

Research Article

Anti-discrimination Law and Digital Vulnerability Based on Gender

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Abstract

Anti-discrimination law is based on principles such as equality and the dignity of the human person, expressly provided for in international texts such as the Universal Declaration of Human Rights and the European Convention on Human Rights. It aims to guarantee equal treatment and protection against negative discrimination, promoting the inclusion of vulnerable groups. In the digital environment, this protection becomes even more relevant, since technology can both reduce inequalities and amplify vulnerabilities and, consequently, inequalities. Digital vulnerability refers to the unequal exposure to technological risks, which can affect the privacy, security, and exercise of fundamental rights of socially marginalized groups, such as the elderly, people with disabilities, and economically disadvantaged communities, who face greater obstacles to the safe use of technology. Furthermore, digital exclusion can perpetuate inequalities in access to information, education, and essential public services. Digital vulnerability based on gender refers to the specific inequalities and risks faced by women and people of segregated and/or marginalized gender identities in the digital environment, considering that technology has the potential to reproduce and amplify discrimination, giving rise to new forms of violence, exclusion, and inequality. In this sense, the digital environment has become a new space for the perpetuation of gender-based violence, through online harassment, digital sexual violence, misogynistic and transphobic attacks, as well as algorithms that determine discriminatory outcomes. The proposed theme aims to create a dialogue that considers public policies and regulations that promote the inclusion of these vulnerable groups, ensuring that technology becomes an instrument of inclusion and not of oppression and segregation. This article argues that digital technologies reproduce and amplify structural gender inequalities through algorithmic bias, underrepresentation, and intersectional exclusion. It concludes by proposing concrete legal and technical reforms, including mandatory gender-focused algorithmic audits, diversity obligations in AI teams, and the adoption of a European Directive on Digital Equality, to ensure substantive gender equality in digital environments.

Keywords

Vulnerability, Gender, Discrimination, Technology

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1. Introduction

The digital revolution has profoundly transformed contemporary social, economic, and legal structures. However, this evolution, is far from being neutral, has progressively highlighted and sometimes intensified pre-existing structural inequalities, among them, gender-based discrimination or gender-based inequalities. Within the digital environments, a contemporary reconfiguration of social exclusion is manifested: digital gender discrimination, characterized by disparities in access, use, representation, and differentiated algorithmic treatment based on gender.

This study adopts a doctrinal and analytical methodology, integrating comparative legal interpretation with interdisciplinary insights from sociology and technology studies. The approach combines normative legal analysis (European Union and International Human Rights Law) with literature review, aiming to elucidate how legal systems can respond to algorithmic discrimination and digital exclusion. The analysis focuses primarily on the European Union, while drawing comparative lessons from international law. The scope is limited to gender-based and intersectional discrimination in digital environments, without attempting a global empirical generalization. The article structure proceeds as a conceptual clarification (digital discrimination and exclusion), analysis of legal foundations, critical evaluation of existing mechanisms, intersectional perspectives, and proposals to reform.

This aims to analyze the contours of digital gender discrimination, using a multidisciplinary approach that spans the fields of law, social sciences, and technology. It is based on the premise that discriminatory practices observed in the physical world find new mechanisms for reproduction and amplification in digital spaces, namely through the use of biased algorithms and the lack of female representation in technological and decision-making structures [1, 2].

In this context, a critical analysis of the conformity of technological practices with the fundamental principles of law is necessary, especially the principle of equality and non-discrimination, as provided for in legal instruments such as the Charter of Fundamental Rights of the European Union (CFREU, articles 21 and 23), the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), and the European Convention on Human Rights (ECHR, article 14). Indeed, this article aims to identify the predominant forms of digital discrimination based on gender, critically analyze the technological, social, and legal factors that contribute to this phenomenon, and present proposals for a normative and technical framework for its prevention and mitigation.

Digital discrimination refers to practices of unjustified exclusion or differentiation in access to and use of information and communication technologies (ICTs) and can manifest itself in various forms: from unequal access to the Internet and devices, to the reproduction of biases in automated decisions [3]. The phenomenon acquires particular relevance when it is

linked to gender, translating into the so-called gender digital divide, that is, the disparity between men and women regarding digital literacy, access to information, and representation in technological sectors [4, 5].

Algorithms, when trained with biased historical data, tend to perpetuate gender stereotypes, contributing to systematically discriminatory decisions in processes such as recruitment, personalized advertising, and credit eligibility [1]. As Liu and Gao [2] warn, these forms of discrimination are particularly pernicious due to their hidden nature and the difficulty of public scrutiny, which compromises transparency and legal accountability.

Digital inequality is not limited to access. It extends to the underrepresentation of women in technological professions, in spheres of decision-making in digital innovation, and in the content produced and disseminated online [6]. This underrepresentation not only reduces the visibility of women's experiences in the digital space but also perpetuates a technological architecture centered on masculine paradigms. This perspective is reinforced by Nie's conclusions, which identify recurring patterns of online harassment, symbolic violence, and marginalization of women and gender minorities in digital environments [7].

On the other hand, even public digital platforms, such as e-Government services, are not immune to structural biases. Studies such as that of Foteinou demonstrate how efficient systems can present structural flaws that devalue or disregard the needs and conditions of women [4].

2. Digital Discrimination and Digital Exclusion

Digital discrimination and digital exclusion are interrelated. These two forms intersect: exclusion precedes discrimination, and algorithmic bias perpetuates exclusion by embedding historical inequalities in data. Thus, effective regulation must target both access and algorithmic fairness simultaneously.

Digital discrimination consists of technological practices, processes, and decisions that result in unequal treatment of individuals or groups based on protected personal characteristics, such as gender. This can occur in multiple dimensions: (i) exclusion from physical and economic access to digital technologies; (ii) exclusion from digital skills (literacy and proficiency); and (iii) algorithmic exclusion, where automated systems operate based on patterns that perpetuate stereotypes and inequalities [1, 3].

The systemic nature of this discrimination is exacerbated by the invisible nature of its mechanisms. Unlike direct discrimination, which is often revealed as targeted by explicit behaviors, digital discrimination is frequently indirect, diffuse, and structured within the technological systems themselves. Arti-

ficial intelligence algorithms, for example, are based on historical data that reflect gender biases. The use of such data leads to the reproduction and amplification of these biases under the guise of technical neutrality [2].

This type of discrimination is particularly concerning in areas such as behavioral advertising, automated recruitment, and credit systems, where algorithm-based decisions can exclude women from economic and professional opportunities based on statistical inferences that reflect past inequalities.

According to Talapina (2022), the opacity of algorithms requires the implementation of instruments such as algorithmic audits, impact tests on fundamental rights, and transparency obligations on the part of operators of automated systems [1].

Digital exclusion is often revealed as the process by which certain individuals or groups are systematically deprived of equitable and meaningful access to digital technologies, the Internet, digital skills, and the benefits of digitization, due to socioeconomic, cultural, territorial, or identity factors [3]. It is a structural phenomenon that reproduces existing inequalities in society, often made invisible by the apparent neutrality of technological tools.

Digital discrimination, in turn, refers to the attribution of unequal or unfavorable treatment to people or groups in digital environments based on protected characteristics, such as gender, ethnicity, age, religion, sexual orientation, or disability. This can take two main forms: a) Direct discrimination, when a digital interface, algorithm, or service imposes explicit or differentiated restrictions based on gender, for example, offering fewer job opportunities to women based on arbitrary criteria; b) Indirect discrimination: when an apparently neutral practice (such as an algorithm trained with biased data) generates disproportionate disadvantages for certain groups, even without discriminatory intent [1, 2].

Under Article 21 of the Charter of Fundamental Rights of the European Union, such discrimination is prohibited whenever it occurs within the Union's competences, including in the development and regulation of the digital market. Although there are no specific provisions on digital discrimination in the founding treaties, the general principles of equality, transparency and fairness are fully applicable to technological environments.

2.1. Dimensions of Exclusion: Access, Use, and Literacy

Digital exclusion should be understood as a multidimensional phenomenon, whose implications vary according to the social and legal context. Three main dimensions should be highlighted:

2.1.1. Access (Infrastructure and Connectivity)

This refers to the availability and material possibility of access to digital devices and the Internet. This dimension includes factors such as network coverage, service costs, the existence of adequate equipment, and socioeconomic conditions.

Research shows that, globally, women have less access to mobile and fixed Internet, especially in developing countries, which limits their potential for civic and economic participation [4, 7].

2.1.2. Usage (Effective Digital Adjustment)

It goes beyond connectivity. It includes the frequency, quality, and relevance of technology use, as well as the freedom to choose how, when, and why to use digital technology. Cultural and family factors, such as restrictive gender norms or surveillance of women, often limit this use, even when technical access exists [5].

2.1.3. Digital Literacy (Technical and Critical Skills)

It encompasses the ability to use, understand, and critically evaluate available digital resources, as well as to create content in a safe and ethical manner. Digital literacy is essential to avoid technological marginalization and to exercise fundamental rights online, such as freedom of expression or data protection. However, gender disparities in digital training persist, including in formal education and continuing education, perpetuating inequalities in the digital labor market [6].

2.2. Dimensions of Exclusion: Address Discrimination

These three dimensions are dynamically interconnected: without access, there is no use; without use, there is no skills development; without skills, exclusion is perpetuated. Effective public policies should therefore address all dimensions simultaneously, promoting equal digital opportunities with a gender focus and respecting the principle of non-discrimination enshrined in European Union law and international human rights law.

3. Gender and Technology

The relationship between gender and technology is marked by structural power asymmetries, which are reflected in the development, access, use, and regulation of digital technologies. Technology, far from being neutral, is a social construct that reflects and reproduces the values, interests, and prejudices of the society in which it is produced. This often includes patriarchal and binary views on gender, which marginalize or render invisible women, non-binary people, and other gender minorities (Nie, 2023).

The right to equitable participation in the digital society, implicitly enshrined in Article 23 of the EU Charter of Fundamental Rights, requires overcoming these inequalities by promoting an inclusive approach in the design and implementation of technologies, as well as in access to professional opportunities in the sector.

3.1. Gender Stereotypes in Technology

The social construction of women's roles in technological contexts has historically been shaped by persistent gender stereotypes that associate women with support or caregiving tasks and men with innovation, logical reasoning, and technical leadership. These stereotypes have a significant impact because they discourage girls from an early age from pursuing STEM fields, creating a cycle of professional disengagement; they influence the expectations of companies and recruiters, leading to less hiring of women for technical or leadership positions in ICT; and they contribute to the normalization of the masculinization of algorithms and artificial intelligence, as demonstrated by Liu and Gao, when trained with historically androcentric data and logic [2].

Talapina also warns that these biases, when incorporated into automated systems, become systemic and self-perpetuating, with discriminatory effects aggravated by their technical opacity [1].

3.2. Underrepresentation of Women in the Technology Industry

Women's participation in the technology industry remains low, both quantitatively and qualitatively. Women are a minority in university computer engineering courses, in technical software development positions, and in business leadership structures in the digital sector [6, 8]. Underrepresentation is particularly visible in top management and leadership positions in technology companies, in patent authorship and digital innovation, and in the construction of artificial intelligence models, where there is a critical diversity deficit in development teams [7].

This deficit compromises not only equal professional opportunities, but also the democratic and inclusive quality of the technology itself. The absence of women in the design of technological systems contributes to biased results, reinforcing indirect discrimination and perpetuating gender asymmetries in the social outcomes of digitalization.

3.3. Sociocultural and Economic Barriers

The causes of female underrepresentation and digital exclusion are not only technological but are rooted in sociocultural and economic structures of historical discrimination. Among the main barriers identified by the specialized literature are gender norms that assign women the responsibility for family care, limiting the time and resources available to invest in digital training or career advancement [4], wage inequality, which affects women's ability to acquire digital devices or access specialized training, the absence of public policies for reconciling family and professional life, especially in technological sectors, which require high availability and long working hours, direct or veiled discrimination in recruitment, where female applications are frequently overlooked based on

assumptions about ability, emotional stability or availability [1], and a lack of female role models in the sector, which limits the aspirations of young girls in technological fields [6].

These barriers require integrated responses that combine public policies for equality, regulatory measures in the private sector, and digital empowerment initiatives specifically for women and girls.

4. Intersectionality and Digital Discrimination

The intersectional approach, as developed by Kimberlé Crenshaw, is an indispensable analytical tool for understanding how multiple forms of discrimination intersect and reinforce each other, generating complex inequalities that cannot be reduced to isolated categories. In the digital context, intersectionality allows us to examine how gender, in conjunction with factors such as race, social class, age, disability, sexual orientation, or territory, influences how different groups experience exclusion and discrimination [9].

Intersectionality explains how multiple discrimination axes in digital environments, manifests through data invisibility (e.g. underrepresentation in datasets) and algorithmic misrecognition (e.g. systematic bias in facial recognition, credit scoring or job screening). For example, algorithms used in recruitment have been shown to replicate gender and racial stereotypes, disproportionately excluding women of color. Similarly, facial recognition systems have demonstrated higher error rates for dark-skinned women, revealing an intersectional pattern of bias [10, 11].

To operationalize intersectionality, European Legal Instruments must embed it into regulatory processes, specifically it should mandate gender and intersectionality based impact assessments, equality directives must expand their scope to cover algorithmic and indirect discrimination arising in automated decision-making, and public policies should institutionalize participatory design mechanisms, ensuring affected communities co-create digital inclusion strategies [12].

Actually, although the principles of equality and non-discrimination are firmly grounded in international and European law, their application to digital contexts becomes clearer when examined through concrete examples of algorithmic gender bias. These examples demonstrate how structural inequalities, traditionally addressed under anti-discrimination law, are now reproduced through data-driven technologies, requiring renewed regulatory attention under Article 21 and 23 of the CFREU, CEDAW and IA Act.

4.1. Invisibility and Invisibility-Making in Data and Algorithms

In algorithmic and artificial intelligence systems, the data used to train models are frequently marked by historical omissions and biases. Racialized women, transgender people, older

adults, or individuals with disabilities are often underrepresented in datasets or represented in a stereotypical way. As point out, this phenomenon leads to automated decisions that reinforce intersectional exclusions: for example, advertising targeting may render Black women invisible in employment or credit campaigns; or facial recognition may systematically fail to identify the faces of non-white women [2].

These concrete cases demonstrate that algorithmic discrimination is not a theoretical risk but an observable reality that challenges existing legal doctrines. By aligning them with established case law from CJUE and ECHR, it becomes clear that indirect and intersectional discrimination principles already offer a solid legal basis for addressing algorithmic bias, that positive obligation compel both States and private entities to prevent digital discrimination proactively, and that legal neutrality must yield to substantive equality, requiring algorithmic transparency, gender-sensitive audits, and enforceable accountability mechanisms.

By ignoring these intersections, technological systems not only perpetuate inequalities but also produce discriminatory results with the appearance of mathematical neutrality. This, therefore, challenges the very idea of algorithmic justice, requiring a legal interpretation capable of incorporating identity intersections into proportionality tests and impact obligations foreseen in the European AI Regulation Proposal (COM/2021/206 final).

4.2. Double and Triple Marginalization in Access to and Digital Literacy

Studies such as those by Foteinou and Ayuso indicate that low-income women, belonging to ethnic minorities, residing in rural areas, or migrants face accumulated barriers to accessing technology. These barriers range from a lack of adequate digital infrastructure to the economic impossibility of acquiring devices, including linguistic and legal obstacles (in the case of migrants without legalized status, for example) [4, 6].

In the realm of digital literacy, the situation worsens: training programs rarely consider cultural diversity or schedules adapted to the realities of caregivers who are digitally illiterate or in situations of multiple vulnerabilities. Thus, intersectionality reveals how digital exclusion becomes stratified and cumulatively accentuated, placing certain groups in a situation of true structural marginalization.

4.3. Intersectional Legal and Political Responses

The legal response to digital discrimination must explicitly recognize the intersectional nature of inequalities. Article 21 of the Charter of Fundamental Rights of the European Union prohibits discrimination based on sex, racial or ethnic origin, religion, disability, age or sexual orientation — but European case law has, albeit in a limited way, recognized that the com-

bination of these factors can create aggravated forms of discrimination that require enhanced protection.

As Bulea and Talapina point out, it is essential to ensure that impact tests on fundamental rights in digital environments consider intersectional variables, that public policies for digital inclusion are designed with the direct participation of vulnerable groups, and that regulators impose specific diversity obligations in algorithmic training data and technological development teams [1, 3].

Thus, the inclusion of an intersectional approach in legal and technical systems is not only a measure of social justice, but a legal imperative stemming from the principles of substantive equality, human dignity, and non-discrimination, central pillars of the democratic rule of law.

Analyzing discrimination from the perspective of a single characteristic does not allow an adequate response to various manifestations of unequal treatment. Multiple discrimination describes a type of discrimination based on several characteristics that intervene separately. Intersectional discrimination describes a situation in which several characteristics interact with each other simultaneously, in such a way that they are inseparable and produce specific types of discrimination.

People from different backgrounds are often victims of multiple discrimination, because each person has an age, a gender, an ethnic origin, a sexual orientation, a belief system or a religion, all are in a certain state of health or may suffer from a disability. No group with a specific characteristic is homogeneous, this means that each person possesses a unique pattern of characteristics that affect their relationships with other people and may involve the dominance of some over others.

Currently, the only allusion to multiple discrimination in EU law is contained in the recitals of the Directive on racial equality (2000/43/EC) and the Directive on equality in employment (2000/78/EC), which simply provide that "women are frequently victims of multiple forms of discrimination".

Similar to Article 14 of the ECHR, Article 21 of the EU Charter contains a non-exhaustive list of grounds for discrimination. In contrast, it is not possible to extend the grounds for discrimination provided for in EU secondary law because the grounds covered by equality directives are listed exhaustively.

5. Legal Basis and Jurisprudence on Gender Equality and Intersectional Discrimination

The ECHR appears to tacitly recognize intersectional discrimination, although it does not use the terms discrimination multiple or intersectional discrimination, it clearly adopts an approach that takes into account discrimination based on multiple grounds. The case law of the European Court of Human Rights (ECtHR), in the context of the application of the principle of non-discrimination (Article 14 of the Convention), has been concretizing the principle through the configuration

of the negative obligation of non-discrimination, an obligation to ensure respect for the principle of equality in the various spheres of social life.

This means that there has been an evolution from the concept of discrimination (direct discrimination) to one sensitive to the results of discriminatory behavior (indirect discrimination). In these terms, we understand that a concrete comparative analysis between two individuals who are in relevantly similar situations and the demonstration of the causal link between the use of the prohibited criterion and the harm suffered will suffice to establish the existence of direct discrimination. The principles of equality and non-discrimination have received increasingly attentive scrutiny from international institutions that, directly or indirectly, assume as their mission the respect for human rights. This attention is justified by the divisive nature of the violation of those principles, reflecting the central role they have been consolidating at the international level.

Within the framework of the European Court of Human Rights, both Article 14 and Additional Protocol N°12 prohibit discrimination based on multiple protected categories, thus allowing, in theory, the initiation of an action based on multiple grounds. Furthermore, since the list of protected categories of discrimination is not exhaustive, the ECtHR can expand it and include grounds that are not expressly stated. However, the Court does not use the terms multiple discrimination or cross-intersectional discrimination.

In the case *N. B. v Slovakia*, concerning the forced sterilization of a roman woman in a public hospital, the applicant expressly alleged that she was discriminated against on more than one ground (race, origin, ethnicity and sex). The ECtHR made no explicit reference to discrimination or multiple discrimination but stated that the practice of sterilizing women without their prior and informed consent affected vulnerable individuals from various ethnic groups. It concluded that there was a violation of Articles 3 and 8 of the ECHR [13].

Also in the *B. S. v. Spain* case, a sex worker of nigerian origin and legally residing in Spain alleged that the spanish police mistreated her physically and verbally because of her race, sex, and profession. She stated that, unlike other sex workers of European origin, she was repeatedly subjected to police checks and the victim of racist and sexist insults. In this process, two third parties (the AIRE Center and the European Unit for Social Research at the University of Barcelona) asked the ECHR to recognize intersectional discrimination, which required an approach that took into account discrimination based on multiple grounds. The Court concluded that Article 3 had been violated, but this time it went further, examining separately whether the authorities had failed to investigate the existence of a possible causal link between the alleged racist attitudes and the violent acts of the police. Consequently, it concluded that Article 14 had been violated, since the national courts had not taken into account the applicant's special vulnerability inherent in her position as an African woman working as a prostitute [14].

In the *Carvalho Pinto de Sousa Morais v. Portugal* case, the plaintiff filed a civil action against a hospital for medical negligence during her gynecological surgery. The Administrative Court ruled in her favor and ordered the other party to pay compensation. On appeal, the Supreme Administrative Court upheld the first instance decision but reduced the amount of compensation. The plaintiff argued that the Supreme Administrative Court's decision was discriminatory on the basis of sex and age. The Supreme Administrative Court took into account the fact that, at the time of the surgery, the plaintiff was already 50 years old and had two children. It is considered that, at that age, sexuality is not as important as in youth and that its relevance diminishes with age. The Supreme Administrative Court also stated that, considering the age of the children, the plaintiff "probably only needed to take care of her husband." The ECHR observed that the issue was not age or sex per se, but rather the assumption that sexuality was not as important for a 50-year-old woman and mother of two as for someone younger. This assumption reflected a traditional idea of female sexuality as being essentially associated with reproduction, thus ignoring its physical and psychological relevance to women's personal fulfillment. In addition to being moralistic, it did not consider other dimensions of women's sexuality, in the specific case of the applicant. In other words, the Supreme Administrative Court had started from a generic assumption without seeking to confirm its validity in the specific case. The decision of the Supreme Administrative Court cannot be explained solely by unfortunate wording. The applicant's age and sex appear to have been decisive factors in the final decision, introducing a difference in treatment based on these reasons. Consequently, the ECHR concluded that there was a violation of Article 14 of the ECHR, in conjunction with Article 8 [15].

In the case of *Parris v Trinity College*, the Court of Justice of the European Union (CJEU) had to rule on the possibility of multiple discrimination, since the referring court specifically raised this issue. D. L. Parris requested that, upon his death, his same-sex partner in a registered de facto union should benefit from the survivor's pension provided by the pension scheme. This request was dismissed on the grounds that this registered de facto union was only formed after his sixtieth birthday, so it did not meet the requirements of the pension scheme. However, the de facto union was registered in the United Kingdom in 2009, after D. L. Parris turned 60; in Ireland, it was only recognized from 2011 onwards. Therefore, the spouse or registered partner of a homosexual person born before 1 January 1951 would not be entitled to a survivor's pension under this scheme. However, the CJEU ruled that if a measure is not likely to create discrimination based on any of the grounds prohibited by Directive 2000/78/EC — when those grounds are viewed in isolation — it cannot be considered to constitute discrimination by virtue of the combined effect of those grounds, in this case, sexual orientation and age [16].

5.1. International and European Legal Instruments

The Convention on the Elimination of All Forms of Discrimination against Women, adopted by United Nations General Assembly Resolution 34/180, imposes on signatory States the obligation to eliminate discrimination in all spheres, including the technological one. Article 5 mandates the elimination of prejudices and practices based on stereotypical gender role, which underlie digital discrimination.

The Charter of Fundamental Rights of the European Union (2000/C 364/01) in its Article 21, the prohibition of discrimination based on sex, and in Article 23, and eu European Convention on Human Right, in its Article 14 and Protocol 12, enshrines the duty to actively promote equality between men and women. These principles are also applicable to areas regulated by digital technologies, especially with regard to services provided online by public and private entities.

Furthermore, the European Regulation on Artificial Intelligence provides the prohibition of AI systems that pose an unacceptable risk to fundamental rights, including automated discriminatory practices. The AI Act also provides for the obligation to assess the impact on fundamental rights, including the right to equality.

5.2. Key Jurisprudence on Gender-Based Discrimination

Jurisprudence demonstrates that European Union and the European Court of Human Rights already provide conceptual tools to address algorithmic discrimination, even if not yet explicit framed as such. Indeed, european jurisprudence collectively supports our central argument that the discrimination in digital systems should be legally treated as a continuation of structural inequalities already recognized by the ECHR and de CJEU.

The precedents establish a coherent doctrinal bridge between traditional equality law and algorithmic accountability, reinforcing the call for intersectional impact assessment, gender-sensitive algorithmic audits, and binding transparency obligation in the EU's IA Act and future Digital Equality Directive.

These examples also reveal how intersectional vulnerabilities compound discrimination in algorithmic environments. Women of color, older women, or individuals identifying as transgender are often doubly marginalized by data biases and underrepresentation in datasets, what illustrates the need to explicit include intersectional variables in digital impact assessments. Legally, this requires interpreting de Charter's equality provisions dynamically, ensuring that discrimination in the digital sphere is not assessed solely in single-axis criteria but as a cumulative and systemic violation.

The fight against digital gender discrimination finds legal support in various international, european, and national instru-

ments that enshrine the principle of equality and non-discrimination. The problem is not the insufficiency of legal instruments for protection, but rather their effectiveness; it suffices to list the various instruments already in force, with the fight against gender-based digital discrimination rests upon. However, existing a robust normative foundation, the existing norms remain technologically neutral, with hinders their direct application to algorithmic contexts.

6. Need for Sectoral Legal Integration

According to Talapina the emerging challenges posed by digital gender discrimination require an integrated and preventive legislative response, with specific obligations regarding algorithmic transparency, technical accountability of programmers, and regulatory oversight. In this sense, it is necessary to strengthen independent algorithm audits to detect discriminatory impacts, institutional capacity building for technological oversight focused on fundamental rights, and the equitable participation of women and gender minorities in the design and regulation of emerging technologies [1].

These instruments and proposals should be interpreted in conjunction with the foundational values of the rule of law, which impose not only the abstention from discrimination by the State, but also positive duties to promote substantive equality in digital spaces, as already recognized by the Court of Justice of the European Union and the European Court of Human Rights.

As Fernando Rey Martínez points out that modern anti-discrimination law should be understood not only as a reactive system for prohibiting formal inequality, but as an active instrument of social justice that imposes positive transformative duties on the State [17].

According to an inclusive model, the fight against discrimination must be based on a three-dimensional vision of equality: formal equality (equal treatment before the law), material equality (compensation for actual inequalities), and inclusive equality (guarantee of participation and representation in spaces of power and decision-making) [18].

This last dimension proves especially relevant in the digital context, where the lack of representation of women and gender minorities in technological systems perpetuates structural exclusions. Thus, in light of Fernando Rey's theory, Martínez argues that digital discrimination based on gender requires a structural legal response that goes beyond neutrality and incorporates affirmative action and guarantees of plural inclusion in technological development and algorithmic governance.

7. Critical Evaluation of Current Legal and Technical Mechanisms

The proliferation of digital technologies and the increasing automation of decision-making processes pose significant

challenges to the protection of fundamental rights, particularly the principle of equality and non-discrimination based on gender. Although relevant normative instruments exist, both internationally and in Europe, the current legal and technical framework is still insufficient, fragmented, and difficult to operationalize in the face of the complexity of the phenomenon of digital discrimination [19, 20].

7.1. International and European Legal Mechanisms

7.1.1. Charter of Fundamental Rights of the European Union

The CDFEU is the main instrument for the protection of fundamental rights in the European area. Article 21 expressly prohibits discrimination based on sex, sexual orientation, ethnic origin, age or disability. Article 23 imposes an active duty to promote equality between men and women. However, these provisions do not contain specific provisions on technology or algorithmic discrimination, which hinders their direct application in digital contexts, where forms of discrimination are often indirect, technical and invisible [1].

7.1.2. European Regulation on Artificial Intelligence (AI Act)

The Regulation of the European Parliament and of the Council establishing harmonised rules on artificial intelligence (Regulation EU 2024/1689) represents the European Union's most robust effort to regulate the impact of AI systems on fundamental rights. Article 5 provides for the prohibition of AI systems considered to pose an "unacceptable risk", such as those that use subliminal techniques or perform social evaluation.

The regime set out in Article 9 and following imposes obligations regarding risk management, data quality, transparency, and human oversight on "high-risk" systems. This category includes systems used in recruitment, credit, and access to education—all with a high potential for gender discrimination.

However, the proposal has important gaps, such as the absence of a specific obligation to test impact with a gender or intersectional focus, it does not impose clear diversity duties on teams that design or audit algorithms, and the concept of "high risk" is vague and dependent on sectoral categorization, which may leave out relevant discriminatory practices.

7.2. Lack of Regulatory Uniformity

Despite the existence of horizontal directives on gender equality (e.g., Directive 2006/54/EC on equality in employment), European legislation still lacks a coherent and cross-cutting framework for regulating digital discrimination. The absence of harmonized standards on algorithmic audits, the legal responsibility of programmers, and citizens' rights to explanation exacerbates the risk of algorithmic impunity.

7.3. Technical and Self-Regulatory Mechanisms

7.3.1. Algorithmic Audits

Algorithmic audits constitute one of the most promising technical tools for detecting and correcting discriminatory biases in automated systems. Talapina emphasizes that these audits should be independent, transparent, mandatory, and legally binding [1].

However, in practice, they are rarely implemented outside of experimental or voluntary contexts, there is a lack of a standard methodology for evaluating gender impact, and the results are not public, which compromises transparency and democratic scrutiny.

7.3.2. Impact Assessment Tools

Tools for assessing the impact on fundamental rights are emerging as recommended practice—notably in the AI Act—but they remain vague, non-normative, and lack effective sanctions in cases of omission or bad faith.

7.4. Industry Initiatives and “Digital Ethics”

Large technology companies have adopted voluntary codes of conduct and “AI ethics” departments. However, such mechanisms lack external oversight, legal obligation, and social representation, especially of women and gender minorities in decision-making processes [6]. As Nie points out, overconfidence in technological self-regulation perpetuates a logic of self-referentiality and irresponsibility, which contradicts the legal principles of the rule of law [7].

8. Lack of Involvement of Affected Groups

Existing mechanisms, both legal and technical, often fail to directly involve groups affected by digital discrimination, such as racialized women, migrants, or LGBTQ+ people. The absence of meaningful participation compromises the legitimacy, effectiveness, and contextual sensitivity of proposed solutions, contradicting the principle of substantive equality enshrined in European law.

The analysis reveals that current mechanisms are insufficient to guarantee effective protection against digital gender discrimination. Although a general legal framework exists, it lacks specificity, binding force, and articulation with technical realities. On the other hand, the technical mechanisms lack legal legitimacy, oversight, and social inclusion. Thus, a legal-institutional and technical reform is necessary, which will be proposed in the next section.

9. Proposals to Promote Gender Equality

Given the finding that current legal and technical mecha-

nisms are insufficient to effectively address digital gender discrimination, it is imperative to adopt a renewed regulatory and institutional framework, as well as to implement effective and inclusive technical instruments guided by principles of substantive equality, transparency, and social justice [20–22].

The following proposals aim to operationalize fundamental rights in a digital context, promote democratic regulation of technology, and guarantee representation, participation, and protection for the most affected groups, with a particular focus on women and gender minorities.

9.1. Regulatory Proposals

9.1.1. Integration of Gender-Specific Clauses in the European AI Regulation

The current AI Act should be explicitly revised to include a gender-focused impact assessment clause. This obligation should be mandatory for all systems classified as "high risk," include analysis of data disaggregated by sex, age, race, and other relevant factors, and be accompanied by harmonized technical and legal guidance developed by bodies specializing in gender equality.

9.1.2. Creation of a European Directive on Digital Equality

It is proposed that an EU Framework Directive on equality in access to and use of digital technologies be adopted, establishing mandatory minimum standards for universal access to digital infrastructure with a focus on vulnerable groups, promoting digital literacy in school and community contexts, ensuring equitable gender representation in technology professions, and combating harassment and gender-based violence in the digital space.

This directive could be linked to the Charter of Fundamental Rights of the European Union (articles 21 and 23), reinforcing the European social pillar and the European Strategy for Gender Equality 2020–2025.

9.2. Legal Recognition of Algorithmic Discrimination

A clear definition of algorithmic discrimination as a form of indirect discrimination should be included in EU law and national legal systems. Such recognition should have procedural effects, allowing for the reversal of the burden of proof to the entity responsible for the algorithm, the right to explanation and individual challenge of automated decisions, and strict civil liability for damages arising from digital discrimination.

9.3. Technical and Institutional Proposals

Mandatory implementation of algorithmic audits with a

gender focus, with these audits to be carried out by independent entities with expertise in human rights and equality, made publicly available in an accessible and transparent manner, and integrated into pre-commercialization technology certification and periodic review processes. A European repository of best practices and identified shortcomings should be created to foster collective accountability and institutional learning.

9.4. Mandatory Training for Programmers and ICT Professionals on Gender Equality

Universities, companies, and public bodies that develop or operate digital systems must ensure continuous and mandatory training on equality, digital ethics, and the social impacts of technology, based on standardized materials validated by equality agencies.

9.5. Mandatory Inclusion of Women and Gender Minorities in Technical and Decision-Making Teams

Promoting equality is not achieved solely through regulations. It is imperative to guarantee representation in technological development processes. To this end, it is proposed that minimum gender quotas be adopted in research and technological development teams as eligibility criteria for European public funding (Horizon Europe), tax incentives, and certifications for technology companies that demonstrate internal policies of parity and inclusion, as well as the creation of ethics committees with plural and equal representation in large AI projects.

9.6. Promoting Public Participation and Access to Digital Justice

For digital gender equality to become a tangible reality, it is necessary to simplify the mechanisms for complaining about and reporting digital discrimination, including online discrimination, promote legal and digital literacy campaigns with a gender focus, and ensure the proactive action of regulatory bodies and public defenders in cases of digital discrimination, regardless of the victim's initiative.

The consolidation of a just and egalitarian digital society requires a combination of binding normative regulation, conscious technical innovation, and active social participation. The proposals presented aim to promote algorithmic governance centered on human rights, where gender equality ceases to be a rhetorical objective and becomes a structuring criterion for public and private action in the technological field.

This analysis demonstrated that gender-based digital discrimination constitutes a structural and multidimensional reality, manifested not only in unequal access to technologies, but above all in the way these technologies reproduce and amplify gender biases through algorithmic systems, processes of

symbolic exclusion, and intersectional sociocultural barriers.

It has been found that, despite the existence of relevant international and European regulations, such as the Charter of Fundamental Rights of the European Union and CEDAW, the current legal framework still lacks effective, specific and binding instruments to prevent and combat this type of discrimination in digital environments. The proposed European Regulation on Artificial Intelligence represents a promising step forward, but it lacks robust regulations regarding gender equality and the provision of transparent and accessible accountability and control mechanisms.

Meanwhile, technical mechanisms, such as algorithmic audits and digital codes of ethics, prove to be limited and often self-regulatory, lacking normative coherence, institutional oversight, and representativeness of the affected populations.

In this sense, a repositioning of public policies and technological regulation is proposed, through a legal and technical approach that incorporates substantive equality as an operative and structuring principle. The implementation of gender-focused digital justice requires the articulation between legislative reforms at the European and national levels, mandatory technical mechanisms for prevention and control, and the effective inclusion of women and gender minorities in technological decision-making processes.

Only in this way will it be possible to ensure that the fundamental rights formally enshrined in international treaties and charters translate, in practice, into a universal, fair and equitable digital experience, free from structural discrimination or algorithmic invisibility.

10. Conclusion

Digital gender discrimination is not an isolated phenomenon but a structural manifestation of enduring inequalities reproduced through technological systems. This study demonstrates that legal neutrality is insufficient and that substantive equality must become a binding operational principle in the design, regulation, and governance of digital technologies [23].

The emergence of the digital society, despite its promises of democratizing knowledge, inclusion, and innovation, has progressively revealed profound contradictions regarding the realization of the principle of gender equality. The analysis developed in this article confirms that digital discrimination based on gender is not an accidental or isolated phenomenon, but rather a contemporary expression of historical inequalities, now reproduced through technical means, often invisible and automated.

The persistence of gender stereotypes, the underrepresentation of women in technological structures, and the absence of diversity-sensitive data in algorithmic systems generate decisions that are systematically unfavorable to women and gender minorities, with real impacts on access to employment, education, public services, and social visibility [24].

In legal terms, despite the existence of robust normative instruments such as the Charter of Fundamental Rights of the

European Union and CEDAW, there is a lack of specific regulations addressing the technical, diffuse, and intersectional nature of digital discrimination. The current AI Act, while meritorious, reveals significant gaps regarding the protection of vulnerable groups, the mandatory implementation of gender-focused audits, and the effective accountability of technology operators.

Given this scenario, a strategic repositioning of law and technological regulation is proposed, anchored in three fundamental pillars: legislative reform, with explicit integration of the gender dimension in impact assessment processes, criminalization of algorithmic discrimination, and creation of specific directives on digital equality; the implementation of binding and transparent technical mechanisms, such as mandatory algorithmic audits, technological equity certifications, and continuous ethical training for digital professionals; and the active promotion of representativeness and social participation in technological development and regulatory processes, ensuring that digital solutions reflect the diversity of the society that uses them.

Finally, it is recognized that combating digital discrimination based on gender requires a joint and continuous effort between academia, legislators, the technology sector, and civil society. As a continuation of this investigation, it is suggested that empirical studies be developed to assess the impact of automated systems on vulnerable populations, as well as the construction of legal and technical indicators capable of measuring digital inequalities based on gender and intersectionality.

Building a truly democratic digital space requires that gender equality cease to be a declarative principle and become an operational criterion in the design, development, and evaluation of the technologies that shape the present and future of human societies.

Abbreviations

CDFEU	Charter of Fundamental Rights of the European Union
AI Act	EU Regulation on Artificial Intelligence
STEM	Science, Technology, Engineering, and Mathematics
LGBTQ+	Lesbian, Gay, Bisexual, Transgender, Queer (or Questioning), and others (+)
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
ECHR	European Convention on Human Rights
ECtHR	European Court of Human Rights
CJEU	Court of Justice of the European Union

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Conflicts of Interest

The author declares no conflicts of interest.

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