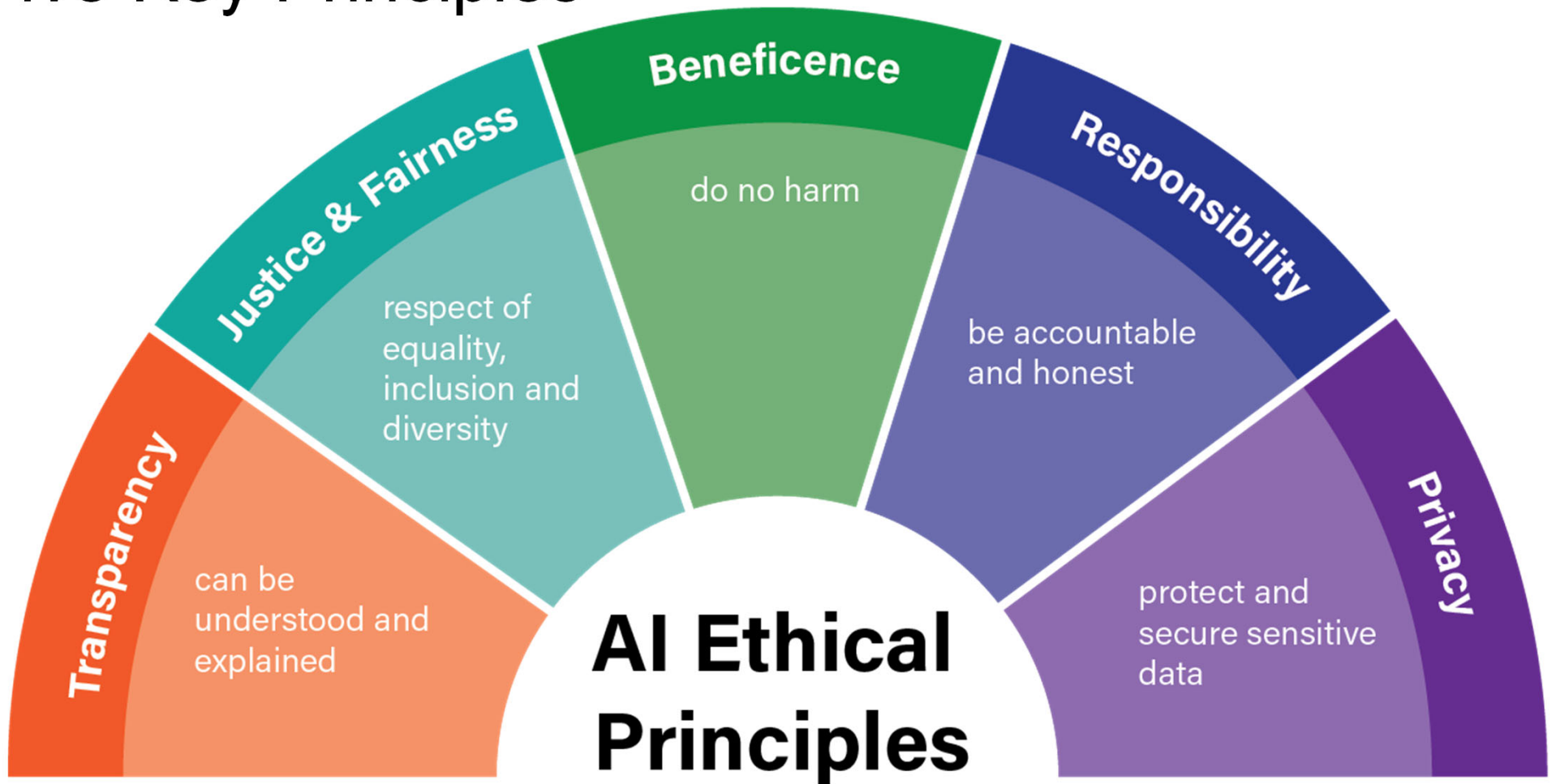
Around the world, governments, companies, society, stakeholders, etc. are authoring their AI ethical principles

## Five common principles from a growing list

- Transparency
- Fairness and Justice
- Beneficence
- Responsibility
- Privacy

Source: [linking-ai-principles.org](https://linking-ai-principles.org); Jobin et al. (2019) *Nature*

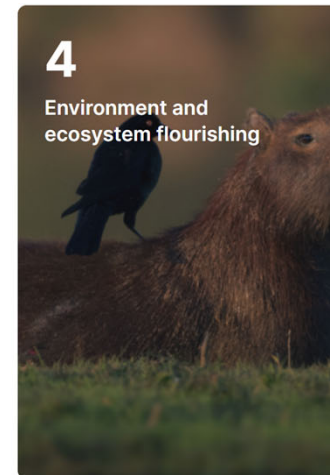
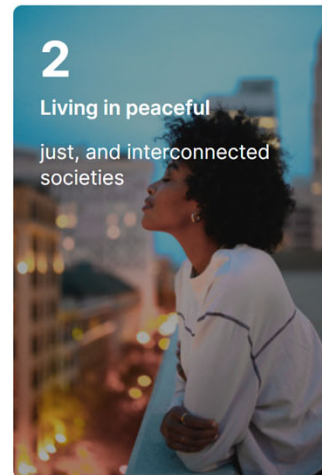
# Five Key Principles



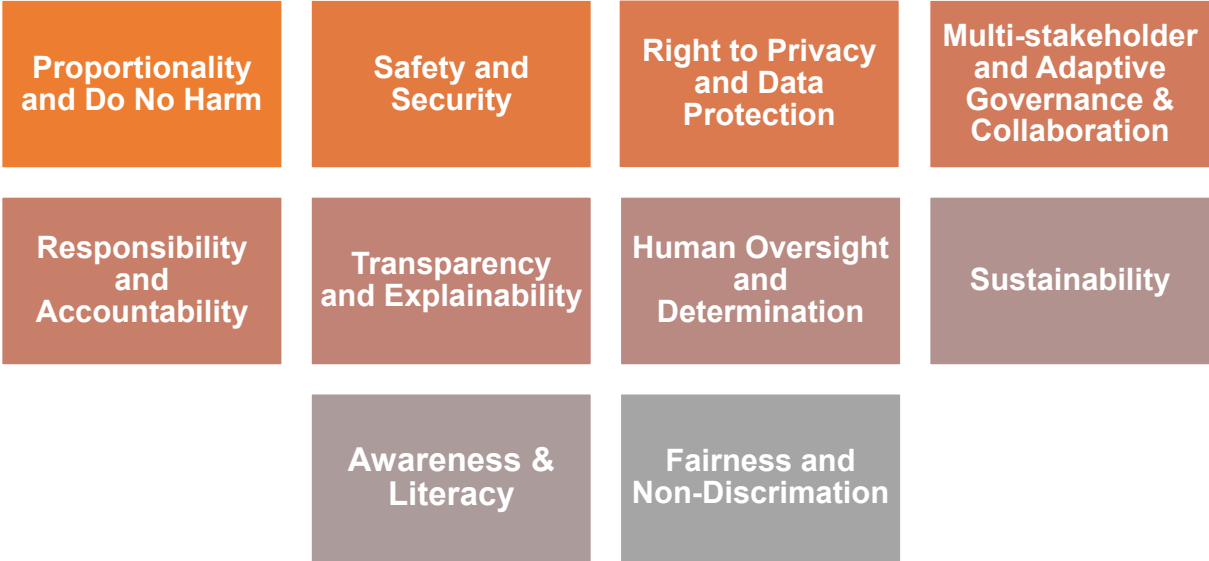
# UNESCO Recommendation on the Ethics of Artificial Intelligence



- First global standard on AI Ethics adopted by 193 Member States in November 2021
- The foundations for AI systems are based on four core values:



# UNESCO Recommendation on the Ethics of Artificial Intelligence



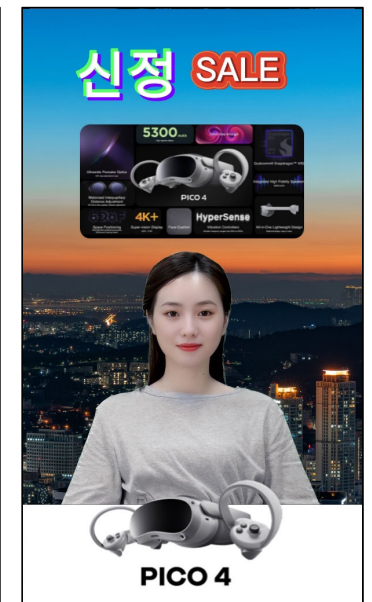
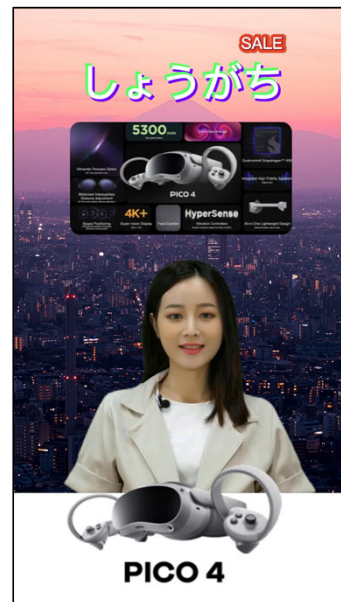
**Ten core principles**



**Eleven policy areas**



# Example: Video Generation for E-Commerce



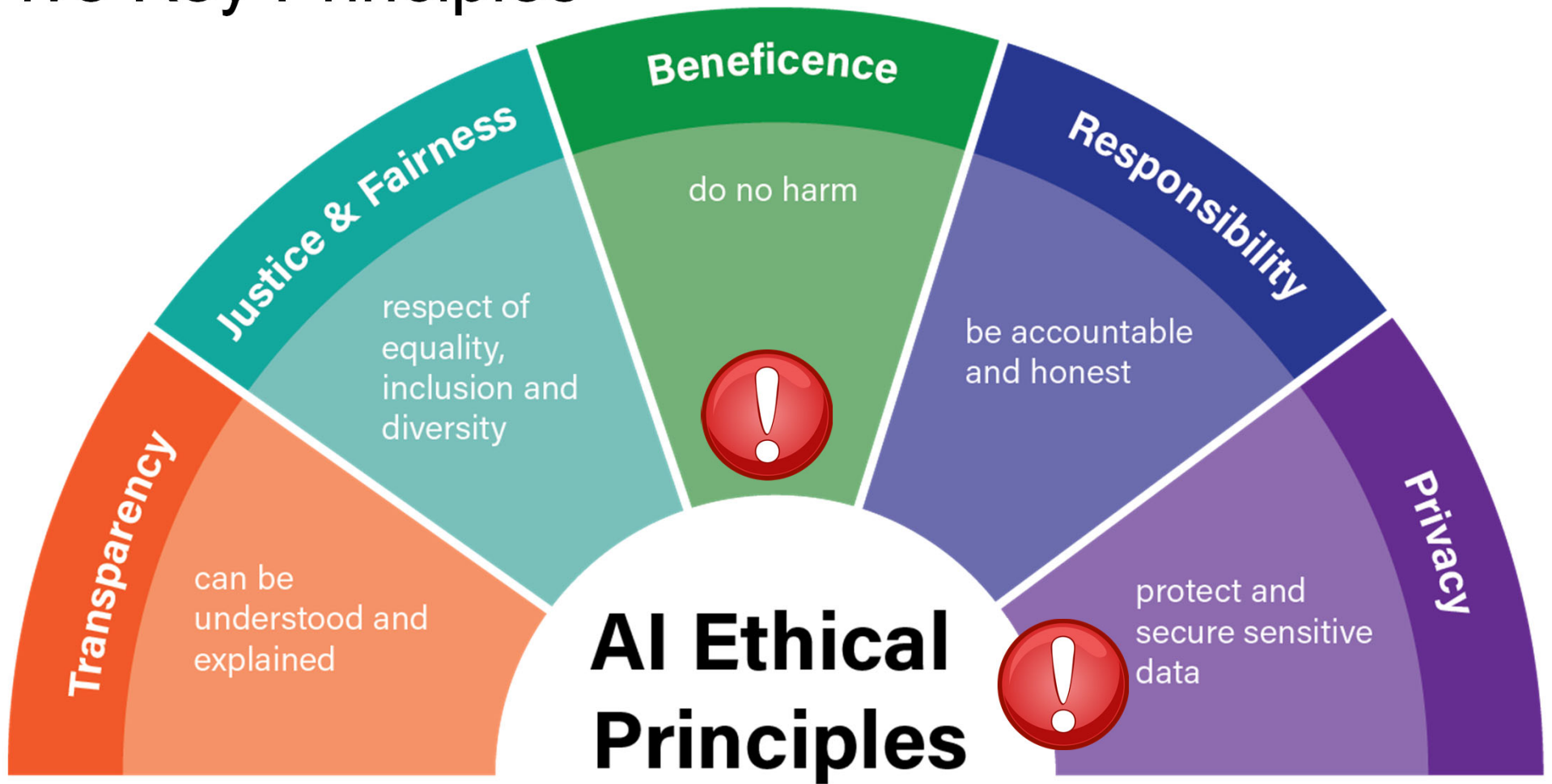
Source: [www.dailylive.cn](http://www.dailylive.cn)

# Example: Video Generation (Harmful Use)



Source: Deep Fakes

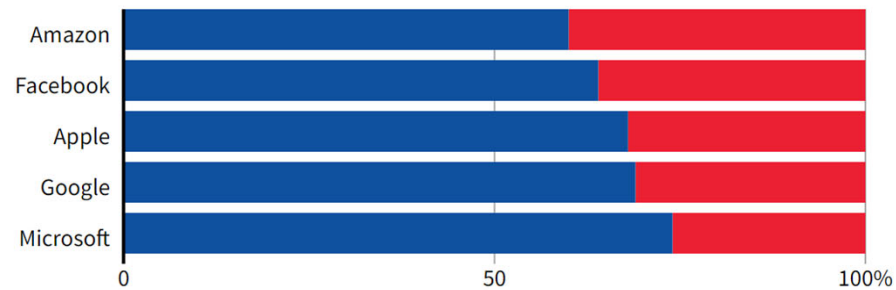
# Five Key Principles



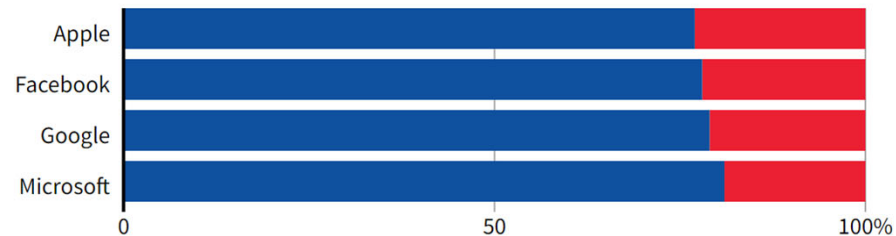
# Example: AI Recruiting Tool

## GLOBAL HEADCOUNT

■ Male ■ Female



## EMPLOYEES IN TECHNICAL ROLES



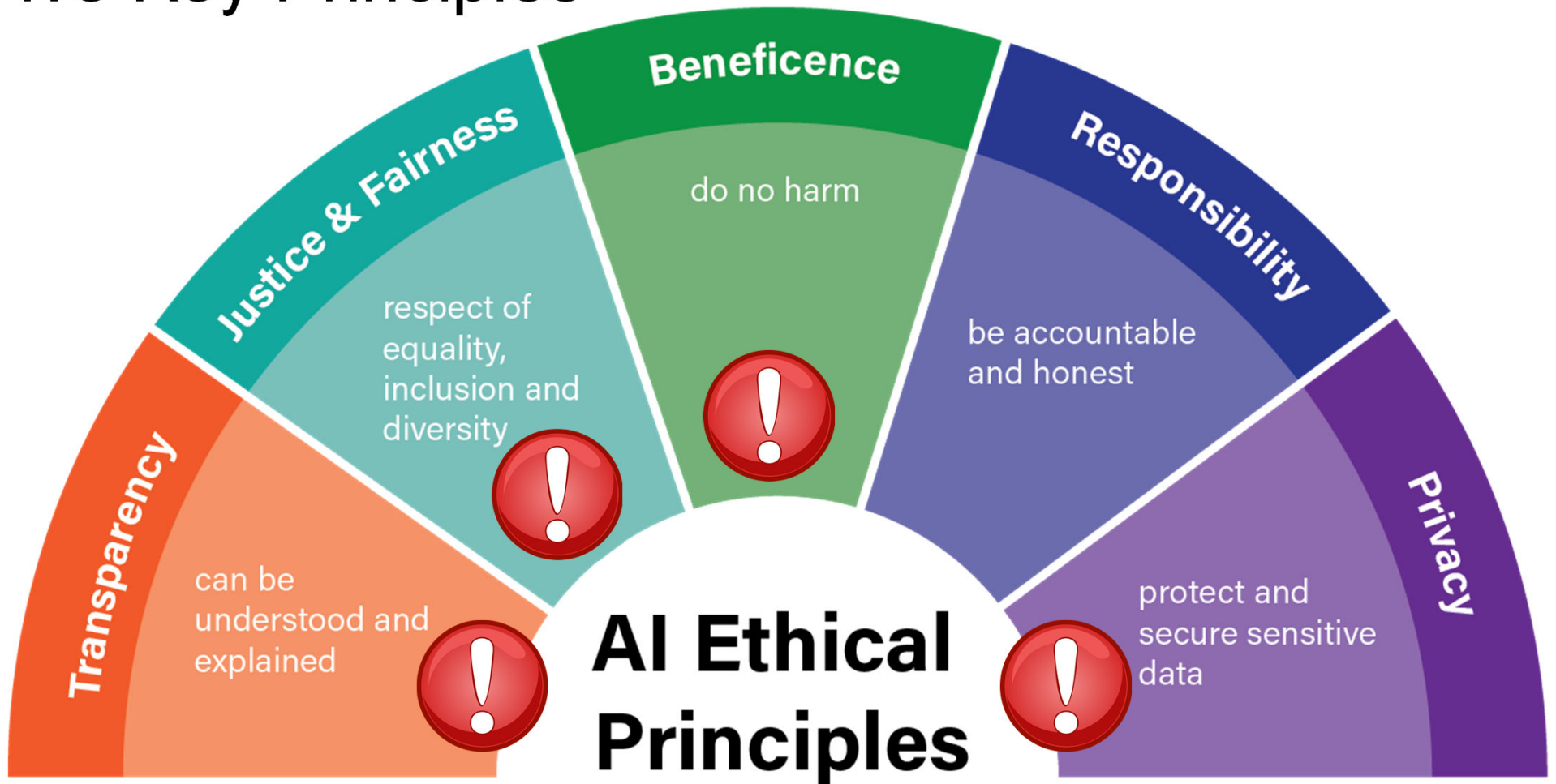
Amazon scraps secret AI recruiting tool that showed bias against women



Source: Reuters (2018)



# Five Key Principles



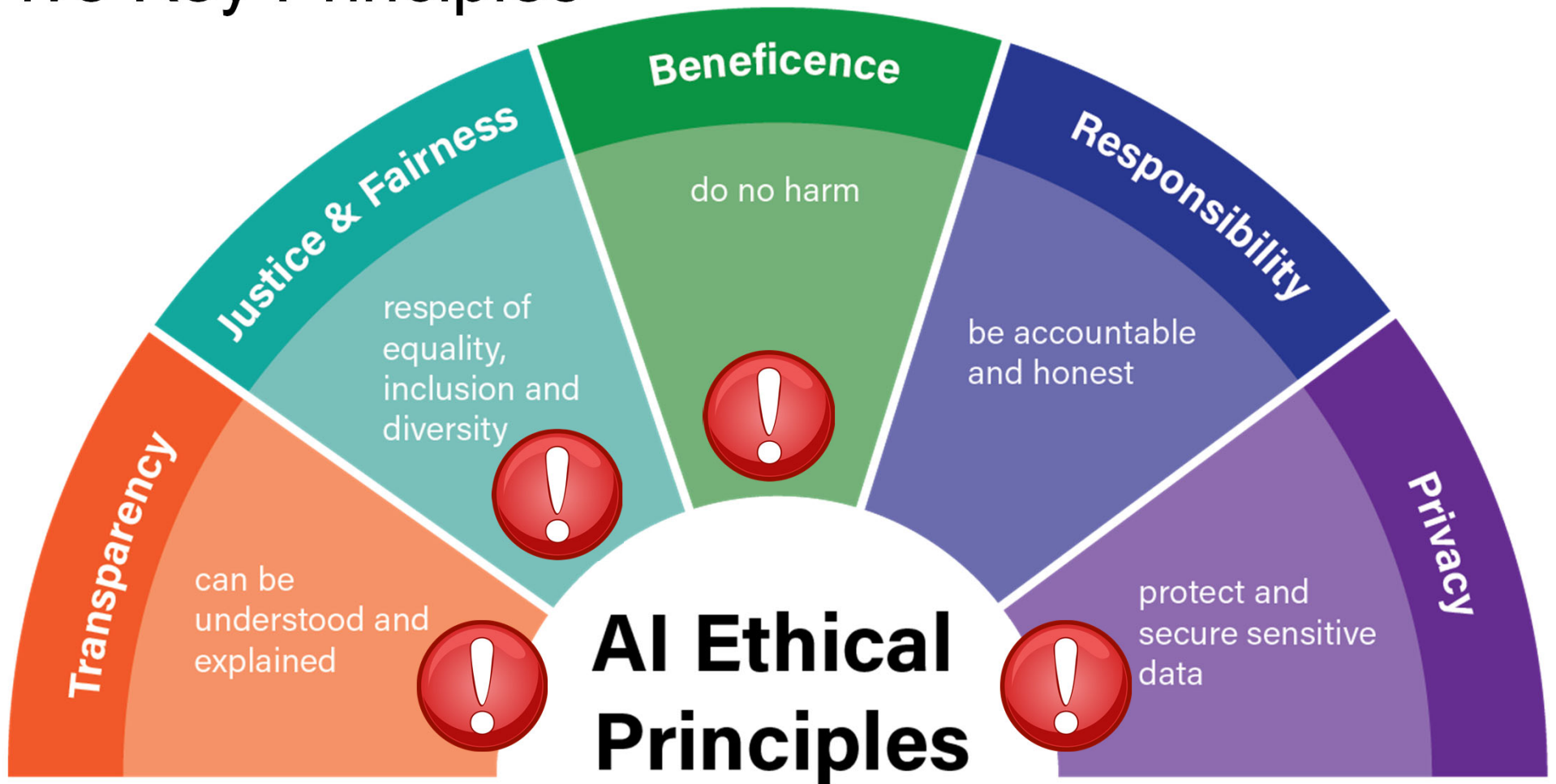
# Example: Credit Scoring

## Two faces of AI-based credit scores

Credit score providers and banks are taking a cautious approach to artificial-intelligence-based credit scores, with good reason

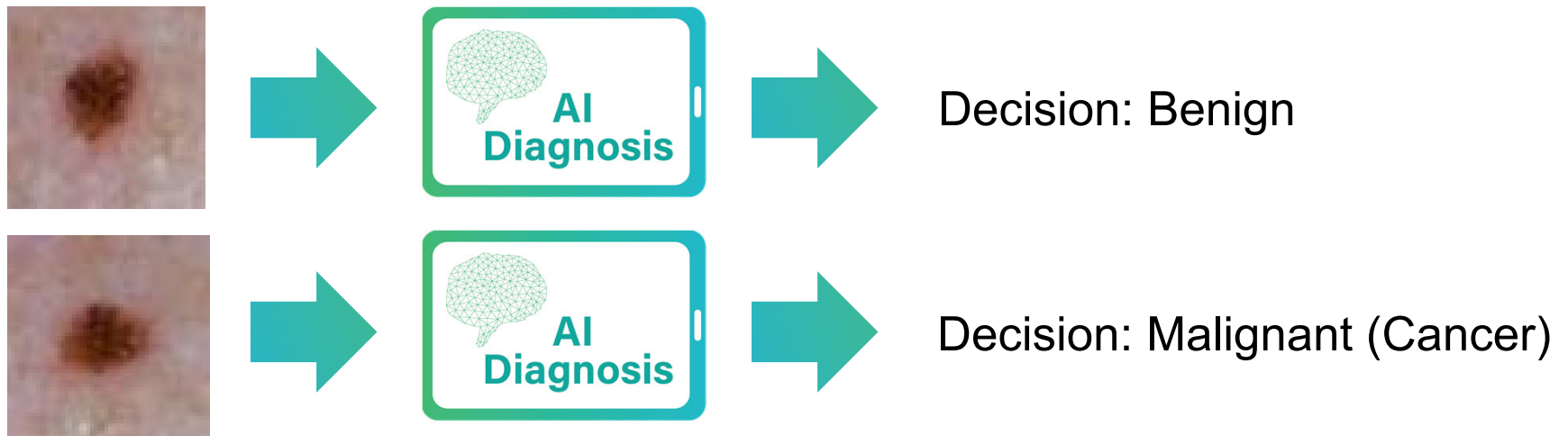
<b>Pros</b>	
More precise scores, through more nuanced evaluations of data	Ability to consider consumers that linear models would reject
<b>Cons</b>	
Risk that regulators will consider the score a "black box"	Challenge of providing one clear reason for credit denial

# Five Key Principles



# Example: Diagnosing Skin Cancer

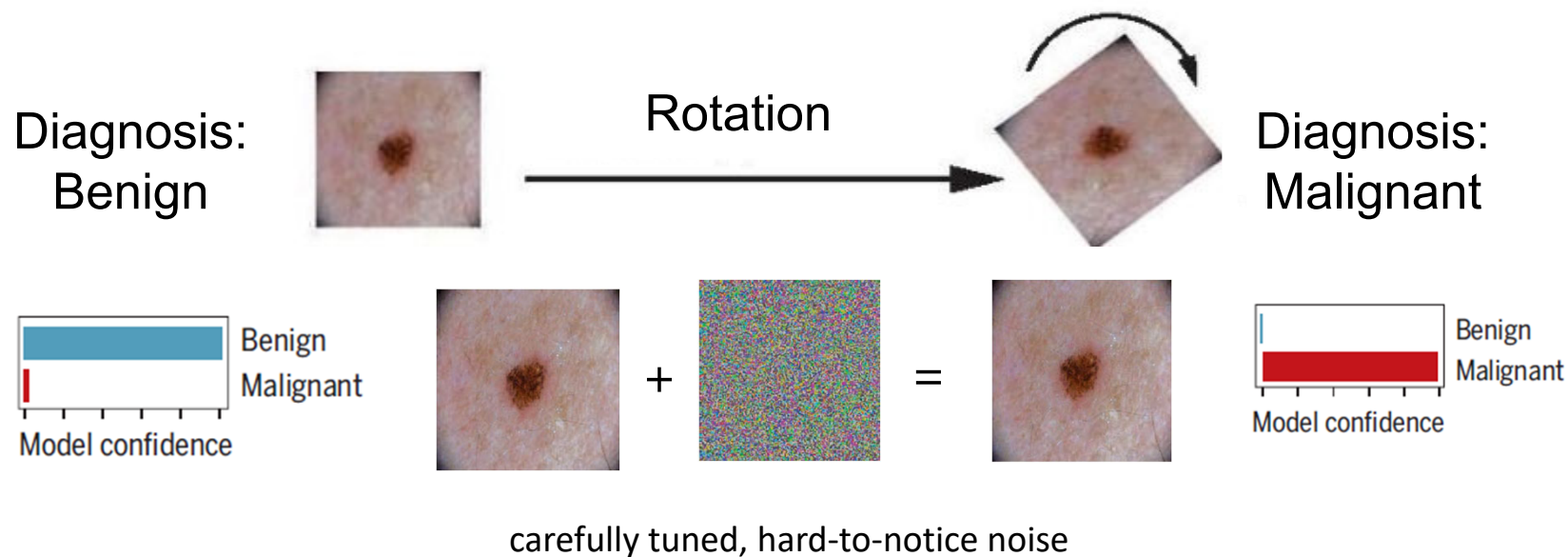
- Trained AI models may not always produce correct decisions
- Even high-performing AI models can be 'attacked' by manipulated data



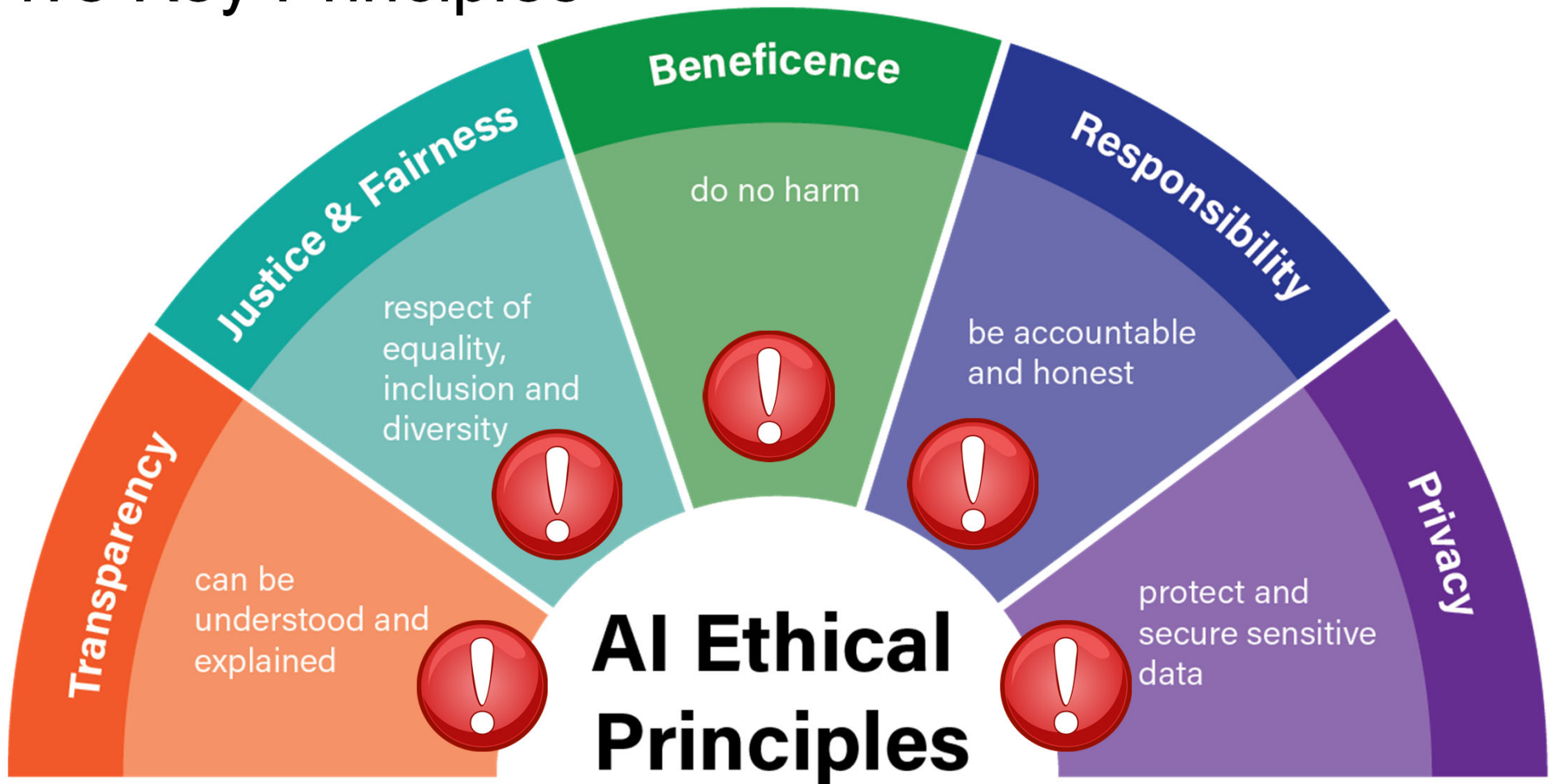
Source: Finlayson et al. (2019), *Science*

# Example: Diagnosing Skin Cancer

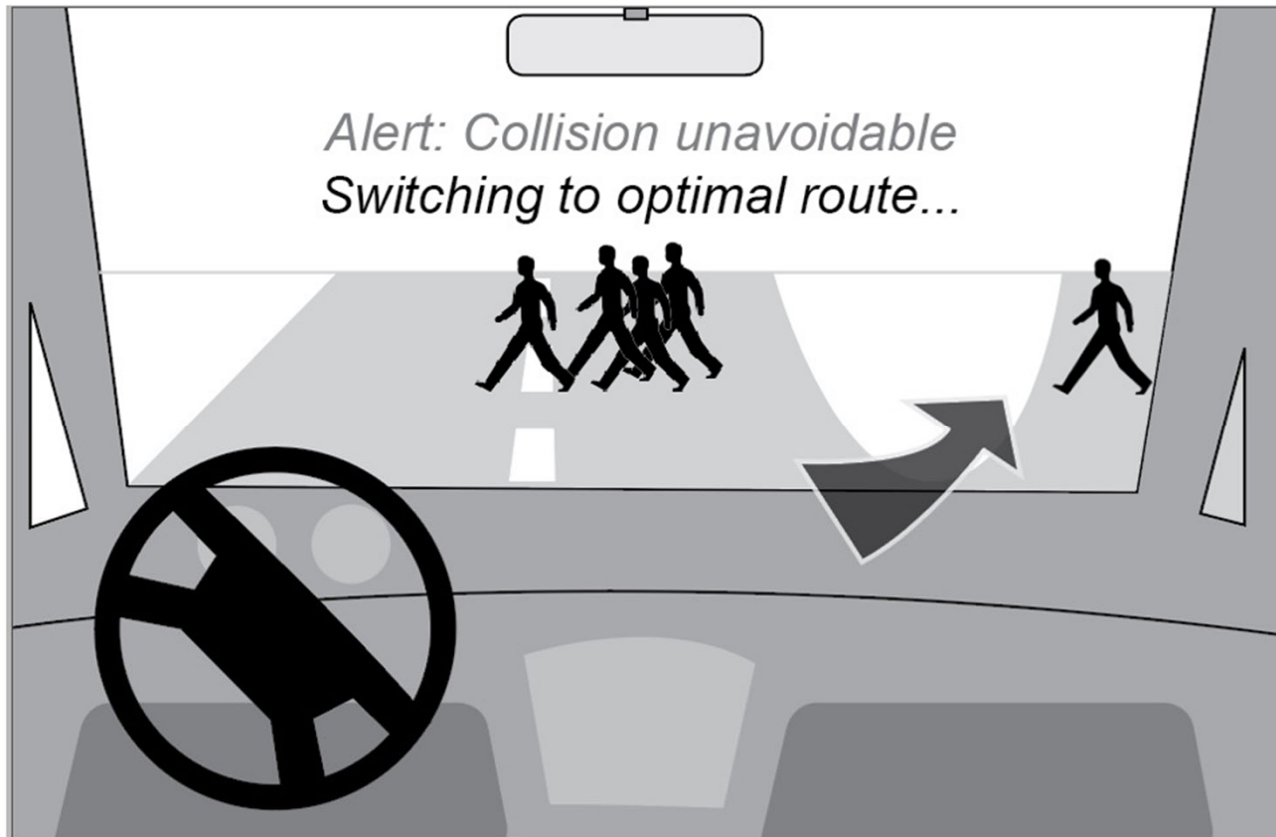
- Image data orientation or noise may affect the AI model's decision



# Five Key Principles



# Example: Moral Dilemma for Self-Driving Car



Trolley problem faced by a self-driving car

Image source: [harkerquila.com](http://harkerquila.com)



# News on AI Regulation

*The Washington Post*  
*Democracy Dies in Darkness*

## Europe moves ahead on AI regulation, challenging tech giants' power

Brussels brought a new antitrust challenge against Google on the same day European lawmakers voted to approve the E.U. AI Act – lapping counterparts in the U.S., where legislation has languished

By [Cat Zakrzewski](#) and [Cristiano Lima](#)

Updated June 14, 2023 at 6:34 p.m. EDT | Published June 14, 2023 at 7:13 a.m. EDT



- Ban on emotion-recognition AI
- Ban on real-time biometrics and predictive policing in public places
- Ban on social scoring
- Restrictions for Generative AI
- Restrictions on recommendation systems on social media



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# Technology Transforms Jobs

Job	Past	Present	Future
<b>E.g. Cashier</b>	Marked goods sold by hand on a piece of paper	Humans scan barcodes on goods	Humans occasionally help customers using self-checkout machines
<b>Driver of a Vehicle</b>	<u>Vehicle powered by animals (e.g. horses, oxen) and driven by humans</u>	<u>Vehicle powered by petroleum or electricity and driven by humans</u>	<u>Vehicle powered by petroleum or electricity and driven by AI</u>
<b>Security Guard</b>	<u>Human security guards</u>	<u>Human security guards monitor multiple areas with the aid of closed-circuit television (CCTV) or cameras</u>	<u>Surveillance by AI to identify suspicious activities</u>

# Example: Driverless Taxi

- Fully autonomous robot taxi navigates city streets using sensors to detect other vehicles and pedestrians



Source: BBC News





2022

# Skills for Future of Work

## Top 10 skills of 2025

-  Analytical thinking and innovation
-  Active learning and learning strategies
-  Complex problem-solving
-  Critical thinking and analysis
-  Creativity, originality and initiative
-  Leadership and social influence
-  Technology use, monitoring and control
-  Technology design and programming
-  Resilience, stress tolerance and flexibility
-  Reasoning, problem-solving and ideation

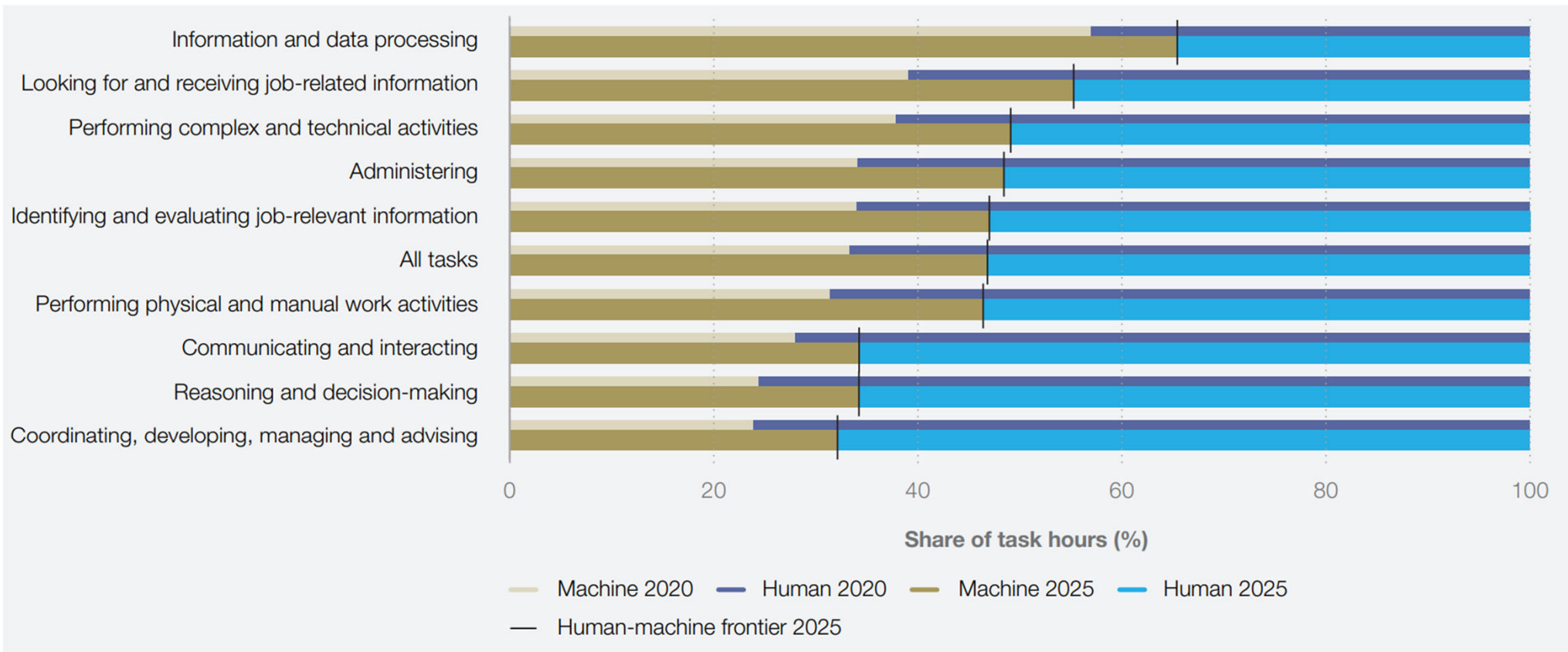
### Type of skill

-  Problem-solving
-  Self-management
-  Working with people
-  Technology use and development

11	Emotional intelligence
12	Troubleshooting and user experience
13	Service orientation
14	Systems analysis and evaluation
15	Persuasion and negotiation

Source: Future of Jobs Survey 2020, World Economic Forum

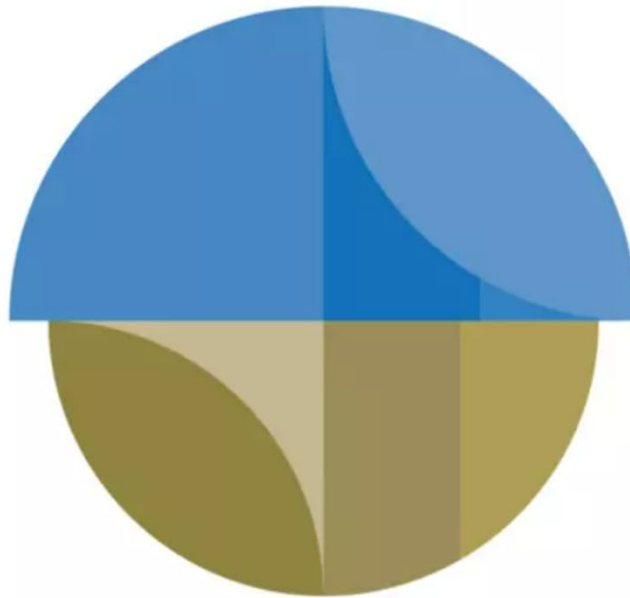
# Tasks Performed by Humans vs Machines (2020 and 2025 expected)



Source: Future of Jobs Survey 2020, World Economic Forum

# Job Landscape

97 million



85 million

## Growing job demand:

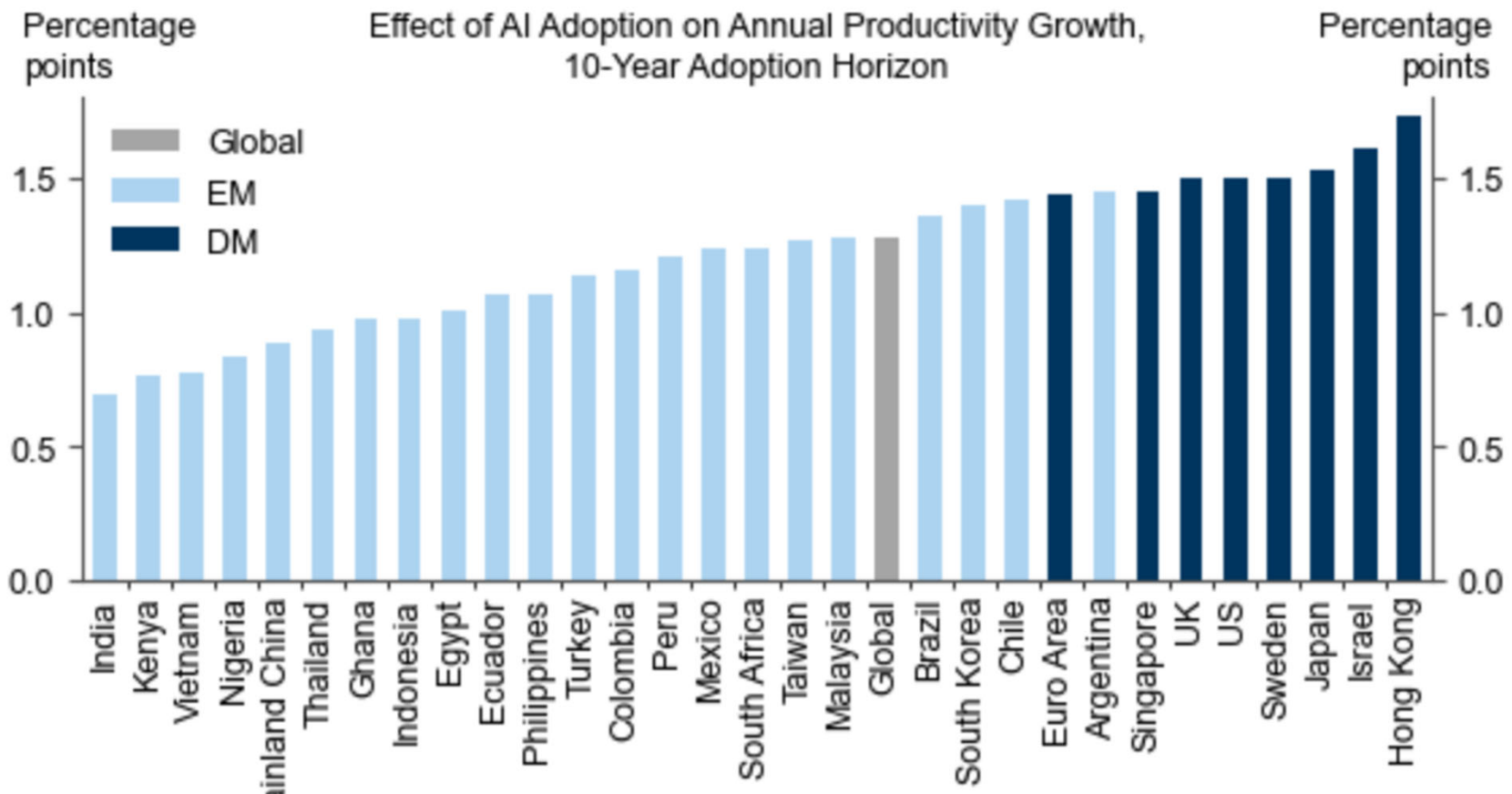
1. Data Analysts and Scientists
2. AI and Machine Learning Specialists
3. Big Data Specialists
4. Digital Marketing and Strategy Specialists
5. Process Automation Specialists
6. Business Development Professionals
7. Digital Transformation Specialists
8. Information Security Analysts
9. Software and Applications Developers
10. Internet of Things Specialists

## Decreasing job demand:

1. Data Entry Clerks
2. Administrative and Executive Secretaries
3. Accounting, Bookkeeping and Payroll Clerks
4. Accountants and Auditors
5. Assembly and Factory Workers
6. Business Services and Administration Managers
7. Client Information and Customer Service Workers
8. General and Operations Managers
9. Mechanics and Machinery Repairers
10. Material-Recording and Stock-Keeping Clerks

Source: Future of Jobs Survey 2020, World Economic Forum

# Increase in Productivity



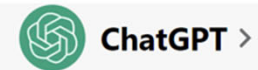
Source: Goldman Sachs Global Investment Research 2023

# Example: Generative AI

- Use of ChatGPT to compose marketing text



Please write a 100-word marketing spiel for a new design of teenage purse



Introducing the perfect accessory for the style-savvy teen: our new design of teenage purse! With its trendy and modern design, this purse is the perfect way to add a pop of style to any outfit. Featuring multiple compartments, it provides ample space to store all the essentials, from your phone to your makeup. The [adjustable strap](#) allows for [versatile wear](#), making it perfect for any occasion. Whether you're heading to school or out with friends, our teenage purse is the ultimate accessory for any [teenage girl](#) looking to make a statement. Get yours today and step up your style game!

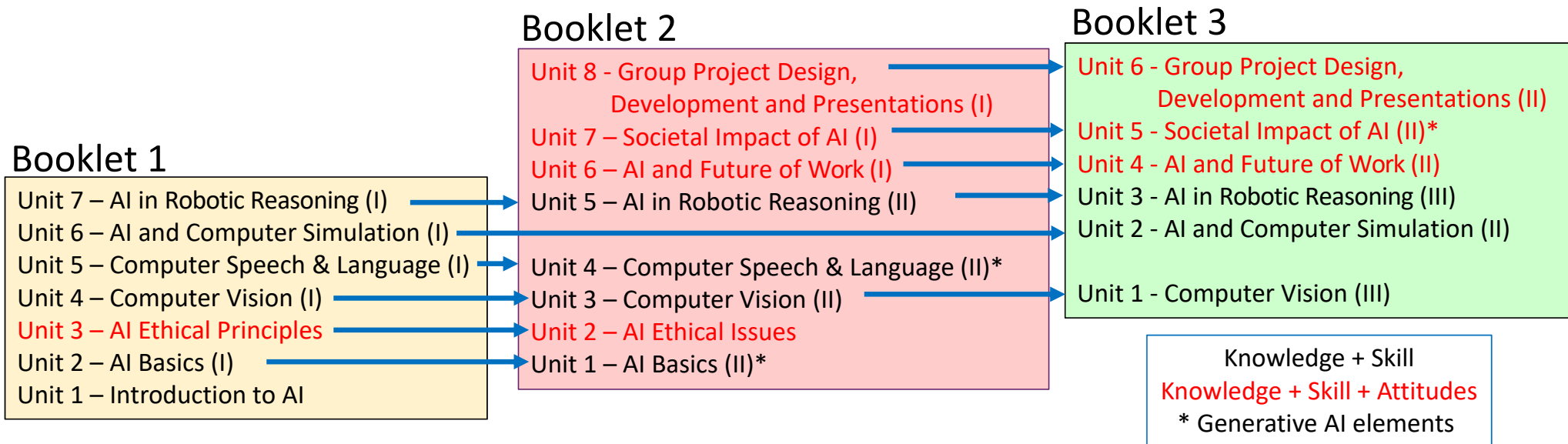


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# Curriculum Arrangement of Module on AI

- Progressive coverage of essential AI technologies
- Strong emphasis on ethics and future of work



- **Notes for Teachers** provide suggested answers to questions and materials for further reading
- **Exercises** to assess students' understanding of the materials
- **Summary** to consolidate students' grasp of the basic content of each unit

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# Summary and Conclusion

- AI literacy is crucial for all
- Need to acquire knowledge to use, interpret and develop AI across disciplines
- Need to acquire a keen sense of AI ethics for social good
- AI adoption will transform the future of work and raise productivity for economic growth
- Module for AI is a timely starting point to prepare our next generation – stay updated and expand from here

Thank you!