Ageism in AI. Some juridical suggestions pursuing participatory strategies*

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Abstract

Statistics reveal that the population of people over 65 years of age is increasing worldwide. The special characteristics and needs of these individuals are often overlooked during the design process of artificial intelligence systems. This lack of attention represents a risk of exclusion and discrimination. These problems may have a solution through participatory artificial intelligence. On this basis, this study aims to present a reconstruction of the legal framework of the European Union (EU) and offer suggestions to mitigate discrimination and increase involvement.

Keywords

third age, ageism, discrimination, participatory artificial intelligence

1. Preliminary remarks

The number of people aged 65 years and older worldwide is projected to more than double, rising from 761 million in 2021 to 1.6 billion in 2050[1]. Current data and a longer life expectancy confirm that this group is numerically representative in contemporary society. On the other hand, Artificial Intelligence (AI) is becoming an important pillar of socioeconomic activity. As a result, the provision of services and the production of goods have expanded the use of this type of technology. This offers significant benefits for this age group, with a particular impact in the fields of healthcare and assistance [1]. However, digital illiteracy and digital ageism increase the risk of exclusion and discrimination of older adults from the assumption of stereotypes about this age group and the failure of attention to their characteristics, needs, behaviours, and values in the design and development of AI systems. This issue may have a solution through Participatory AI, intended both as a greater involvement of interested people in AI design and as an empowerment of the elderly in human-machine interactions. Based on this, the research focus is to provide an overview of ageism in the context of AI, highlighting a current topic overlooked in investigations related to discrimination and inclusive AI. It also critically assesses the EU regulatory framework regarding this issue, analysing the feasibility of alternatives to empower and protect this group through Participatory AI.

2. Old age, illiteracy and digital ageism

The definition of old age varies across contexts and has no standard delimitation. The established age limits vary according to the issuing authority and are also closely tied to cultural and economic factors. The categories "third age", "elderly person", or "older adult" are defined as being from 60 or

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[1]United Nations, Leaving No One Behind in An Ageing World, World Social Report, 2023.

65 years of age[2]. According to the World Health Organization, "at the biological level, ageing results from the impact of the accumulation of a wide variety of molecular and cellular damage over time. This leads to a gradual decrease in physical and mental capacity, a growing risk of disease and ultimately death. These changes are neither linear nor consistent, and they are only loosely associated with a person's age in years. The diversity seen in older age is not random. Beyond biological changes, ageing is often associated with other life transitions such as retirement, relocation to more appropriate housing and the death of friends and partners". This process involves a decline, resulting in functional and social limitations. Consequently, this group is considered vulnerable in health, administrative, and legal dimensions [2].

The growing expansion of technologies exacerbates both the limitations and the vulnerability of this group. These circumstances are essentially related to two phenomena: digital illiteracy and digital ageism. Digital illiteracy is "defined as the difficulty or inability to use digital technologies effectively, whether to access, understand, produce or evaluate information. Thus, this phenomenon is not limited simply to a lack of access to the Internet, but also includes an inability to use digital technologies effectively" [3]. This situation is closely related to the fact that they have spent a significant part -if not most- of their lives outside the period of rapid development of emerging technologies, which, according to some scholars, leads to their classification as digital migrants [4]. In this context, this age group experiences limitations or inability to access services, both public and private, understand commercial transactions, and interact with technological devices, which contributes to their isolation in a world profoundly shaped by digital technologies [5, 6].

Older adults are also affected by digital ageism, understood as age-based prejudice or discrimination regarding digital technologies [7, 8]. Its manifestation encompasses discrimination in the context of the digital divide, digital platforms, artificial intelligence, and age bias in the technology industry [9].The phenomenon is related to stereotypes and prejudices about older adults' ability and interest in using digital technologies. The perception that older adults are technophobic, incapable, or disinterested in technological advances is deeply rooted in current society[3], particularly influenced by digital illiteracy and the digital divide [10].

The aforementioned elements expose how older adults are susceptible to particular forms of exclusion and discrimination in the current technological context, reaffirming the risk that emerging and disruptive technologies pose to fundamental rights, notably equality and non-discrimination. In this context, the lack of skills to interact with technologies, related to digital illiteracy, has been addressed through strategies focused on education. Digital ageism, on the other hand, is emerging as a more complex problem, considering the characteristics of these technologies and the prevalence of stereotypes about this age group among operators and investors in the sector.

3. Artificial intelligence and age discrimination

AI has been recognized as a subdiscipline of Computer Science [11]. However, the literature refers to at least one hundred non-coincident definitions of AI [12], highlighting the absence of a universally accepted definition [13]. According to the European Commission, the AI "refers to systems designed by humans that, given a complex goal, act in the physical or digital world by perceiving their environment, interpreting the collected structured or unstructured data, reasoning on the knowledge derived from this data and deciding the best action(s) to take (according to pre-defined parameters) to achieve the given goal. AI systems can also be designed to learn to adapt their behaviour by analysing how the environment is affected by their previous actions. As a scientific discipline, AI includes several approaches and techniques, such as machine learning (of which deep learning and reinforcement learning are specific examples), machine reasoning (which includes planning, scheduling, knowledge representation and reasoning, search, and optimization), and robotics (which includes control, perception, sensors and

[2]United Nations, Ageing, Older Persons and the 2030 Agenda for Sustainable Development; World Health Organization, Promoting physical activity and healthy diets for healthy ageing in the WHO European Region, 2023.

[3]United Nations Economic Commission for Europe. (2021). Ageing in the digital era (Policy Brief on Ageing No. 26).

actuators, as well as the integration of all other techniques into cyber-physical systems)"[4]. Recently, the Artificial Intelligence Act (AIA) has stated that "AI is a fast evolving family of technologies that contributes to a wide array of economic, environmental and societal benefits across the entire spectrum of industries and social activities"[5]. This formulation abandons the perspective of placing the AI system category at the center of the AI concept to align with a generic conceptual view focusing on its potential benefits [14]. Nevertheless, AI also poses significant risks[6] for humans and fundamental rights, demonstrating an impact with respect to the right to equality and non-discrimination [15].

AI-derived discrimination can have a particular impact on different groups and manifest itself in various parameters, ranging from access to the systems' functioning. The latter aspect is particularly complex due to their autonomy, opacity, and self-learning capacity. Age is one category that identifies one of the groups susceptible to discrimination. In detail, discrimination based on age includes any instance in which a person is treated unfairly or excluded based on their age, whether for being a young person, a child, an adolescent, or an older adult. However, discrimination in this category particularly affects the elderly due to their vulnerability resulting from biological processes and their innate physical degeneration. These situations of discrimination are prohibited based on the principle of equality and non-discrimination regulated in the Universal Declaration of Human Rights[7]. Subsequently, other initiatives have been established that have been more specifically targeted at this group, taking into account the generality of the principle of equality[8]. With regard to soft law, the UNESCO emphasises the priority of protecting the dignity and human and fundamental rights in interactions with AI systems in all life cycles. However, when the text refers to these interactions with vulnerable people and older adults, its formulation inadvertently exemplifies their relationship based on caregiving. This position indirectly reproduces the abovementioned stereotypes and highlights the need to continue promoting AI with a more inclusive approach, which in this context means taking an approach that encourages appreciation of the older adult group as active consumers with multidimensional needs, motivations, and preferences[9].

In the context of AI, older adults are among the most excluded from both access and use of AI, and are significantly underrepresented in the design and development processes of systems that implement this technology due to illiteracy and digital ageism. In contrast to these facts, two interesting elements emerge. On the one hand, it is noteworthy that, in the context of research, less attention is paid to this topic compared to the depth with which it has been addressed regarding the categories of race and sex [16]. On the other hand, it is evident that, given the global demographic situation, where older adults constitute a quantitatively significant group, there is little market interest in capturing these consumers, supporting the hypothesis that persistent stereotypes about older adults play a significant role in shaping industry priorities and excluding this demographic from technological innovation[10].

[4]European Commission, High-Level Expert Group on Artificial Intelligence. A definition of AI: Main capabilities and scientific disciplines, 18 December 2018.

[5]See Recital 4 of Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024.

[6]Assessing potential future artificial intelligence risks, benefits and policy imperatives, OECD Artificial Intelligence Papers No. 27, 2024, p. 11-29.

[7]See article 2 of Universal Declaration of Human Rights, United Nations General Assembly, 1948, Resolution 217 A. Although the declaration does not specifically refer to age as a motivating criterion for discrimination, some subsequent pronouncements refer to including this category within the expression "other social condition". Office of the High Commissioner for Human Rights, Analytical Outcome Paper: Normative standards in international human rights law in relation to older persons, 2012. Moreover, documents such as the Charter of Fundamental Rights of the European Union and the Treaty on the Functioning of the European Union expressly include this category in the articles devoted to regulating the prohibition of discrimination. See article 21 of the Charter of Fundamental Rights of the European Union and article 10 of the Treaty on the functioning of the European Union. The notion that age discrimination is condemned by the Universal Declaration of Human Rights finds support in the statement of the Office of the United Nations High Commissioner for Human Rights. United Nations Office of the High Commissioner for Human Rights (OHCHR) & Inter-Parliamentary Union, Human Rights: Handbook for Parliamentarians No. 26. Geneva, 2016.

[8]Among many strategies and regulations focused on guaranteeing their protection, see: Inter-American Convention on the Protection of the Human Rights of Older People, Organisation of American States, 15 June 2015; 2030 Agenda for Sustainable Development, United Nations, 2015; Council of Europe, European Social Charter, 1996.

[9]See UNESCO, Recommendation on the Ethics of Artificial Intelligence, 2021, point 15.

[10]In this regard, the Recital 2 and 4 of the Directive (EU) 2019/882 of the European Parliament and of the Council of 17 April

The process of discrimination has also been evidenced as a result of the technical operations of systems. In this regard, it is noted that researchers and institutions outside the field of ML have documented instances of ageism in AI applications across many domains, including healthcare, recruitment, and credit lending [17]. However, international and regional regulatory frameworks have paid little attention to AI's specific challenges to older adults. This lack of specific legal provisions, coupled with limited scientific focus, contributes to the persistent invisibility of this group in AI policies and governance. Based on these criteria, it is important to delve deeper into the circumstances that motivate discrimination against the elderly in the context of investment, use, development, and operation of AI. This perspective can contribute to the establishment of the theoretical foundations for the design of a specific legal framework that addresses situations of vulnerability. It will also promote the consolidation of a more inclusive AI from the action of developers, designers, data engineers, data curators, labellers, system architects, project managers and investors in the sector.

3.1. IA industry and age stereotypes

The AI industry is influenced by stereotypes associated with the elderly. The standardized perception of these individuals identifies them as a group with little interest and difficulties adapting to systems that implement this technology. As a result, developers and investors often overlook them as consumers and neglect their needs in systems design. Furthermore, assessments based on their needs and interests are schematic, leading to the development of AI systems for this group in the healthcare and care sectors. This reinforces a perception of fragility that ignores their existence as full individuals with very diverse expectations [18]. In this regard, the literature maintains that "the ageing and innovation discourse, used in policy and practice, emphasizes a rhetoric in which older persons are mainly associated with negative aspects of ageing, namely, frailty, cognitive decline, and dependency" [19]. This perception is reinforced by the digital divide that characterises older adults. However, this projection overlooks that the global population is aging and that older adults now represent a numerically significant group whose ability to interact with digital systems is steadily increasing. Over time, new generations of older adults have experienced the digital transition and are therefore closer to technological innovation, culturally and technically. Thus, the older adult group is progressively evolving in its interaction with AI, redefining the perception of the digital divide [9].

The mentioned stereotypes influence the investment and design of AI systems. The World Health Organization in its Report of 2022, Ageism in Artificial Intelligence for Health: WHO policy Brief, has commented that "biases can reflect who funds and designs an AI technology, with these technologies often excluding older people from market research, design and testing of user experience with the technology. Such exclusion is often due to ageism and particularly the stereotype that older people are forgetful, more rigid in thought, less motivated, less dynamic than their younger counterparts; frail, ill, dependent and incompetent". Therefore, those who play the roles of investors and designers must assume that older adults are valid and representative users.

Discrimination in the AI system design process could be mitigated through co-design, following an approach that aims for Participatory AI [20]. "The aim of a co-design approach is to better involve all the stakeholders in the design process. It is motivated by the assumption that by doing so, the final outcome will be more aligned with the needs, requirements, and desires of the final users if they are more actively involved in the design process. This is particularly true in the case of developing digital technology for older adults, who, despite being the main target users, are often excluded from design considerations" [21]. Although presented as a positive solution, this mechanism depends mostly on the willingness of designers and investors and the reconciliation between productivity and participation.

2019 recognizes that the demand for accessible products and services is increasing and that the number of persons with disabilities is expected to increase significantly. A more detailed analysis of some aspects of this document will be conducted in the following pages, but it is useful to underline that the directive maintains that accessible products and services enable an inclusive society and facilitate independent living for persons with disabilities. Based on these considerations, the Directive promotes improved access to generic products and services. Its regulation extends to older persons, considering that it focuses on persons with functional limitations, a category that, according to the directive, includes persons with physical, mental, intellectual, or sensory disabilities, as well as people with age-related disabilities.

Achieving more inclusive AI design depends on the development of specific strategies that facilitate interaction between older users and system designers. These measures could be implemented today as an expression of industry best practices. However, the lack of a regulatory perspective that explicitly requires the inclusion and protection of older adults throughout the lifecycle of AI systems, as a specific operationalization of the principle of equality towards the elderly, significantly limits the adoption and practical impact of inclusive design.

3.2. Algorithmic Bias and Discrimination in Automated Decision-Making (ADM) and Machine Learning (ML)

One of the most recent problems in the field of discrimination and AI is connected to the technical dimension through the phenomenon of algorithmic discrimination, which extends to the elderly. This infringement results when an algorithmic decision produces outcomes that unjustifiably and arbitrarily privilege certain groups over others, diverging from the intended function of the algorithm. This type of systems demonstrates algorithmic bias, defined as "the output of an algorithm benefits or disadvantages some individuals or groups more than others without a justified reason for these unequal impacts" [22], acquiring particular importance since the development of systems that employ autonomous decision making[11] and ML as a consequence of their opacity, increasing autonomy, and lack of transparency and traceability of decisions.

ML develops models to learn patterns through a database and make decisions without being programmed to do so [23]. These models learn from historical data, which contains biases inherent to social perspectives, including age-related stereotypes. The literature cited three primary causes of this type of bias: bias in modelling, bias in training, and bias in usage [24]. These biases are not always perceptible or easy to correct because the decision-making process is opaque[12](black box) [25], making discrimination difficult to detect and trace. Consequently, it can be said that discrimination prevails mainly in ML systems [26]. The bias and algorithmic discrimination involve technical processes or solutions. However, their origins have been connected to human behaviour. The quality of the data used, the stereotypes and prejudices that underlie them, and the transmission of values and concepts by the operators involved in the development of AI systems all contribute to the creation of discriminatory algorithmic solutions. Therefore, older adults, who are characterized by strong stereotypes regarding their interaction with technology and AI, are affected by this phenomenon.

In general, the insertion of the bias that generates the situation of discrimination can be associated with different moments or actions[13]. One of the moments identified is the process of identifying and selecting target variables and class labels. In this context, the risk of discrimination is generated by the identification and the relationships established between the "target variable", the characteristic sought by the search system, and the "class label" associated with it [27]. It has also been noted that discrimination can occur during data collection and selection, stemming from the use of incomplete or unrepresentative data. In this respect, it is underlined that "the quality of the collected data will influence the quality of the algorithmic decisions" [28]. Consequently, if the data used to train the algorithm is more representative of some groups of people than others, the model's predictions may also be systematically worse for unrepresented or underrepresented groups [29]. These deficiencies particularly impact the older adults' group. In this regard, it has been noted that "taken together, there is not enough data from older adults available for training AI models, and the corpus that is available shows an explicit and implicit age-related bias"[14] [30].

Some research links this problem to historical biases and social inequalities present in the data that the system works with. About this issue, it has been said that "given that our environment is widely

[11] See ELI, Guiding Principles for Automated Decision-Making in the EU, ELI Innovation Paper, European Law Institute, 2022.
[12] See the Recommendation on the Ethics of Artificial Intelligence, 2021 and the OECD AI Principles, 2019.
[13] Council of Europe, Discrimination, Artificial Intelligence, and Algorithmic Decision-Making, Study by Prof. Frederik Zuiderveen Borgesius, published by the Directorate General of Democracy, 2018.
[14] Discrimination issues associated with the data are foreseen in the AIA. See articles 10 (2) and (3) of Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024.

shaped by historical patterns of injustice and discrimination, we can expect many problematic social patterns to be ubiquitous in this way" [31]. Moreover, these biases can be introduced through the subjective perspectives of technical operators involved in the various stages of the development of AI systems[15]. In this case, stereotypes about this group's capabilities, interests, needs, and vulnerabilities are transmitted to the algorithm, which, on the one hand, generates the risk of discriminatory solutions or operations [30] and, on the other, the possibility of increasing and perpetuating this social scourge through the operations of AI systems.

Based on these arguments, it can be argued that age discrimination concerning older adults is a problematic issue linked to the development of AI. The data processing and the subjective perspectives of the subjects involved in its development and implementation can lead to discriminatory solutions. Consequently, the legal perspective on protecting the right to equality and non-discrimination of this group should focus on three fundamental directions: training the actors involved in the design of AI systems, supervising data-related processes, and strengthening policies aimed at Participatory AI.

These factors can give rise to both direct and indirect expressions of discrimination. Direct discrimination "describes the situation in which a person or group is treated less favourably than another on grounds of a characteristic protected under anti-discrimination law" [32]. On the other hand, the Council Directive 2000/43/EC establishes that "indirect discrimination shall be taken to occur where an apparently neutral provision, criterion or practice would put persons of a racial or ethnic origin at a particular disadvantage compared with other persons, unless that provision, criterion or practice is objectively justified by a legitimate aim and the means of achieving that aim are appropriate and necessary"[16]. Algorithmic biases are identified with both types of discrimination. "There are multiple ways algorithmic decisions may lead to discriminatory outputs. Except for direct discrimination cases outlined above, the indirect discrimination category fits the cases derived from data mining systems: apparently neutral practice disproportionately posing disadvantages to a protected group in comparison with other people" [33]. The complexity of how these systems operate, combined with their inherent opacity, makes the detection of indirect discrimination particularly challenging. This makes it difficult to determine age discrimination, as it facilitates its entrenchment and dissemination through technology widely used in contemporary society.

The above elements lead us to conclude that discrimination against older persons arising from the operation of AI systems responds to general problems affecting various social groups and minorities. Its broad scope requires the development of comprehensive technical measures and a review of the anti-discrimination legal framework. However, solutions must avoid overly generic approaches or those focused exclusively on the most visible marginalized groups, considering that age discrimination presents definite dynamics that require a specific technical and legal approach.

4. The European legal framework between liability and accountability

The EU did not ignore the issue and since 2006 signed the UN Convention on the Rights of Persons with Disabilities, that is, the first international human rights instrument that recognizes the need to promote equal access to information and communication technologies and systems as a fundamental right for individuals with disabilities (including in this category aged persons). So, the EU is bound to develop and enact laws that advance the accessibility of digital technologies for persons with disabilities and has attempted to respond to this request following two different but complementary itineraries: ex post and ex ante.

The first itinerary has been framed from a perspective of liability; that is, it has been conceived to ensure a satisfactory level of protection for aged people harmed by AI systems (individual risk

[15]The lack of awareness and knowledge of these issues and their corresponding effects has been addressed to some extent in the AIA since the regulation of digital literacy. The regulation itself states that in order to derive the greatest benefits from AI systems and protect fundamental rights, AI literacy should equip providers, deployers and affected persons with the necessary concepts to make informed decisions regarding AI systems. See Recital 20, article 3 (56) and article 4 of Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024.

[16]Article 2.2 a) of the Council Directive 2000/43/EC of 29 June 2000.

dimension). Such a perspective involved a civil liability framework - adapting liability rules to the digital age- and a revision of sectoral safety legislation (e.g. General Product Safety Directive). The liability measures, however, have a very low impact on ageism. Discriminatory practices and consequent harm are difficult to prove, and the restorative function of liability rules is hardly effective in this specific case. Moreover, on 11 February 2025, the EU Commission officially announced that the proposal for a new Artificial Intelligence Liability Directive has been withdrawn, while the new Product Liability Directive doesn't contain specific dedicated measures. In fact, faced with the challenges of AI, the current liability rules leave vulnerable people alone and do not protect them adequately in case of concrete harms.

A more effective approach, hence, should be focused on the prevention of damage. This is the second itinerary that directly intervenes in the AI systems' design before their commercialization, with the aim of ensuring respect for fundamental rights and addressing safety risks specific to AI systems. In this context, the agents are requested to adopt strategies and concrete measures in order to reduce risks connected with the use of AI. At the same time, they can autonomously determine modes, guarantees and limits of their own conduct, balancing the respect of fundamental rights and producers' costs and avoiding the imposition of a disproportionate burden on economic operators [34]. This second pilaster is essentially based on two directives, approved at different times and in different contexts but bound together by the common exigence of building safety products and services to boost the level of trust and improve the internal market efficiency.

The first of the mentioned acts is the AIA, which is part of a broader strategy to build a robust legal framework for trustworthy AI in the EU. The AIA is developed from a perspective of accountability; that is, it is focused on the analysis and prevention of risks (social risk dimension). It does not contain a specific discipline regarding ageism, but the age is expressly taken in account as a factor of vulnerability in the evaluation risks processes. Article 5 prohibits "the placing on the market, the putting into service or the use of an AI system that exploits any of the vulnerabilities of a natural person or a specific group of persons due to their age"; the related Recital 29 explains that the prohibition applies to AI systems deploying techniques that subvert or impair person's autonomy, decision-making or free choice and/or exploit "the vulnerabilities of a person or a specific group of persons due to their age", inducing people to materially distort their behaviour in a harmful manner. The adopted approach is purely objective: "it is not necessary for the provider or the deployer to have the intention to cause harm, provided that such harm results from the manipulative or exploitative AI-enabled practices". Such discipline, however, is less effective than it appears: it prohibits the commercialization and use of manipulative and/or exploiting AI systems, but it does not clarify what happens if, after the commercialization, a given system, that was believed innocuous at first, turns out to be harmful. Moreover, the adoption of guidelines and codes of conduct is recommended, but not mandatory for low risk systems, and are not been provided with any indication on specific ethical contents of such norms. Every initiative is left to producers.

The second legislation that should be considered is the Directive 2019/882 on the accessibility requirements of products and services (EAA). This last initiative is not commonly associated with the specific issue of inclusive AI. However, it clearly prescribes a series of provisions to make products and services more accessible for vulnerable people, "[allowing] for a more inclusive society and [facilitating] independent living for persons with disabilities". The Directive (Annex 1) specifies that "products must be designed and produced in such a way as to maximise their foreseeable use by persons with disabilities and shall be accompanied where possible in or on the product by accessible information on their functioning and on their accessibility features". This general obligation is followed by a series of more detailed measures, establishing standards for packaging and instructions, modes of communication of support services, and design and functionality of interfaces. Moreover, such a discipline is expressly extended to older people: the n. 4 of the premises clarifies that the Directive includes any person with functional limitations: so, not only "persons who have any physical, mental, intellectual or sensory impairments", but also those who have "age related impairments" that reduce their access to products and services. If so, the only obstacle to any extension of the mentioned act to the design and commercialization of AI systems to protect older persons could be the way the notion of "product and services" has been intended. In this regard, article 3 gives a very comprehensive definition

of "product" as any "substance, preparation, or good produced through a manufacturing process" but does not address AI systems directly. In the meantime, the accessibility requirements can be easily applied to AI systems, as the article 24 of the EAA have established that they are mandatory and that "any product or service, the features, elements or functions of which comply with the accessibility requirements set out in Annex I to this Directive [...] shall be presumed to fulfil the relevant obligations set out in Union acts other than this Directive, as regards accessibility, for those features, elements or functions". Moreover, in 2024 the revised Product Liability Directive adopted a wide definition of "product", which expressly includes AI systems.

5. Some final suggestions

The construction of more inclusive AI systems with specific regard to aged people is not only a social interest but also a legal obligation. However, it is not clear how such obligation shall be complied.

A first response may undoubtedly be to improve inclusive democracy mechanisms during the design phase of AI systems, on the assumption that by doing so, the final outcome would be more aligned with the needs, requirements, and desires of the final users [35]. The participation in the design processes is particularly relevant in the case of older adults, who, despite being the main target users, are often excluded from design considerations [36]. Such approach could also contribute to avoid victimization and the false representation of elder people uniquely in a perspective of illness and weakness [37].

The EU has long pursued a strategy, in order to ensure for citizens a better level of protection not only for individual rights, but also for societal interests (where the concept of societal interest is considered as distinct from the "individual" or "collective", as it "goes beyond the concern of (the sum of) individuals, but affects society at large") [38]. A main part of this strategy foresees the involvement of consumers, stakeholders and representative organizations; in this perspective, greater participation of aged people could easily be imagined. As an example, a user experience agency has been proposed, that systematically uses storytelling and visual communication design as a method for identifying potential cases of implicit ageism and for better addressing the negative impacts of implicit ageism [35]. However:

- even when a co-design approach is adopted, "the pervasive nature of implicit ageism - which affects designers and older adults themselves alike - can still negatively impact the outcome of the design process [21];
- such participation is currently contemplated in the drafting of ethical guidelines or codes of conduct, it would be necessary to extend it to the design process of AI systems;
- such participation is not a definitive solution, according to the criticisms some academics have highlighted [39]. The civil society's involvement is not in itself a guarantee of fair representation of different interests at stake. A disproportion between the presence and the right balance of different stakeholders' voices has been observed in many expert hearings in terms of AI policies;
- lastly, the risk of "participation washing" is concrete, that is, the risk that participation is merely formal, with the traps of the participation token and the tyranny of participation [40, 41]. In this sense, it is interesting that some scholars argue that the notion of "participation" should include "more subtle, and possibly exploitative, forms of community involvement in participatory machine learning design" [42]. It is suggested, indeed, "to recognize design participation as work; to ensure that participation as consultation is context-specific; and that participation as justice must be genuine and long term."

A second solution could be the better involvement of users from a technical perspective, raising the level of human-machine interaction after the design phase. Software should be added to current technology platforms' services, allowing users to express preferences about content, graphical interfaces, etc. The proposal is the creation of a system that mediates the interaction of the users with the digital world by offering a personalized tool. The multidisciplinary EXOSOUL project is an example of how to travel this road [34]. It is aimed at empowering humans with an automatically generated

software exoskeleton, i.e. "a software shield that protects users and their personal data through the mediation of all interactions with the digital world that would result in unacceptable or morally wrong behaviors according to their ethical and privacy preferences" [43]. The exoskeleton relies on the ethical profiling of a user and reflects his moral preferences, predicting user's digital behaviors. It "would act as an ethical software mediator that adjusts the system's behavior according to the user's soft ethics (personal preferences), without violating the system's hard ethics (values and norms collectively accepted)" [44]. The approach is first based on the identification of profiles in a top-down manner, through the individuation of personality traits and ethical attitudes in order to determine specific conduct of action, and then on the refinement of profiles by a personalized data-driven approach" [43]. In this sense, it has been reasoned that "empowering the users with a personalized exoskeleton will introduce more symmetry of power in the present digital world and will effectively put humans in the center" [45]. In the context of ageism, this should mean avoiding standardized and imposed solutions, following the principle that, paraphrasing Tolstoj, "all aged persons resemble one another, each aged person is old in its own way".

This second way is not alternative but complementary to the first: the participation of interested people in the design phase should be guaranteed, and they should be allowed to choose how to interact with AI systems. This option implies a perspective of collaboration with users and a bottom-up approach, promoted by several scholars [39]. Their assumption as active agents would allow addressing the problem of ageism at all stages of the technological process. This approach would also allow identifying the physical and emotional needs of older adults, as well as their preferences and group values, fostering a real impact on the developed solutions.

6. Conclusions

By adopting the suggested integrated approach, before (co-design) and after (interaction), older people should gain a place in the design, the implementation and the use of intelligent systems by involving them in ethics committees, design engeneering, market processes, and concrete decisions. This contributes to recognizing ageism and eradicating it through proper procedures. In this way, digital inclusion (that is, the ensemble of specific actions to fill the gap of the digital divide) could be transformed into digital inclusiveness (that is, the construction of more inclusive AI systems ensuring equal conditions for people and for territories, both at an individual and at a collective level) [46].

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Declaration on Generative AI

The author(s) have not employed any Generative AI tools.

References

[1] T. Shiwani, S. Relton, R. Evans, A. Kale, A. Heaven, A. Clegg, O. Todd, New horizons in artificial intelligence in the healthcare of older people, Age and Ageing 52 (2023) 219.
[2] C. Irti, et al., Older people as vulnerable persons in the perspective of law, PHENOMENOLOGY AND MIND 28 (2025).

[3] I. Lamia, Digital illiteracy and the myth of digital natives: unveiling realities and challenges, JETT 15 (2024) 263–276.
[4] M. Prensky, Digital natives, digital immigrants part 2: Do they really think differently?, On the horizon 9 (2001) 1–6.
[5] A. Seifert, M. Hofer, J. Rössel, Older adults' perceived sense of social exclusion from the digital world, Educational Gerontology 44 (2018) 775–785.
[6] F. Mubarak, R. Suomi, Elderly forgotten? digital exclusion in the information age and the rising grey digital divide, INQUIRY: The Journal of Health Care Organization, Provision, and Financing 59 (2022) 00469580221096272.
[7] L. Ayalon, C. Tesch-Römer, Introduction to the section: Ageism—concept and origins, Contemporary perspectives on ageism (2018) 1–10.
[8] S. Manor, A. Herscovici, Digital ageism: A new kind of discrimination, Human Behavior and Emerging Technologies 3 (2021) 1084–1093.
[9] A. Rosales, J. Svensson, Perceptions of age in contemporary tech, Nordicom Review, 2021, 42 (1) (2021).
[10] B. Levy, Stereotype embodiment: A psychosocial approach to aging, Current directions in psychological science 18 (2009) 332–336.
[11] M. Imran, G. Murtiza, M. S. Akbar, The impact of artificial intelligence on human rights, democracy and the rule of law, Journal of Politics and International Studies 9 (2023) 15–29.
[12] C. Casonato, Costituzione e intelligenza artificiale: un'agenda per il prossimo futuro, BioLaw Journal-Rivista di BioDiritto (2019) 711–725.
[13] L. S. Fernández, La proposta di regolamento dell'unione europea sull'intelligenza artificiale tra diritti fondamentali, mercato e progresso tecnologico, Tecnologie e Diritto (2023).
[14] E. D. Gibbons, Toward a more equal world: the human rights approach to extending the benefits of artificial intelligence, IEEE Technology and Society Magazine 40 (2021) 25–30.
[15] C. Muller, The impact of artificial intelligence on human rights, democracy and the rule of law, Council of Europe, Strasbourg (2020).
[16] J. Stypinska, Ai ageism: a critical roadmap for studying age discrimination and exclusion in digitalized societies, AI & society 38 (2023) 665–677.
[17] I. C. on Machine Learning (Ed.), Invisible Inequities: Confronting Age-Based Discrimination in Machine Learning Research and Applications, 2024.
[18] I. Mannheim, Ageism in the use and design of digital technology: A theoretical model, Innovation in Aging 7 (2023) 834.
[19] I. Mannheim, Ageism in the use and design of digital technology, Ph.D. thesis, Tilburg University, Warandelaan 2, 5037 AB Tilburg, Netherlands, 2023.
[20] A. Parthasarathy, A. Phalnikar, A. Jauhar, D. Somayajula, G. S. Krishnan, B. Ravindran, Participatory approaches in ai development and governance: A principled approach, arXiv preprint arXiv:2407.13100 (2024).
[21] E. Comincioli, E. Hakokõngäs, M. Masoodian, Identifying and addressing implicit ageism in the co-design of services for aging people, International journal of environmental research and public health 19 (2022) 7667.
[22] N. Kordzadeh, M. Ghasemaghaei, Algorithmic bias: review, synthesis, and future research directions, European Journal of Information Systems 31 (2022) 388–409.
[23] W. Niemiec, R. F. Borges, D. A. Barone, Artificial intelligence discrimination: how to deal with it?, in: Workshop sobre as Implicações da Computação na Sociedade (WICS), SBC, 2022, pp. 93–100.
[24] X. Ferrer, T. Van Nuenen, J. M. Such, M. Coté, N. Criado, Bias and discrimination in ai: a cross-disciplinary perspective, IEEE Technology and Society Magazine 40 (2021) 72–80.
[25] V. Hassija, V. Chamola, A. Mahapatra, A. Singal, D. Goel, K. Huang, S. Scardapane, I. Spinelli, M. Mahmud, A. Hussain, Interpreting black-box models: a review on explainable artificial intelligence, Cognitive Computation 16 (2024) 45–74.
[26] I. H. Sarker, Machine learning: Algorithms, real-world applications and research directions, SN computer science 2 (2021) 160.

[27] C. Nardocci, et al., Intelligenza artificiale e discriminazioni, Gruppo di Pisa 2021 (2021) 9–60.
[28] L. Belenguer, Ai bias: exploring discriminatory algorithmic decision-making models and the application of possible machine-centric solutions adapted from the pharmaceutical industry, AI and Ethics 2 (2022) 771–787.
[29] N. T. Lee, P. Resnick, G. Barton, Algorithmic bias detection and mitigation: Best practices and policies to reduce consumer harms, Brookings Institution (2019).
[30] C. H. Chu, R. Nyrup, K. Leslie, J. Shi, A. Bianchi, A. Lyn, M. McNicholl, S. Khan, S. Rahimi, A. Grenier, Digital ageism: challenges and opportunities in artificial intelligence for older adults, The Gerontologist 62 (2022) 947–955.
[31] G. M. Johnson, Algorithmic bias: on the implicit biases of social technology, Synthese 198 (2021) 9941–9961.
[32] R. Xenidis, The concept of direct discrimination in european anti-discrimination law: Theory, practice and limits, Research Handbook on European Anti-Discrimination Law (2022).
[33] P. P. Ponce, Direct and indirect discrimination applied to algorithmic systems: Reflections to brazil, Computer Law & Security Review 48 (2023) 105766.
[34] C. Alfieri, F. Caroccia, P. Inverardi, et al., Ai act and individual rights: A juridical and technical perspective., in: IAIL@ HHAI, 2022.
[35] B. Ku, E. Lupton, Health design thinking: creating products and services for better health, mit Press, 2022.
[36] I. Mannheim, E. Schwartz, W. Xi, S. C. Buttigieg, M. McDonnell-Naughton, E. J. Wouters, Y. Van Zaalen, Inclusion of older adults in the research and design of digital technology, International journal of environmental research and public health 16 (2019) 3718.
[37] M. Wallimann, K. Inerle, A. Ferrario, E. Benz-Steffen, B. Demiray, Co-developing an educational platform against ageism with older adults: A use case from switzerland, Educational Gerontology (2025) 1–11.
[38] N. A. Smuha, Beyond the individual: governing ai's societal harm, Internet Policy Review 10 (2021).
[39] F. Delgado, S. Yang, M. Madaio, Q. Yang, The participatory turn in ai design: Theoretical foundations and the current state of practice, in: Proceedings of the 3rd ACM Conference on Equity and Access in Algorithms, Mechanisms, and Optimization, 2023, pp. 1–23.
[40] L. Liebenberg, A. Jamal, J. Ikeda, Extending youth voices in a participatory thematic analysis approach, International Journal of Qualitative Methods 19 (2020) 1609406920934614.
[41] A. Moriggi, Green care practices and place-based sustainability transformations: A participatory action-oriented study in Finland, Ph.D. thesis, Wageningen University and Research, 2021.
[42] M. Sloane, E. Moss, O. Awomolo, L. Forlano, Participation is not a design fix for machine learning, in: Proceedings of the 2nd ACM Conference on Equity and Access in Algorithms, Mechanisms, and Optimization, 2022, pp. 1–6.
[43] C. Alfieri, P. Inverardi, P. Migliarini, M. Palmiero, Exosoul: ethical profiling in the digital world, in: HHAI2022: Augmenting Human Intellect, IOS Press, 2022, pp. 128–142.
[44] P. Inverardi, M. Palmiero, P. Pelliccione, M. Tivoli, et al., Ethical-aware autonomous systems from a social psychological lens., in: CoPDA@ AVI, 2022, pp. 43–48.
[45] M. Autili, D. Di Ruscio, P. Inverardi, P. Pelliccione, M. Tivoli, A software exoskeleton to protect and support citizen's ethics and privacy in the digital world, IEEE Access 7 (2019) 62011–62021.
[46] M. Gibin, G. Pirina, et al., Il processo di sviluppo dei sistemi di ia: dal participation washing al digital inclusiveness, AGENDA DIGITALE EU 18 (2024) 15–26.