

# Artificial Intelligence and Gender: Unveiling Hidden Biases

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**Abstract:** *Artificial Intelligence is increasingly influencing the behaviours, opinions of human beings. Research shows that there is an over-representation of men in this domain. Machine intelligence learns primarily from observing and using embedded data which is gender biased. Researchers have exposed this bias, since it perpetuates the gender inequality cycle. The problem of gender bias isn't confined to pre-existing issues contained within historical data. Some male developer teams are liable to inadvertently create ineffective Artificial intelligence on account of their failure to pre-empt how their algorithms which may produce discriminatory outcomes. Women need to be part of the process at every stage. The best way to prevent this type of bias from infecting Artificial intelligence technology is to involve people from under-represented backgrounds at every stage of the development cycle. Having gender-balanced development teams is the first line of defence against biased algorithms and their potentially devastating consequences.*

**Keywords:** Gender, Artificial Intelligence and Technology

## 1. Introduction

*“Equality is the cornerstone of every democratic society that aspires to social justice and human rights. It often means women having the same opportunities in life as men, for instance equal access to education and employment, which does not necessarily lead to equality of outcomes” (UN, 2002: 1).*

Globally, there has been a great advance towards gender equality. The representation of women in the Information sector in South Africa is far from perfect. Research indicates that there are more women in IT management support functions or subsidiary roles than leadership positions. In 2019 the World Economic Forum reported that only 22% of Artificial Intelligence professionals are female. The number of Information Technology Executives profiled has increased, from 153 in 2011 to 172 in 2016, only 10% averages of them are female. Although women comprise the majority of South Africa's population. The most populated industries in terms of senior female presence are the “softer skills,” namely education and health. Interestingly, companies with the biggest gaps in female leadership presence include ICT. So, the shortage of females among machine learning researchers is no surprise. The wider field of computer science and engineering is well documented as being dominated by men.

There is an interdisciplinary methodology between technology and gender. Generally speaking, technology has been beneficial Covid 19 is an important case in point. Technological education contributes to this in multiple ways by empowering people with requisite skills and technological literacy. Contextualising the key purpose of gender and Artificial intelligence assists in exposing these biases. Artificial intelligence is used in different doctrines, domains and discipline-therefore it makes it difficult to define. Robotic technology relies heavily on mathematics

and statistics. Artificial Intelligence research is deep rooted on how human beings form knowledge.

This paper shows that increased automation can heighten inequalities at the workplace, as algorithms can have unintended consequences. Machine learning has been widely used for computational problem and neural networks etc. There is no doubt that Artificial intelligence is advantageous, but until recently, certain groups are feeling the impacts of this higher form of intelligence. Also, intelligent technology taps into the heart of fundamental human rights like privacy issues data breaches, and freedom of expression. Data is also prone to errors and biases which could easily undermine the usefulness thereof. There are numerous examples from a variety of sectors that demonstrate how Artificial intelligence is transforming many facets of life. The dissemination of Artificial intelligence has enhanced response rates and efficiencies. Simultaneously, these developments come at a price, namely: The intersect between policy, regulatory, and ethical issues. The question data access? The Legal liability, the transparency of the engineers and designers behind the software programming.

There is also another debate whether government will use or misuse information. Again there is the capacity for Artificial intelligence to be used for good governance instances like fraud reduction, money laundering etc. Therefore, it is implicit to empower and educate females so that they become technologically efficient. However, this is where the conundrum emerges, i. e. technology a become an impediment and entrench gender inequality. Social psychology proposes a number of theories why gender inequality exists-namely stereotypical behaviour Women now seek and acquire the highest leadership roles in various sectors. Yet, the societal response towards women is not accepting some sectors are still male dominated and this poses an immense challenge for women. There are still many obstacles that prevent women from obtaining their

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optimum leadership levels, this can be the “glass ceiling”, the “glass cliff,” even the labyrinth, or the “visibility-vulnerability spiral” (invisible processes in formal organisations) sometimes it is common situational barriers that women face as they excel in an organisation. There are also personal challenges such as familial responsibility. Stereotyping also affects the role of women. Very often, women have to conform to the acceptable norms of society. In South Africa, women face multiple burden of oppression due to their gender, race and societal discrimination. Therefore, any conclusions or recommendations on how to advance women as leaders are conditional upon their specific set of circumstances and the organisational setting.

Amartya Sen’s notion of social justice clearly demonstrates that rights are linked to survival. Women’s participation in the workforce has been one of the most significant societal changes. As this awareness swells, women have made notable advances in management which used to be the male domain. But, women have not made Major inroads into the higher levels of corporate power. Studies in various countries, especially Norway, monitor the presence of women in executive position. Research, especially surveys indicate that gender is still common barrier to women’s career advancement even in international contexts.

In this article, it is important to approach Artificial Intelligence on multi-faceted approach and not simply a narrow feminist approach. Gender differences in IT careers appear to be affecting the competitiveness of companies globally. It is posited that given the current labour shortage in the IT industry, it has become more important than ever to reduce sources of leakage in the IT career paths of women. A model of barriers faced by women in the field of information technology is presented.

The lack of women in senior positions of technology cannot be explained by theories. Other areas include the following:

- The role of gender and culture.
- There are several factors to look at in this research.
- The technology industry which is male dominated.
- The educational system
- Cultural biases or stereotypes such as specific jobs for men and women.
- The culture of the technology industry
- Women in technology globally

Globally, gender differences in IT careers appear to be affecting the competitiveness and productivity of companies and institutions. It is posited that given the current labour shortage in the IT industry, it has become more important than ever to reduce barriers for women. The concept or phrase Artificial intelligence can conjure up images of avatars, super human machines with super human strength overpowering humans and taking over the world. This implies that super intelligence comes into play, even when goals are closely aligned to human’s needs, there can be instances wherein these goals become unanticipated. Human intelligence and technology can be a lethal combination, if it is unregulated. The repercussions can be devastating.

One is familiar with movies where humans and technology intersect, often with cataclysmic results. Essentially these movies portray the human/machine relationship which leads

to devastating results. Machine learning and Artificial Intelligence are not new fields; they have been in existence and enable automated systems to do human tasks. The reality tends to describe a scenario that’s stable, in search of patterns and offers a host of solutions to some problems from e commerce, to chat bots and covid 19 surveillance Apps. In China, thermal scanners and facial recognition software was used to track and trace the virus.

Whilst there are gains to be made, there is strong evidence to suggest that Artificial Intelligence can make the world a much more unequal space. Most of the Artificial Intelligence tools are developed so rapidly, that the traditional way of doing things is eliminated. It is clear that Artificial Intelligence may seem to be objective, Artificial Intelligence carries a history of gender bias. Still, Artificial Intelligence systems and processes can reflect and amplify existing cultural and prejudices and inequalities (Sweeney, 2013). Although Melvin Kranzberg (1986) argues that technology is neutral or impartial. In this sense, Artificial Intelligence is unbiased and can do no harm. However, there are a number of research papers about word embedding and human biases. Some researchers have used the Implicit Association Test.

The author argues that it would be imprudent for Artificial Intelligence and ML to adopt premature measures that counteract the gains made by women. This could trigger an inadvertent escalation of job losses, especially in a country like South Africa where the unemployment rate is very high. The constitution realises the progressive realisation of the right to gender equality. The rights and empowerment of women has stimulated debate on a global level. Women’s lack of representation in positions of leadership is well known. The stereotyping of gender roles illustrates that women are more likely to be in the service industry (e. g. health care, teaching etc.), (e. g. the energy sector-very male dominated). Gender stereotypes also extend to leadership, with typical male characteristics of dominance. The leadership standard continues to be male orientated. Globalisation has changed the way in which business is done; therefore, leadership requirements have also changed. In addition, the educational levels of women have increased substantially; despite this, women are still under represented in top level positions. According to International Labour Organisation report, although women represent 40 % of the world’s labour force, their share in management positions remains considerably low.

There have been concerns about the displacement of workers (Autor, 2015). This will widen the inequality gap and lead to more economic and social polarisation. Algorithms and Artificial Intelligence have gained huge importance; however, it is women who are still a minority-It is women who are marginalised and excluded. Artificial Intelligence researchers must and should take into account data that is gender disaggregated. Data science is powerful. According to Catherine D’ Ignazio, in a book titled Data Feminism; she asserts that “data is the new oil.” Further, the author speaks about data justice and not data ethics.

## The Science and Technology debate

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Science and technology as well as concepts such as ‘research’, ‘engineering’ and ‘design’ are sometimes used interchangeably. Undeniably, they have various points of contact, they often at times overlap but they are distinct. In particular, any discussion or debate must make this clear distinction. Science and research are closely connected and at times overlap. The term ‘Science’ has its origins in the Latin ‘scientia’ and stands for ‘knowledge’. However, with time, the definitions are more complex, and can be simply referred to as knowledge acquisition. Webster’s dictionary defines science as “knowledge or a system of knowledge covering general truths or the operation of general laws especially as obtained and tested through scientific method” (Merriam-Webster 2011). Technology is often based on the results that are acquired from science and engineering or the end result. Technology comes from the Greek ‘tekhne’ (standing for ‘art’, or ‘way of doing’) and ‘logike’ (which means ‘reasoning’) – so technology can be translated “reasoning about the art of doing” (Smith Keller 1992, 24). At this point it becomes explicit that language plays an important role in how communication occurs. Similarly, prejudices of masculinity almost become inscribed in certain disciplines-like science and technology.

In many parts of Africa, women are underrepresented in the STEM fields (Science, Technology, Engineering and Mathematics). Similarly, the problem around Artificial intelligence is not simply about gender but inherently about power. AI systems by their very nature are discriminatory. Currently, many institutions an organisation face a dilemma, submit to AI and strengthen global competitiveness or promote Artificial intelligence at the expense of the work force? Can machine learning algorithms surpass the biases? Does Artificial intelligence amplify the differences and social inequality? With discussions and debate surrounding Artificial Intelligence, a number of challenges have arisen especially in terms of gender and inclusivity. Technology is influenced by the behaviour of human beings. “like all technologies before it, artificial intelligence will reflect the value of its creators. (Crawford, K, 2016)” quoted in the New York Times. The over representation of men in this field can silently dissipate the strides made by women. The uses of Artificial intelligence also raise ethical considerations-It is well known that technological design, automation, robots or gaming is seen as the masculine domain. Often technological design will replicate the restrictive gender prototypes. This filters into a hierarchical system that creates a fundamental barrier or the clichéd glass ceiling that it is difficult to infiltrate. Every country has its own legislative framework when dealing with Artificial intelligence ad ML in the workplace. In levelling the playing fields, often economic and political power supersede social justice issues. This chapter proposes that research needs to intersect with policy to impact gender equality. The challenges of Artificial Intelligence and ML must be made a priority, while the conversations around Artificial intelligence maybe speculative; one needs to face the unwanted consequences of Artificial intelligence.

The workforces in terms of design, engineering, Artificial Intelligence technologies are mainly male. Does this imply that Artificial intelligence will perpetuate this vicious cycle? Many feminist scholars have investigated the relationship

between science and technology. Can robots learn new behaviour if they are programmed by human beings? The question, then arises is society ready and able to deal with the gendered consequences? If Artificial intelligence aims to accelerate work methodologies-then Artificial Intelligence creates a major role for women. Most countries lack the resources and capacity to have verifiable and quantifiable data-therefore they are unable to legislate policies that will benefit women in the workplace.

Any policy must be gender sensitive, or else these policies will reproduce and reinforce gender stereotypical behaviour. Inclusivity, diversity and gender balance are important prerequisites for any human resource component in society to thrive. Suffice to say, algorithms are based on data that is filtered into it, this can create be difficult-since algorithms are predictive in nature. It is clear that research is limited on Artificial intelligence. Profiteering and time consumption might the end result but gender discrimination will become more entrenched. Some of the common questions that arise are:

Why do females avoid computer science?

Why are there more male computer scientists?

Are males more technically competent?

Do females have not enough confidence when dealing with technology?

Any policy that is to address human resource capacity demands a human centred approach. It is clear in the continuous male domination in the areas of technology research, design and development. One of the objectives of this study is to contribute towards gender equity and Artificial intelligence. How do organisations and institutions stop replicating this type of discrimination? It is important to link the theories of gender equality with workplace methodology. In the economy, there is risk and need for organisational survival. While, we need the right managers and leaders in Artificial intelligence and ML, we also need women. The potential of women as software and robotic engineers is often disregarded and ignored. Male leadership is still viewed as “normal.” The forces of globalisation are moving in the direction to improve the plight of women. Therefore, we need to see an increase of women in engineering and computing science. We need to pave the way for more women to take up leadership positions. Therefore, masculine characteristics should not be the predictors of leadership status for women.

Opportunities are created by Artificial Intelligence, but they should not supersede human intelligence. While some may argue that the biggest threat of Artificial Intelligence is weaponisation, on the contrary Artificial Intelligence can lead to mass unemployment and gender discrimination. Discrimination and inequality at the workplace have devastating repercussions, mainly exclusions of certain groups. Therefore, it would be reasonable to consider the ethical implications to society.

### Limitations of the Study

Reaffirming the importance of AI long term effects, there needs to be much more research in the future. It is well known that qualitative insights from any study are valuable; however quantitative study is also important. Artificial

intelligence is a multidisciplinary field that requires the input of sociological, legal, technical and academics.

## 2. Conclusion

When you invent the ship, you also invent the shipwreck; when you invent the plane you also invent the plane crash and when you invent electricity, you invent electrocution.... Every technology carries its own negativity, which is invented at the same time as technical progress. (Paul Virilio). Robots can communicate in a human code without being human; they can hold a mechanical body and a biological brain (think of biological AI); they have been constructed from human knowledge and categories, and still, they transcend them both. Cultural beliefs play a key role in the human reception of advanced Artificial Intelligence, while political, social, technological and economic interests are crucial to its advances. This translates into robots continually evolving-similar to a simple example of the smart phone. As ML advances, it may become more difficult to distinguish between AI and human produced content. Gender prejudice in Artificial Intelligence, machine learning, and deep learning is the result of the replication by design of a deeply systemic mind-set.

The corporate world is supposed to exemplify equality in decision making however, AI can begin to replicate these prejudices in myriad forms. To boost ICT and women in the workplace, it is critical to recruit more women in the workplace and governments need to allocate more spending on women and ICT research, bursaries for female students studying ICT. Any society must invest in ICT and maintain human accountability. Therefore, there needs to be accountability, transparency by humans since machines cannot be held accountable. This means that companies and institutions need to be held accountable for the consequences of their "system's" actions. In the end, the designers and developers of software cannot predict the end result. Political leaders, including researchers need to ask: How can we build gender-sensitive AI to advance gender equity, rather than embed and entrench gender bias?

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