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Emerging Technologies and Feminist Futures: Artificial Intelligence, Blockchain, and Virtual Reality in Cyber Feminism

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ABSTRACT

The paper critically examines the intersections between feminism and emerging technologies, focusing on artificial intelligence (AI), blockchain, and virtual reality (VR) as pivotal sites of both oppression and possibility. It situates cyberfeminism within contemporary technological transformations, arguing that technologies are not neutral but deeply embedded within patriarchal, racial, and capitalist systems. Through feminist theoretical frameworks such as intersectionality, techno-feminism, and posthumanism, the paper explores how these technologies reproduce and challenge gendered and racialised power hierarchies. Each section analyses the dual potential of these technologies: AI's algorithmic biases and its activist applications, blockchain's promises of decentralisation against its accessibility and ecological limitations, and VR's capacities for feminist education and identity experimentation alongside its ethical dilemmas. Collectively, these analyses advocate for a feminist technological agenda grounded in inclusivity, transparency, and social justice, calling for active feminist participation in the design, governance, and regulation of technological systems. The paper concludes by envisioning feminist futures where technology is harnessed not as a tool of domination but as an instrument of liberation and equity.

Keywords: Artificial intelligence, blockchain, cyberfeminism, gender bias, techno-feminism, virtual reality

1. Introduction

In the digital age, the relationship between technology and feminism has undergone significant transformation. From the early optimism of the 1990s to contemporary critiques of emerging technologies, feminist thought has continuously adapted to the shifting technological landscape. The term “cyber feminism” emerged as a response to the internet’s perceived potential for reshaping power dynamics and challenging patriarchal structures (Wajcman, 2004). Early cyber feminists such as Sadie Plant and Donna Haraway viewed digital spaces as opportunities to transcend traditional gender roles, imagining technologies that could dissolve the boundaries between the body and machine (Haraway, 2007; Plant, 1997).

Donna Haraway’s ‘A Cyborg Manifesto’ was instrumental in defining the early cyber-feminist vision. The cyborg was employed by the author as a tool to argue against rigid gender constructions and explore the innovative effects of technology in aspects of one’s self and physicality. In Haraway’s perspective, the coming together of men and machines creates an arena where it becomes possible to transcend gender, ethnicity, and class divisions thereby allowing for more versatile and encompassing identities. This optimistic view of technology was echoed by other cyber feminists, who saw the internet as a space where women and marginalised groups could engage in new forms of expression, community-building, and resistance (Plant, 1997).

However, as the internet and digital technologies have evolved, so too have feminist critiques. The initial optimism of cyberfeminism has been tempered by the recognition that technology is not neutral. Instead, it reflects and often amplifies existing power dynamics. Feminist scholars have increasingly focused on how digital technologies, especially artificial intelligence (AI), blockchain, and virtual reality (VR), reproduce gendered, racialised, and class-based inequalities (Noble, 2018). The emergence of new technologies calls for a re-evaluation of how feminist theory and practice can be applied, subjected to critique and praxis in the digital realm.

The debate related to the evolutionary stage of technology requires feminist engagement with the evolution and implementation of the same. Technologies such as AI, blockchain, and VR are not just tools but, rather, socio-technical systems whose values and biases are embedded in their development (Wajcman, 2009). The feminist critical analysis of these technologies should ideally point out how they help in maintaining power or challenging current power structures and envision ways on how one can unlock the futures that may be more equitable.

Artificial intelligence has become one of the most pervasive technologies in modern life, with applications in fields ranging from healthcare and finance to education and policing. However, AI systems are often trained on biased data, leading to discriminatory outcomes that disproportionately affect women and people of colour (Buolamwini & Gebru, 2018). For example, facial recognition technology has been shown to have higher error rates for women and people with darker skin tones, perpetuating racial and gender inequalities (Crawford & Calo, 2016). Similarly, AI-driven hiring algorithms have been found to disadvantage women by replicating biases present in historical hiring data (Noble, 2018).

Blockchain technology has been praised for its ability to order disintermediation and enhance trust in processes. This is because blockchain promotes secure and unseen exchanges without the need for a middle party who facilitates the transaction. Particularly, this development threatens traditional banking systems, enabling a new form of e-commerce for the women in the Global South. The promise of blockchain technology, however, disappoints because of issues of access, since this technology can only be handled by the elites who are quite often found in the upper classes. This, however, is a challenge that all feminist movements face, especially those which are eco-sensitive due to the large amounts of power that any processes which use blockchains will require (Truby, 2018).

Virtual reality could act as a platform through which feminist concepts of identity, embodiment, and space are reconceptualized with its immersive, interactive features. With users able to inhabit virtual bodies and environments that undermine what has been considered normative up to this point for gender and identity, users in VR could try to push feminist boundaries in expression and experimentation (Nakamura & Chow-White, 2013). However, as with AI and blockchain, virtual environments have also created interlocking systems of patriarchal and racial orders resulting in the perpetuation of negative stereotypes and exclusionary practices (Gray, 2020). In addition, accessibility and representation of users still remains a problem in VR as there are often user groups that get excluded from the development and use of this technology.

In light of these challenges, feminist praxis must adapt to engage critically with emerging technologies. There is an increasing interest from feminist scholars and activists about how these technologies can be used against oppression and in the promotion of social justice. For example, AI can be used against online harassment and gender-based violence through developing algorithms that will help detect and mitigate abusive behaviour on social media platforms (Noble, 2018). Blockchain technology can support feminist activism by providing secure platforms for organising and sharing information, particularly when women's rights are threatened. VR can be employed as a tool for feminist education, offering immersive experiences that raise awareness about gender-based violence and other forms of oppression (Nakamura & Chow-White, 2013).

This paper explores the potential and perils of AI, blockchain, and VR for feminist theory and practice. By examining these technologies through a feminist lens, we can better understand how they shape and are shaped by power relations and how they can be harnessed to promote gender equity and social justice. Accordingly, it is important to question AI, blockchain, and VR in critically developing and using them for feminist theory and practice. For example: How do these technologies reinforce existing power structures? In what ways might they be reimagined to challenge these? What role do feminist technologists, activists, and policymakers play in shaping the future of these technologies? How can we ensure that marginalised voices are included in the development of AI, blockchain, and VR and that these technologies are accessible to all?

Feminist scholars such as Ruha Benjamin (2019) and Safiya Umoja Noble (2018) have argued that technology is not an inherently neutral force but rather one that reflects the social, political, and economic contexts in which it is created. This means that feminist engagement with technology must go beyond critique to include active participation in its design and governance. Feminist technologists and activists are increasingly working to create alternative models of technology development that prioritise inclusivity, equity, and justice (Benjamin, 2019). For example, initiatives such as the Feminist Data Manifest- No call for creating data and algorithms that centre marginalised voices and challenge the notion of "neutral" technology (Cifor et al., 2019).

By critically engaging with AI, blockchain, and VR, feminist scholars and activists can help shape the future of these technologies in ways that promote social justice and gender equity. This paper seeks to contribute to this conversation by exploring the potential and limitations of these emerging technologies and offering insights into how they can be harnessed for feminist praxis.

2. Artificial Intelligence: Potential and Perils for Feminist Theory and Practice

2.1. Gender Bias in AI: Historical Context and Present-Day Challenges

Artificial Intelligence (AI) is one of the most transformative technologies of the 21st century, permeating various aspects of society, from healthcare and criminal justice to education and employment. While AI promises efficiency and complexity, it is often highly criticized for further deepening more deeply existing forms of inequalities. One area of concern in feminist discourse is the trend by AI systems to perpetuate gender bias. It reflects and enlarges societal discrimination against women and marginalized groups (Crawford & Calo, 2016). AI's ability to learn and make decisions based on historical data means that any biases present in the data whether gendered, racial, or class-based are likely to be replicated in the outcomes of AI models.

Historically, women and minorities have been underrepresented in fields such as science, technology, engineering, and mathematics (STEM), which has influenced the development of AI. The diversity of the AI algorithm-making tech team is often so poor that the designs fail to consider lived experiences and needs of women and of marginalized groups. This is not just a matter of technical gender bias within AI but something that goes straight to the heart of the broader societal context. Feminist scholars have highlighted how data used to train AI systems often reflects a world shaped by patriarchy, colonialism, and capitalism (Noble, 2018). For example, algorithms designed to automate hiring processes usually reproduce biases against women by favouring male-dominated fields or undervaluing experiences associated with women's traditional roles, such as caregiving (Dastin, 2022). This reproduction of biases is particularly insidious because AI is often presented as "neutral" or "objective," masking how it reinforces systemic inequalities.

To address these issues, feminist critiques of AI have focused on the need for inclusive and diverse data sets and the importance of involving women and marginalised groups in designing and developing AI systems (Criado-Perez, 2019). Feminists who wish to build AI that promotes equity as opposed to propagating discrimination can do by diversifying teams toward making the technologies as well as interrogating underlying assumptions embedded in AI models.

2.2. *AI and Intersectionality*

The problems with AI are much more than those of gender bias and extend to the more complex aspects of race, class, disability, and sexuality all intersecting to define gender, which then leads to results in AI outputs. Using Kimberlé Crenshaw's idea of intersectionality as to how different forms of oppression overlap and compound each other, analyse how these limitations outstrip AI's effort to provide solutions to gender issues. Many AI systems fail to account for the diversity of human experiences, particularly the experiences of women of colour, LGBTQ+ individuals, and those with disabilities (Benjamin, 2019).

For instance, Joy Buolamwini and Timnit Gebru's (2018) groundbreaking work on the gender and racial biases in facial recognition systems revealed how these technologies are more accurate for white men than for women and people of colour. The intersectional biases in AI systems can have profound implications for marginalised communities, especially when AI is used in high-stakes decision-making contexts such as law enforcement, healthcare, and finance. In policy, for example, biased algorithms can lead to increased surveillance and criminalisation of communities of colour, while in healthcare, AI-driven diagnostic tools may fail to address the unique health needs of women and people of colour (Crawford et al., 2019).

Feminist scholars argue that AI must be developed with a commitment to intersectional justice. This means the data set has diversified populations and appreciates the fact that the structural inequalities also dynamically shape how AI technologies get produced and employed (Noble, 2018). An intersectional feminist analysis identifies issues in the fact that the intersection of AI-technology with the larger social, political, economic systems disadvantages or penalizes certain groups, making AI that perpetuates rather than solves these inequalities.

2.3. *Feminist Approaches to AI Development*

Feminist technologists and scholars have argued for a rethink on how AI should be designed, developed, and deployed in ways to handle gendered and intersectional biases in AI systems. One of the prime feminist criticisms about AI is a sort of technological myth: machines and algorithms are objective and free of human bias. Feminist scholars argue that this neutrality is an illusion; all technologies are shaped by the values, assumptions, and biases of the people who create them (Wajcman, 2009). Therefore, designing more equitable AI systems requires a deliberate effort to incorporate feminist principles into the development process.

One such principle is the importance of diverse and inclusive teams in AI development. Research has shown that more diverse teams produce better and more innovative outcomes (Page, 2007). In the context of AI, diversity is critical because it brings a broader range of perspectives and experiences to the table, helping to identify potential biases and blind spots in the design of algorithms. Feminist technologists advocate for the inclusion of women, people of colour, LGBTQ+ individuals, and people with disabilities in AI development teams to ensure that the technology serves the needs of all users, not just those already privileged (Criado-Perez, 2019).

Besides team diversity, feminist approaches to AI development encourage openness and accountability. Most AI systems are "black boxes"; their decision-making processes are opaque and complex to scrutinise. For this reason, embedded biases in AI systems can rarely be identified and corrected because of the lack of transparency. Feminist scholars argue for transparency through further awareness about the AI development to enlighten the public, through clear documentation of how algorithms were trained, what data sets are used, and how decisions made (Keyes, 2018). One way to achieve such valuable transparency is through holding those accountable who develop the AI technology for the social impact and ethics that play in its process.

Feminist approaches to AI also advocate including social and ethical considerations in the design process. This involves thinking critically about the potential consequences of AI systems, particularly for marginalised groups, and designing technologies that promote fairness, equity, and justice (Benjamin, 2019). For instance, the feminism design of AI systems may centre around the needs of the marginalized communities by testing and validation of the algorithms on diverse populations before its deployment. It may also imply creating mechanisms that enable users to challenge and correct biased decisions determined by AI systems.

2.4. *AI and Feminist Activism*

Beyond opportunities for the reinforcement of gendered and intersectional inequalities, AI also offers channels for feminist action. Feminist activists are increasingly using AI to further the cause of social justice as well as gender equality. One area in which AI has finally seemed to hold promise is in combating online harassment and gender-based violence. The main issue here is that online platforms, where harassment and abuse are far greater among women and other groups, have not been able to cope with the scale of these issues. AI-based tools can better and more efficiently identify abusive content, and this will make the online space safer for women and other such vulnerable groups in society (Chen, 2014).

AI is also used in feminist activism to collect and analyse data on gender-based violence. Machine learning models can be trained to identify patterns of abuse and harassment, allowing activists and organisations to target their interventions more effectively (Keyes, 2018). For instance, AI tools are used to track how people are discussing signs of domestic violence and human trafficking through social media platforms. This enables early identification and helping victims. In such ways, AI can become a great tool for amplifying feminist efforts to combat violence against women and other marginalized groups.

Besides all the roles AI can play in preventing violence against women, AI can continue to fuel feminist activism across a myriad of other domains-from reproductive rights and economic justice to political representation. Data analysis by power of AI may reveal disparities within healthcare, employment,

and education and can arm activists with evidence to plead for policy change. For example, AI models capable of analysing wage data may give better insights into pay gaps based on gender and race, thus allowing support for efforts aimed at obtaining equal pay for women and for people of colour (Eubanks, 2018).

However, feminist activists must remain critical of how AI is used in social justice work. As with any technology, AI has the potential to be co-opted by powerful interests and used in ways that harm marginalised communities. For example, predictive policing algorithms have been used to target communities of colour under the guise of improving public safety despite evidence that these systems reinforce racial biases in law enforcement (Crawford et al., 2019). Feminist activists must, therefore, be vigilant in ensuring that AI is used in ways that align with their values of equity and justice.

3. Blockchain Technology: Decentralisation, Security, and Feminist Implications

3.1. Understanding Blockchain in a Feminist Framework

Blockchain technology, often associated with cryptocurrencies like Bitcoin and Ethereum, has garnered significant attention in recent years for its potential to decentralise power structures and promote transparency and security in digital transactions. As a decentralised ledger system, blockchain records transactions across a network of computers, ensuring that no single entity has control over the entire system. For feminist theory, which often critiques centralised power structures and the ways they maintain inequalities, blockchain's potential for decentralisation presents both opportunities and challenges.

At its core, blockchain technology is touted for trusting and being transparent without the need for intermediaries, governments, corporations, or banks. Most alluring, the decentralisation of such a system is open to feminist movements that continue to fight to break up patriarchal, corporate, and institutional control over economic, political, and social systems. As mainstream financial institutions exclusion makes a large proportion of the women, especially from the Global South, largely disadvantageous feminist scholars and activists have much to say about it. Blockchain's promise is to empower women who have been marginalised by the global financial system through the decentralised financial systems that are coined as DeFi.

But of course, this engagement between feminist theory and blockchain also raises some really important questions. Who benefits from this technology and who is excluded? Even in blockchain theory, which speaks to some pretty profound promises regarding equal access, the tech is actually inaccessible to most people—those who do not have the resource, education, or technical know-how to engage with it properly. Furthermore, the sector still remains a male-dominated space—which raises questions of whether it merely perpetuates same gendered power dynamics.

3.2. Blockchain and Economic Empowerment for Women

One of the most promising applications of blockchain technology is its potential to provide economic empowerment for women, particularly in developing regions where access to financial services is limited. This indicates a clear gap between males and females, as more than one billion females lack access to formal financial services, according to the World Bank. Blockchain-based financial solutions, such as cryptocurrencies and decentralised finance platforms, can help fill the gap and provide women with increased opportunities for autonomy in the utilization of financial services.

For example, cryptocurrencies like Bitcoin and Ethereum allow individuals to conduct financial transactions without relying on traditional banking systems, which are often inaccessible to women in rural or underserved communities. With decentralised platforms, women can hold savings, remit money, and do commerce safely, without requiring access to a bank account or even a number of government-issued ID, which in some areas given legal, cultural, or socioeconomic prohibitions, may be challenging to access.

In economies where women are mostly and quite strongly affected by economic instability, inflation, or corruption, blockchain technology can offer a stable store of value as well as secure transactional means. It is this which has been relevant in places such as Venezuela and Zimbabwe, where hyperinflation has made the country's local currencies worthless. By utilising blockchain-based currencies, women can safeguard their savings from government manipulation and economic collapse.

However, while blockchain holds promise for financial inclusion, feminist critiques highlight several challenges. The technical complexity of blockchain technology can be a barrier to entry for women, particularly in regions with low levels of digital literacy and internet access. Also, while blockchain is emphasized as a secure and transparent system, it will most likely prove to become very difficult to regulate because of its decentralized nature, and it then frightens many people with issues regarding fraud, exploitation, and financial abuse in unregulated cryptocurrency markets. For blockchain to be an effective tool for women's economic empowerment, these efforts on digital literacy and access to technology as well as protections against exploitation have to be undertaken in conjunction with these efforts (Truby, 2018).

3.3. Blockchain for Feminist Activism and Data Sovereignty

Beyond economic empowerment, blockchain technology offers new possibilities for feminist activism, particularly in the areas of data sovereignty and privacy. In a digital age where data has become one of the most valuable commodities, feminist concerns about surveillance, privacy, and control over personal information have taken centre stage. Women from the most vulnerable communities often suffer at the hands of intrusive practices of data collection that undermine their right to privacy and personal autonomy in systems of state surveillance, corporate data mining, or online harassment

(D'Ignazio & Klein, 2023). The decentralised nature of blockchain provides an escape from such centralised management of data through offering the opportunity for people to carry and own responsibility over their personal data.

Data sovereignty; the notion that everyone and communities alike should own their data, is crucial for feminist struggles in the protection of the privacy and autonomy of women and, indeed, many others in marginalized groups. Blockchain is a technology that can build a record which is secure, decentralized, and immutable, and one which can enable people to control who accesses information about them and how that information is used. For example, blockchain could be used to create decentralised identity systems that allow women to store and share their personal information without relying on government-issued identification, which may not be accessible or safe for certain groups.

In addition to data sovereignty, blockchain has the potential to support feminist activism by providing secure and anonymous platforms for organising and communication. In countries where women's rights are under attack or where feminist activists face state repression, blockchain-based platforms could offer a safe way for women to communicate, organise, and mobilise without fear of surveillance or censorship (Truby, 2018). For instance, distributed social networks on blockchain could provide an alternative to corporate-dominated networks such as Facebook and Twitter where mainly harass and dox women while committing online violence (Gray, 2020).

However, while it promises feminist activism and data sovereignty, technology in blockchain raises a great challenge. Wherein the record's immutability makes it a salient feature of blockchain, it actually presents a problem when such sensitive information needs removal or alteration for the ones being recorded. For example, survivors of domestic violence or human trafficking may need to erase or protect certain data to ensure their safety, but blockchain's permanent and public nature can make this difficult (D'Ignazio & Klein, 2023). Feminist engagement with blockchain must therefore navigate these complexities, ensuring that the technology can be used in ways that prioritise the safety, privacy, and autonomy of women and marginalised groups.

3.4. Challenges and Critiques

Blockchain technology has enormous potential in feminist theory and practice, though it is not free from challenges and criticism. The primary concern about this is access and inclusion: despite the promises of decentralization and equality, the blockchain industry is highly male-dominated, and women comprise a small fraction of blockchain developers, investors, and users. This gender disparity is reflective of broader patterns of exclusion in the tech industry, where women, particularly women of colour, face significant barriers to participation and advancement (Criado-Perez, 2019).

The technical complexity of blockchain technology also presents a barrier to entry for many women, particularly those in developing regions with limited access to education and digital resources. Without concerted efforts to increase digital literacy and ensure access to technology, blockchain risks reinforcing existing gendered divides in access to technology and financial resources. Thus, feminist engagement with blockchain must not focus only on the technology itself but rather on the structural inequalities more broadly defining access to and participation in blockchain networks.

Apart from the issues of accessibility and participation, feminist evaluation of blockchain points to the harmful effects of the technology vis-à-vis the environment. Sustainability issues arise when such energy demanding operations are incorporated into the technology, especially on the case of bitcoin and other cryptocurrencies. For instance, in order to create bitcoin, more electricity is used than what some countries use leading to global warming and other environmental allocation (Truby, 2018). This aspect of blockchain technology to justify the use of such a disruptive innovation is hard to reconcile for women who are part of environmental justice feminism. Every feminism focused on blockchain technology needs to address the question of how it can be less harmful and greener.

To conclude, while security and transparency are some of the aspects that are endlessly praised when it comes to using blockchain technology particularly in transaction verification, the very nature of the system also poses certain setbacks, especially when it comes to policies governing it and its proper use. Such as in the case of unregulated crypto currencies women as well as other oppressed societies may be subject to financial risks in terms of exploitation, swindles and harassment. In the absence of such protection and control laws within a society, the system whereby blockchain technology encourages financial empowerment for all without discrimination may stand to be defeated by the same forces or systems it aspires to fight against.

4. Virtual Reality and Feminist Consciousness: Redefining Bodies, Spaces, and Identities

4.1. Virtual Reality as a Tool for Feminist Exploration

The VR technology provides an immersive experience that enables the user to engage with digital spaces in ways where physical and virtual boundaries of reality get blurred. Feminist scholars, especially those interested in the conjunctions of technology and embodiment, are now starting to understand the possibility that VR could unfold to challenge understanding of gender, identity, and space. VR is a new frontier of reimagining bodies and identities for feminists, thereby promising to transcend normative constructions of femininity, masculinity, and the binary system of gender (Nakamura & Chow-White, 2013).

The early cyber feminists, including Donna Haraway, believed that digital technologies could critically challenge binary thought processes and hard classifications of identity (Haraway, 2007). Haraway's 'A Cyborg Manifesto' conceptualised technology as a way to transcend traditional boundaries between humans and machines, bodies and identities. VR, as a fully immersive and interactive digital space, embodies these possibilities by allowing users to experiment with different versions of themselves. The ability to take on various avatars—whether human, non-human, or a hybrid—presents an

opportunity for feminist exploration of non-binary and fluid gender identities, racial identities, and bodily representations (Nakamura & Chow-White, 2013).

However, feminist engagement with VR must also consider the ways in which virtual spaces can reproduce existing power structures and inequalities. Although VR has the potential to challenge normative structures, it can also reinforce gendered and racialised stereotypes if its content and environments are not carefully designed. For instance, many VR platforms continue to reflect the patriarchal and racialised logics of the physical world, where women and people of colour are either underrepresented or misrepresented in ways that perpetuate harmful stereotypes (Gray, 2020). Thus, while VR holds the potential to create new feminist possibilities for bodies, spaces, and identities, it also demands critical attention to ensure that it does not replicate the very inequalities it seeks to transcend.

4.2. Gender and Embodiment in Virtual Spaces

It is profoundly deep and can be real for changing users' perceptions of their bodies. In virtual environments, they do not have the physical limitations of a body; instead, they can take upon a form that may be human-like, a fantastical creature, or perhaps something abstract. This allows for a fluidity of envisioning bodies that have become gendered and racialized in such a way that the binary gender system and antiquated notions of identity could be surpassed or staged in ways that contest and rupture old visualizations of the body. The feminist theorists claim that this ability to experiment with different forms of embodiment can indeed have a potential cause for what might question the naturalization of gender and the drawn boundaries that qualify the bodies in space.

In physical reality, bodies are scrutinized and controlled in the name of proper behaviour, how to look, act, and move according to one's assigned gender (Butler, 1993). VR, on the other hand, provides the context in which such norms can be resisted. For example, non-binary or gender-fluid users may express their gender-experience in ways impossible in physical space to such an extent from the sense of body (Nakamura & Chow-White, 2013). With its capability in letting the user try on different gender presentations, VR can contribute to a more fluid and expansive understanding of gender, challenging binary thinking.

However, feminist scholars observe that apparent freedom from embodiment in VR arrived with its limitations. Because, for example, a user can determine or design her avatar, options for customization are limited by choices made by developers; many VR platforms are strictly offering only a few choices of body types, skin tones, and gender identity that mirror the rigid boundaries drawn by the largely male-dominant tech industry (Wajcman, 2009). Avatars are often a representation of cultural stereotypes: female avatars are sexualized and hyper-feminized, whereas male avatars are hyper-masculinized or militarized (Gray, 2020). All this does not allow VR to interfere seriously with the normative conceptions of gender and race; it creates an urgent need for more diverse and inclusive answers in virtual spaces.

To this end, the other important aspect of feminist engagement with VR is that it should consider the larger implications of embodiment in virtual spaces. Just as the possibilities laid open by VR for experimenting with identity and gender, VR should also recognize that virtual embodiments are not detached from the bodies of the real world. The experiences users have in virtual spaces can go on to shape their understanding of their physical bodies and how they move around the world. That is to say, for some users, the possibility of becoming someone else might become a source of empowerment and self-expression; for others, such possibilities can escalate feelings of exclusion or marginalization if their identities are not featured. Hence, feminist scholars have to advocate better inclusivity in the very design of VR platforms and provide every user with an opportunity to find his or her parts as represented and empowered.

4.3. VR and Feminist Education

Another significant application of VR within feminist theory and practice is its potential as a tool for education and empathy-building. By creating immersive experiences that allow users to "step into the shoes" of others, VR can foster a deeper understanding of the lived experiences of marginalised groups. Feminist educators and activists have increasingly turned to VR as a means of raising awareness about issues such as gender-based violence, racial discrimination, and social inequality. VR's immersive nature enables users to experience situations they may never encounter in their everyday lives, making abstract concepts such as structural violence and oppression more tangible and emotionally impactful.

Virtual reality has been used in simulations on domestic violence and the realities of sexual harassment and other forms of gender-based violence, among others. Simulations are opportunities whereby a user can be equipped with the ability to grasp things from the victim's perspective—a setting that essentially develops one's understanding of the emotional, psychological, and even physical impacts of such abuses. This would enable it to have a potential effect on generating empathy and contributing to social change through the urge of prompting users to react against gender-based violence around them. Similarly, VR has been used to raise awareness about racial discrimination by allowing users to experience everyday microaggressions and systemic racism from the perspective of a person of colour (Nakamura & Chow-White, 2013).

However, while VR has the potential to foster empathy and raise awareness, feminist critiques caution against assuming that immersive experiences alone are sufficient to create meaningful social change. Experiencing oppression in a virtual environment is not the same as living it in reality, and there is a risk that users may come away from VR simulations feeling as though they fully understand the complexities of oppression without engaging in deeper critical reflection or action. Furthermore, there are ethical implications involved with the adoption of VR in teaching, such as commodification of traumas. The argument goes that by transforming the experiences of the marginalized into "didactic tools" of which privileged users can use, this can be a way of trivializing actual everyday struggles they have to deal with when there's oppression.

In fact, feminist educators need to accompany VR with critical discussions and moments for reflection. That is, to make them reflect beyond the systems of power and privilege that perpetuate oppression-to think about how they too can contribute to the process of dismantling oppression in their own lives and communities. With the blend of immersive experience and critical pedagogy, VR can be a significant tool for disruption in the service of feminist education and activism.

4.4. Challenges and Ethical Considerations in VR

While VR offers exciting possibilities for feminist exploration, it also raises significant ethical concerns, particularly regarding representation, access, and online harassment. One of the most pressing issues is the underrepresentation of women and marginalised groups in VR content and development. As with many other areas of technology, the VR industry remains dominated by men, and this gender imbalance is reflected in the design and content of VR platforms (Wajcman, 2009). The most common type of space is either not accessible to women and people of colour or portrays them stereotypically and in a derogatory way, thus furthering both patriarchal and racialized power relations (Gray, 2020).

In addition, the virtual video environment affords spaces for gendered and raced harassments. While certain online media such as social media and gaming applications host harassments towards women and marginalized communities, the same happens in virtual space. The distress may be even more heightened because VR is, by its very nature, immersive and interactive; users can embody and experience it in a very visceral sense (Nakamura & Chow-White, 2013). For example, female users have complained of sexual harassment within VR settings as some users would use their avatars to simulate unwanted physical contact with them (Gray, 2020). Furthermore, it casts a long trail of paramount questions about who protects consumers in virtual space and how one might take perpetrators to task in a decentralized, anonymous environment.

Feminist scholars and activists need to strongly advocate for more inclusive and safer VR space for people. This happens through advocacy for diversification in the production of virtual reality content as well as further realization of inclusion in genuine ways of women, people of colour, members of the LGBTQ+ community, among others. Additionally, there is a need for stronger regulations and protections to prevent harassment and abuse in virtual environments. This may involve developing new systems of governance for VR platforms that prioritise user safety and well-being (Nakamura & Chow-White, 2013).

Finally, feminist engagement with VR must also consider issues of access and the digital divide. While VR holds significant potential for feminist exploration, education, and activism, its high cost and technological requirements mean that it is not accessible to everyone. Marginalised communities, particularly in the Global South, often lack access to the infrastructure and resources needed to engage with VR technology. Feminist scholars must therefore consider how to make VR more accessible and inclusive, ensuring that its benefits are not limited to those with the privilege of access (Wajcman, 2009).

5. Critical Reflections on the Intersection of Technology and Feminism

5.1. Cyber Feminism Revisited: A Critical Overview

Feminist scholars revisited and critiqued the optimism of early cyber feminism over the last decades. As these digital technologies have become more pervasive and influential, it is clearer that they are not, of themselves, an obstacle to the fundamental systems of power. Rather, technology can bolster and harden inequalities just as easily. For example, while the internet was once hailed as a democratising force, it has become clear that it is also a space where misogyny, racism, and homophobia flourish. Online harassment and abuse disproportionately target women, particularly women of colour and LGBTQ+ individuals (Gray, 2020). Similarly, AI creates an issue about algorithmic bias where discriminatory patterns in data are reproduced and amplified by supposedly "neutral" technologies (Buolamwini & Gebru, 2018). Then, from the critiques, it argues that technology also has a possibility for feminist intervention but with a critical and cautious approach.

In revisiting cyber feminism, contemporary scholars have called for a more intersectional approach to understanding the relationship between technology and power. Crude gender-based feminist critiques of technology have to move beyond issues of gender to incorporate considerations about how the intersections of race, class, sexuality, disability, and so on cut across these technological systems. An intersectional approach, which has informed much of this book, through thinkers such as Kimberlé Crenshaw (1989), stresses the need to attend to the multiple, overlapping forms of oppression that are reproduced in digital spaces.

5.2. The Politics of Techno-Feminism

A term that characterizes feminist engagements with technology that are explicitly political in focus, techno-feminism-that focuses on how technological systems reflect and determine power relations-aims at rejecting the myth of technological neutrality for this claims that technology is an apolitical and objective force. Instead, techno-feminists argue that all technologies are shaped by the social, political, and economic contexts in which they are created, and therefore reproduce the biases and inequalities of those contexts (Wajcman, 2009).

One of the central concerns of techno-feminism is the gendered division of labour in the tech industry. Despite the rapid expansion of the tech sector, women, especially women of colour, remain underrepresented in positions of power within technology companies. According to a report by the National Center for Women & Information Technology (2020), women make up only 25% of the computing workforce in the United States, and women of colour

account for less than 10%. This lack of representation has significant consequences for how technologies are developed and deployed. When women and marginalised groups are excluded from the design and decision-making processes, the technologies that emerge often fail to reflect their needs and experiences.

Techno-feminism also critiques the commodification of women's labour in the digital economy. The rise of the gig economy and platform capitalism has created new forms of exploitation, where women—particularly those in low-wage and precarious work—are disproportionately impacted by labour abuses and economic insecurity. Platforms such as Uber, TaskRabbit, and Amazon's Mechanical Turk have been criticised for creating conditions of hyper-exploitation, where workers are subject to low wages, lack of benefits, and constant surveillance (Gray & Suri, 2019). Feminist scholars argue that these technologies reinforce neoliberal models of labour that devalue care work and domestic labour, which have traditionally been performed by women and other marginalised groups (Wajcman, 2009).

At the same time, techno-feminism also recognises the potential of technology to challenge these power dynamics. Feminist technologists and activists are working to create alternative models of technological development that prioritise equity, inclusivity, and social justice. For example, initiatives such as Black Girls CODE and the Algorithmic Justice League are working to address the gender and racial biases embedded in AI systems by training the next generation of diverse technologists and advocating for ethical AI development (Noble, 2018; Buolamwini & Gebru, 2018).

What's more, feminist alliances with policymakers, technologists, and activists serve to frame regulatory tools that restrain the social and ethical consequences of the technologies created by tech companies. Feminist scholars have advocated for higher levels of accountability and diversification in technology development; in addition to ethical and legal guidelines designed to make sure technologies are developed and deployed in an equitable manner for social good (Benjamin, 2019).

5.3. Post-Humanism, Feminist Futures, and Technological Utopias

With technological advancement, feminist theory has to also grapple with the coming of post-humanism, which complicates the definition between human and machine. As proponents such as Haraway contend, post-humanism actually succeeds in illustrating the dissolution of human bodies and technology as separate entities; hence, the "posthuman" subject is a hybrid entity that succeeds the barriers of human form as set forth by Haraway (2007). For feminist theorists, posthumanism poses interesting questions about the future in a world that is increasingly technologized: gender, identity, and power.

One of the central concerns of feminist post-humanism is the potential for technology to reshape how we think about bodies and identities. In a post-human world, the boundaries between the physical and digital, the organic and the synthetic, begin to blur. Technologies such as virtual reality (VR), artificial intelligence, and genetic engineering offer new possibilities for reimagining bodies, gender identities, and social relations. For example, VR allows users to inhabit digital bodies that do not conform to traditional gender norms, while AI systems can simulate human cognition in ways that challenge the distinctions between human and machine.

Feminist scholars are divided on the implications of post-humanism for gender and social justice. Some argue that post-humanism offers a radical opportunity to break free from the constraints of biological determinism and the oppressive structures that define gender, race, and sexuality in the physical world. Embracing fluidity in the post-human subject, feminist post-humanism imagines the future as fluid bodies, multiple identities, and decentralized power.

Some feminists have already cautioned that, despite the utopian prospect of the post-human vision of the future, it is not necessarily liberatory. They argued that these technologies which made post-humanism a fact, AI, genetic engineering, and cybernetics, always appear in kinds of capitalist, patriarchal, and colonial frameworks which favour profit-making over social justice. According to Benjamin (2019), this means there might be a dangerous likelihood that these technologies would entrench the existing inequalities rather than destroy them. For instance, the development of AI models simulating the human brain and other new capitalizations of already exploited labourers raises the challenge of the devaluation of labour.

Critical and imaginative engagements with post-humanism, therefore, demand feminist engagements to be both critical and imaginative. In the former mode, feminists must continue to critique how post-human technologies are shaped by extant forms of power and promote more equitable and inclusive technological development. In the latter mode, feminist post-humanism opens up ways of imagining alternative futures and a new way of constructing technology and society-futures where technology is constructed in ways to produce or forge more just societies. This speculative approach, informed by the work of feminist science fiction writers such as Octavia Butler and Ursula K. Le Guin, invites us to imagine new forms of social organisation, gender relations, and political power that transcend the limitations of the present (Butler, 1993).

In this regard, posthumanism converges with earlier cyberfeminist utopian goals in seeing technology as the potential via which new possibilities in and for genders and identities can be collectively imagined. That's probably not always fully realized, but this is a vital critical framework within which feminist futures might be fantasized both more inclusively, equitably, and justly.

6. Conclusion: Towards a Feminist Technological Agenda

The relationship between feminism and technology is thus highly complex and in flux, with the potential to either mark new pathways of empowerment and social justice or buttress and consolidate existing inequalities at one extreme end through newly emergent technologies like AI, blockchain, and VR. The previous sections of this book have explored the possibilities and pitfalls of these technologies for feminist theory and practice and made a case for critical engagement with their development and application.

Next steps need to be visualized toward a feminist technology agenda. A lot of what does end up being a form of critique of technology is talking about its inequalities and trying to co-create and shape future technologies in ways that are inclusive, equitable, and just. This is the conclusion section that wraps up the main themes that have arisen out of looking at AI, blockchain, and VR and envisions strategies for feminist engagement with these technologies, especially through policy advocacy, inclusivity, collaboration, and future directions for research and activism.

6.1. *Synthesising Key Themes*

The discussion in this article has revealed both the bright possibilities for feminist intervention presented by technological opportunities in AI, blockchain, and VR and at the same time numerous tremendous challenges. First of all, the neutrality idea has been debunked time and again. Technologies are not developed in a vacuum; they are shaped by the social, political, and economic contexts in which they are created, and thus, they often reflect and reinforce existing systems of power and privilege (Wajcman, 2009). This is particularly evident in the gendered and racial biases found in AI algorithms (Buolamwini & Gebru, 2018), the exclusionary nature of blockchain technology, and the perpetuation of patriarchal norms in VR spaces (Gray, 2020).

Despite these challenges, the potential for technology to serve feminist ends remains significant. Blockchain technology, for example, promises to decentralise power and offer women economic opportunities, particularly in regions where access to traditional financial services is limited. Similarly, AI can be harnessed for social good when designed with inclusivity and equity, such as using machine learning tools to combat online harassment or detect patterns of gender-based violence (Noble, 2018). Virtual reality offers feminist educators a unique tool for empathy-building and raising awareness about gender-based violence and social inequalities.

However, actualizing these possibilities presumes feminists should be vigilant and proactive scholars, activists, and technologists. It does not suffice to scrutinize technologies after they are implemented; feminists must be involved at every stage of technology development—from design and programming through policy advocacy and implementation. Long-term, sustained engagement with the tech industry and policymakers is involved.

6.2. *Strategies for Feminist Engagement with Emerging Technologies*

A feminist technological agenda, therefore, should be fashioned along these lines and designed to take a multi-pronged approach that puts stress on structural, social, and technical dimensions of emerging technologies. Some key strategies for feminist engagement include:

- Feminists should strive for deeper regulatory frameworks, such as that of technological development and use toward further social justice. For instance, she should strive for policy change that ensures transparency on AI and algorithmic decision-making processes. Such rights may include the right to explanation and the right to contest decisions by AI systems (Keyes, 2018). This means the governments and international bodies should regulate biometric surveillance technologies, such as facial recognition, from being used to practice discrimination and oppression. Similarly, blockchain and cryptocurrency platforms should also be regulated in policy advocacy so that users can be protected against financial exploitation, swindling, and abuse.
- A feminist technological agenda must prioritise including women, people of colour, LGBTQ+ individuals, and other marginalised groups in the design and development of emerging technologies. As discussed in this paper, diversity in tech teams leads to better, more innovative outcomes and reduces the likelihood of reproducing harmful technological biases (Page, 2007). For instance, examples of these activities include Black Girls CODE, while organizations like Algorithmic Justice League are essential for promoting diversity in tech, hence the need to enhance and extend them. Moreover, a feminist outlook about how tech products are created can ensure that technologies develop equity, focusing on justice (Noble, 2018).
- This collaborative effort is part of the building process with feminist scholars, technologists, activists, and policymakers in designing technologies responsive to diverse communities. These collaborations are cross-disciplinary ones that might involve areas like computer science, law, sociology, and gender studies to address complexity required when meeting the interconnected challenges presented by new and developing technologies (Benjamin, 2019). Feminist think tanks and research collectives, such as Data & Society and the AI Now Institute, provide models for how these collaborations can work in practice, offering spaces where technologists and feminists can develop ethical, inclusive technology (Noble, 2018).
- In addition to engaging with established tech companies, feminist innovation should be encouraged by supporting women-led startups and initiatives prioritising social justice. The tech industry's culture of innovation can be harnessed for feminist ends by promoting entrepreneurship that centres on equity, sustainability, and inclusivity. This includes supporting the development of alternative platforms and technologies that challenge dominant, corporate-controlled digital interaction models. For example, decentralised social media platforms built on blockchain technology could offer feminist alternatives to mainstream platforms like Facebook and Twitter, which have often failed to protect women from harassment and abuse (Gray, 2020).
- A feminist technological agenda must also address the digital divide—the gap between those with access to digital technologies and those without. Marginalised communities, particularly in the Global South, are often excluded from the benefits of emerging technologies due to a lack of access to infrastructure, education, and resources (Wajcman, 2009). Ensuring access to technology is a fundamental component of any feminist technological agenda. This includes advocating for affordable internet access, promoting digital literacy programs, and ensuring that emerging technologies such as blockchain and VR are accessible to all users, regardless of socioeconomic status or geographic location.

6.3. Future Directions for Research and Activism

While this article has focused on AI, blockchain, and VR, the landscape of emerging technologies constantly evolves, and feminist engagement must evolve. Genetic engineering, quantum computing, and brain-computer interfaces present new ethical challenges and possibilities for feminist inquiry. As these technologies develop, feminist scholars must continue to expand their critiques to address the unique ways each technology intersects with issues of power, identity, and inequality (Benjamin, 2019).

In addition, feminist activism must remain flexible and responsive to the rapid pace of technological change. This requires ongoing collaboration between feminists and technologists and the development of new forms of activism that can engage with digital spaces in innovative ways. For example, digital activism has effectively organised movements such as #MeToo and Black Lives Matter. However, feminists must continue experimenting with new tools and strategies for mobilising online and offline (Nakamura & Chow-White, 2013).

Finally, feminist research must prioritise the development of alternative technological futures that centre on equity, inclusivity, and sustainability. This would require utopian science fiction or speculative to inspire feminist utopias and practical frameworks that construct technology for social justice (Butler, 1993). Using critical analysis married to visionary thinking, feminists would thus configure the future wherein technology is liberative rather than oppressive.

The future of technology is not predetermined. It is shaped by our decisions today—who gets to design and control technology, how it is regulated, and who benefits from its development. A feminist technological agenda must focus on creating inclusive, equitable, and just technologies. Through promoting diversity in tech, advocating for ethical regulation, working on building collaborative efforts between feminists and technologists, and digital inclusion issues, feminists can hold true the future of technologies acting to serve all people instead of being a fringe privilege.

Continuing in this trend of engaging with emerging technologies such as AI, blockchain, and VR requires continued vigilance in our acts to challenge the inequalities created or exacerbated by such technologies. Simultaneously, we need to remain fluid in what technology affords for forging more just futures, equitable futures. Together, we can forge a technological landscape reflective of the core values found in feminist theory: equity, justice, and liberation for all.

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