MARTIN-LUTHER-UNIVERSITÄT
HALLE-WITTENBERG

Ethische Aspekte künstlicher Intelligenz
bei der Entwicklung und Anwendung von KI in der digitalen Landwirtschaft

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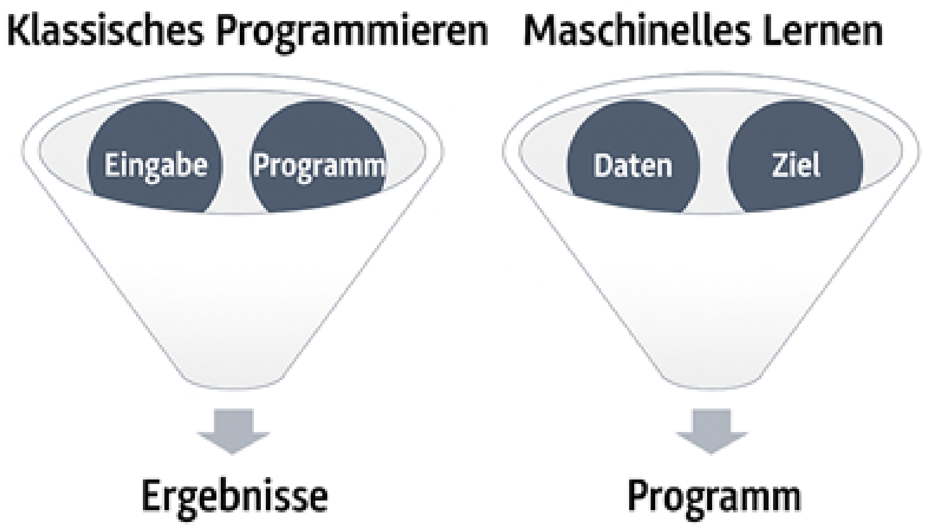
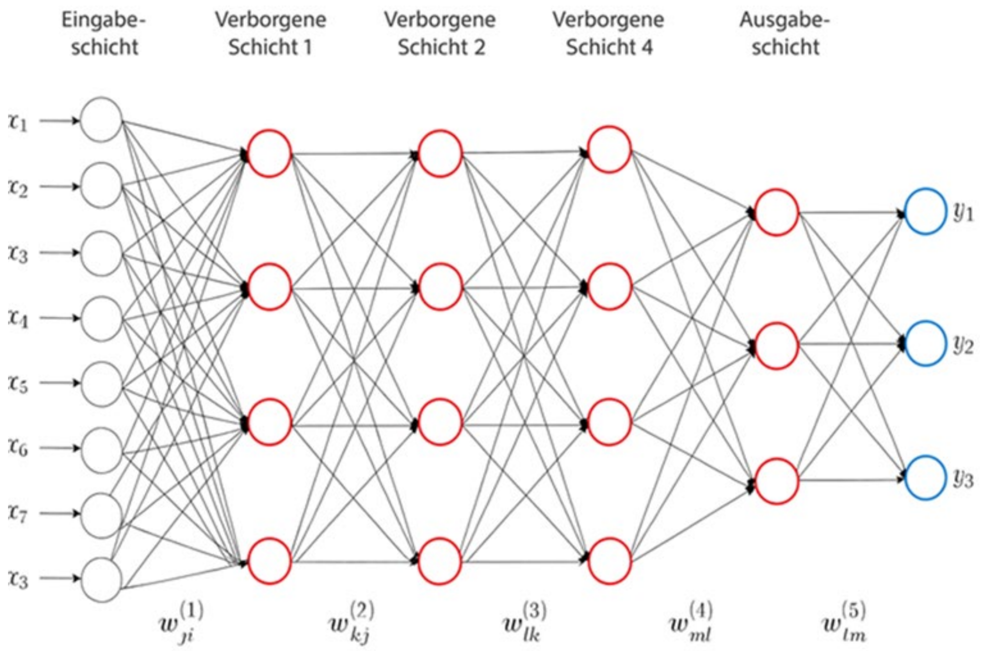
Fragen

1. Was ist das Spezifische von KI, das ethische Betrachtung erfordert?
2. Welche ethischen Fragen werden dadurch aufgeworfen?
3. Grundsätzliche Anmerkungen

Grundlegender Unterschied zwischen KI und klassischem Programmieren





Was ist das Spezifische an KI, das eine ethische Betrachtung erfordert?

Große Datenbasis

'Selbstlernend'

Black Box

Zunehmend autonom

Gibt Empfehlungen

Macht Vorhersagen

Trifft Entscheidungen

Führt aus

Ethische Richtlinien

a project by ALGORITHM WATCH

AI Ethics Guidelines Global Inventory

EXPLORE THE INVENTORY / ABOUT

Welcome to AI Ethics Guidelines Global Inventory, a project by AlgorithmWatch that maps frameworks that seek to set out principles of how systems for automated decision-making (ADM) can be developed and implemented ethically (last update in April 2020). The databas currently includes **167 guidelines**. Learn more about the inventory here or jump right in an browse through our inventory using the new filters and search feature!

Table 3 | Ethical principles identified in existing AI guidelines

Ethical principle	Number of documents	Included codes
Transparency	73/84	Transparency, explainability, explicability, understandability, interpretability, communication, disclosure, showing
Justice and fairness	68/84	Justice, fairness, consistency, inclusion, equality, equity, (non-)bias, (non-)discrimination, diversity, plurality, accessibility, reversibility, remedy, redress, challenge, access and distribution
Non-maleficence	60/84	Non-maleficence, security, safety, harm, protection, precaution, prevention, integrity (bodily or mental), non-subversion
Responsibility	60/84	Responsibility, accountability, liability, acting with integrity
Privacy	47/84	Privacy, personal or private information
Beneficence	41/84	Benefits, beneficence, well-being, peace, social good, common good
Freedom and autonomy	34/84	Freedom, autonomy, consent, choice, self-determination, liberty, empowerment
Trust	28/84	Trust
Sustainability	14/84	Sustainability, environment (nature), energy, resources (energy)
Dignity	13/84	Dignity
Solidarity	6/84	Solidarity, social security, cohesion

nature machine intelligence
PERSPECTIVE
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The global landscape of AI ethics guidelines

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In the past five years, private companies, research institutions and public sector organizations have issued principles and guidelines for ethical artificial intelligence (AI). However, despite an apparent agreement that AI should be 'ethical', there is debate about both what constitutes 'ethical AI' and which ethical requirements, technical standards and best practices are needed for its realization. To investigate whether a global agreement on these questions is emerging, we mapped and analysed the current corpus of principles and guidelines on ethical AI. Our results reveal a global convergence emerging around five ethical principles (transparency, justice and fairness, non-maleficence, responsibility and privacy), with substantive divergence in relation to how these principles are interpreted, why they are deemed important, what issue, domain or actors they pertain to, and how they should be implemented. Our findings highlight the importance of integrating guideline-development efforts with substantive ethical analysis and adequate implementation strategies.

Artificial intelligence (AI), or the theory and development of computer systems able to perform tasks normally requiring human intelligence, is widely heralded as an ongoing "revolution" transforming science and society altogether[1,2]. While approaches to AI such as machine learning, deep learning and artificial neural networks are reshaping data processing and analysis[3], autonomous and semi-autonomous systems are being increasingly used in a variety of sectors including healthcare, transportation and the production chain[4]. In light of its powerful transformative force and profound impact across various societal domains, AI has sparked ample debate about the principles and values that should guide its development and use[5,6]. Fears that AI might jeopardize jobs for human workers[7], be misused by malevolent actors[8], elude accountability or inadvertently disseminate bias and thereby undermine fairness[9] have been at the forefront of the recent scientific literature and media coverage. Several studies have discussed the topic of ethical AI[10–13], notably in meta-assessments[14–16] or in relation to systemic risks[17,18] and unintended negative consequences such as algorithmic bias or discrimination[19–21].

National and international organizations have responded to these concerns by developing ad hoc expert committees on AI, often mandated to draft policy documents. These committees include the High-Level Expert Group on Artificial Intelligence appointed by the European Commission, the expert group on AI in Society of the Organisation for Economic Co-operation and Development (OECD), the Advisory Council on the Ethical Use of Artificial Intelligence and Data in Singapore, and the Select Committee on Artificial Intelligence of the UK House of Lords. As part of their institutional appointments, these committees have produced or are reportedly producing reports and guidance documents on AI. Similar efforts are taking place in the private sector, especially among corporations who rely on AI for their business. In 2018 alone, companies such as Google and SAP publicly released AI guidelines and principles. Declarations and recommendations have also been issued by professional associations and non-profit organizations such as the Association of Computing Machinery (ACM), Access Now and Amnesty International. This proliferation of soft-law efforts can be interpreted as a governance response to advanced research into AI, whose research output and market size have drastically increased[22] in recent years.

Reports and guidance documents for ethical AI are instances of what is termed non-legislative policy instruments or soft law[23]. Unlike so-called hard law—that is, legally binding regulations passed by the legislatures to define permitted or prohibited conduct—ethics guidelines are not legally binding but persuasive in nature. Such documents are aimed at assisting with—and have been observed to have significant practical influence on—decision-making in certain fields, comparable to that of legislative norms[24]. Indeed, the intense efforts of such a diverse set of stakeholders in issuing AI principles and policies is noteworthy, because they demonstrate not only the need for ethical guidance, but also the strong interest of these stakeholders to shape the ethics of AI in ways that meet their respective priorities[16,25]. Specifically, the private sector's involvement in the AI ethics arena has been called into question for potentially using such high-level soft policy as a portmanteau to either render a social problem technical[16] or to eschew regulation altogether[26]. Beyond the composition of the groups that have produced ethical guidance on AI, the content of this guidance itself is of interest. Are these various groups converging on what ethical AI should be, and the ethical principles that will determine the development of AI? If they diverge, what are their differences and can these differences be reconciled?

Our Perspective maps the global landscape of existing ethics guidelines for AI and analyses whether a global convergence is emerging regarding both the principles for ethical AI and the suggestions regarding its realization. This analysis will inform scientists, research institutions, funding agencies, governmental and intergovernmental organizations, and other relevant stakeholders involved in the advancement of ethically responsible innovation in AI.

Methods

We conducted a scoping review of the existing corpus of documents containing soft-law or non-legal norms issued by organizations. This included a search for grey literature containing principles and guidelines for ethical AI, with academic and legal sources excluded. A scoping review is a method aimed at synthesizing and mapping the existing literature[27] that is considered particularly suitable for complex or heterogeneous areas of research[27,28]. Given the absence of a unified database for AI-specific ethics guidelines, we developed a protocol for discovery and eligibility, adapted from the Preferred

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ELSEVIER

Ethical, Legal and Social Aspects (ELSA) for AI: An assessment tool for Agri-food

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ABSTRACT

As Artificial Intelligence (AI) continues to emerge in various sectors, ethical frameworks and guidelines aim to contribute to responsible AI development. While AI ethics has gained prominence in addressing broader societal concerns, existing regulations and guidelines often lack specificity for certain domain-specific applications (e.g. agri-food). AI is rapidly developed and deployed throughout the agri-food sector, but there is little practical guidance on how to do this responsibly. This study examines if the agri-food sector needs domain-specific guidance for the development and use of responsible AI and, if so, what it could look like. This research proposes it does and aims to fill this gap by introducing a novel approach for responsible AI in agri-food: the ethical, legal, and social aspects (ELSA) Scan. This assessment comprises 25 targeted questions aimed at identifying ELSA considerations. These questions were developed and based on 23 ELSA aspects of AI in agri-food literature and from testing in two case studies (arable and dairy farming). The ELSA Scan provides a clear and implementable approach for identifying ELSA in the development and use of AI in agri-food with AI developers and organisations.

1. Introduction

The increased use of artificial intelligence (AI) offers many opportunities and benefits, but risks and threats may also emerge. These are commonly referred to as ethical, legal, and social aspects (ELSA[1]) of AI technologies. As a result of emerging 'ELSA aspects' in AI design and the societal concerns they raise, much funding is being dedicated to research and addressing them [1,2,3]. Also, AI ethics associations have been set up to tackle the risks and challenges posed by AI [4], as well as various legal frameworks and policies that have been established (such as the United States Blueprint for an AI Bill of Rights [5], the EU AI Act [6], and China's Artificial Intelligence Law [7]). While these actions are undoubtedly positive steps towards ensuring AI is being developed and used responsibly, they are usually very high level and often focus on the unacceptable-risk forms of AI, such as biometric identification [8]. However, because of the horizontal nature of these laws, which apply to all sectors, they do not provide clear recommendations for specific sectors and industries in which AI is deployed, such as transportation, health, agri-food or energy.

In addition to AI legislation, AI ethics has emerged to respond to broader social and ethical challenges posed by AI. Various disciplines are engaged in AI ethics (e.g., philosophers, computer scientists, anthropologists, economists, and neuroscientists) to examine the ethical acceptability and societal desirability of AI. As a result of efforts within this field, over 200 types of ethics guidelines [9] and over 100 ethical frameworks and approaches [10] have been developed to assist decision-making on responsible AI. These guidelines and frameworks are important to guide AI development towards responsible AI applications in society. However, similarly to horizontal law, they often do not provide domain-specific considerations and are often not tailored to specific sectors and applications of AI, which makes it challenging to consider sector-specific or contextual issues for responsible AI. For example, AI risks in health are different from agri-food because they directly involve the health of citizens. In contrast, AI risks in agri-food may be related to animal welfare, the environment, and food security, which are less important in healthcare.

Therefore, this paper presents the development of an assessment tool for ELSA aspects of AI in a specific context: the agri-food domain. In this domain, ethical, legal, and social aspects of AI have received increased attention over the past several years [11–14]. The agri-food sector is

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[1] These ethical, legal and social aspects (ELSA) are referred to in this paper as 'ELSA aspects'.

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Table 2
23 Ethical, Legal and Social aspects from literature.

Ethical	Legal	Social
1. Transparency	9. Privacy law and data protection	16. Sustainability
2. Justice and fairness	10. Data ownership and data governance	17. Animal welfare
3. Bias and discrimination	11. Liability	18. Industrialisation
4. Beneficence	12. Human rights	19. Impact on gender, class, race
5. Non-maleficence	13. Standardisation and Protocols	20. Impact on societal views of food production
6. Freedom and autonomy	14. Data and AI regulations	21. Labour
7. Privacy	15. AI code of conduct and guidelines	22. Power asymmetries
8. Responsibility		23. Costs and other economic aspects

Rubish in, Rubish out – Verzerrungen bei den Trainingsdaten

- Verzerrungen - durch bewusste oder unbewusste Fehler bei der Datenerhebung und –verarbeitung

  - Mangelende Repräsentativität der Daten
  - Entscheidende Variablen nicht erfasst
  - Algorithmus bildet falsche Kategorien

- Unfair ist ein Algorithmus dann, wenn er Entscheidungen trifft, die gegenüber bestimmten Gruppen verzerrt sind aufgrund von Vorurteilen oder Stereotypen.

Reduktion von Verzerrungen

- Verfügbarkeit großer differenzierter Datenmengen ist von zentraler Bedeutung

→ Open source ‚Datenökosystem' (GAIA und Agri GAIA)

- Rolle der Entwickler:in
  - Fairness als begrenzende Regel oder als statistische Performance-Metrik integrieren
  - Mit welchen Vorstellungen von Landwirtschaft arbeiten Entwickler:innen?

→ Co-Design mit Endnutzern von Anfang an

Daten als neue Cash-crop

- Transparenz über den Umgang mit den eigenen Daten
- Autonomie über Daten
- Schutz von Privatheit versus Schutz von geistigem Eigentum

→ Frage von Vertrauen und ökonomischer Teilhabe

Vor allem angesichts der ungleichen Machtverhältnisse zwischen den Akteuren schwierig

- Seit September 2025 EU-Data-Act (Regulation (EU) 2023/2854)

Der Algorithmus als Black Box

- Black-Box-Problem
  - Interpretierbarkeit für Entwickler:in (**Wie** kommen Entscheidungen zustande?)
  - Verständlichkeit für Endnutzer:in (**Warum** kommen diese Entscheidungen zustande?)

→ Vertrauen

→ Haftung

- XAI= eXplainable Artificial Intelligence
- Aber: trade-off zwischen Interpretierbarkeit und Genauigkeit

Autonomie – Recht auf die eigene (Fehl-) Entscheidung

Autonomie des Menschen

- Paternalismus des Algorithmus
- Haftungsrechtliche Dimension

- Autonomie der Maschine
  - Haftungsrechtliche Dimension
  - Gewichten wir Fehler der Maschine moralisch anders als menschliche Fehler?
  - Wieviel Autonomie soll ein KI-basiertes System haben?

Landwirtschaftlicher Betrieb als Sammlung von Datenpunkten

- Der Zen-Moment einer körperlich stark anstrengenden, monotonen Arbeit verfliegt schnell
- Argument: KI-basierte Systeme ermöglichen mehr Zeit für Wesentliches.

- Ab welchem Punkt der Übernahme von Entscheidungen durch KI geht das angeblich Besondere der landwirtschaftlichen Tätigkeit verloren?

Grundsätzliche Anmerkungen

- KI für Nachhaltigkeit ≠ nachhaltige KI

- Ethische Betrachtung von KI sollte mehr sein, als nur ‚Value-Sensitive-Design', sondern auch grundsätzliche Fragen einschließen:
  - Ist eine KI-Technologie immer besser als eine Prä-KI-Technologie?
  - Verändern sich Wertvorstellungen durch die Anwendung von KI und ist das wünschenswert?
    - Vorstellungen von Privatheit
    - Mensch-Tier/Mensch-Mensch/Mensch-Maschine-Beziehung

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