DOI: https://doi.org/10.36719/2706-6185/52/7-11

Tinatin Mshvidobadze
Gori State University
doctor of Technical Sciences
https://orcid.org/0000-0003-3721-9252
tinikomshvidobadze@gmail.com

Women in Science: Challenges and Opportunities

Abstract

Over the past 10 to 15 years, discussions about the importance of women in science, technology, engineering, and mathematics (STEM) fields have gained significant traction. This article highlights the stories of several notable women who have made significant contributions to the fields of technology and computer science. It explores how women have shaped the tech world and examines current statistics on women in tech, aiming to shed light on the inequalities that persist. Additionally, the article analyzes a study conducted by researcher Francesca Ferrando, which investigates the relationship between gender and artificial intelligence (AI). The study also emphasizes the unpredictable and unique ways in which robots and AI systems will evolve. This perspective underscores the importance of incorporating critical frameworks such as feminist epistemology, critical race theory, and postcolonial studies to inform the technological field and develop a posthuman epistemology. Looking ahead, a posthuman integral epistemological approach may enable humans and robots to realize their interconnected potential. This collaboration could contribute to humanity's broader existential quest and redefine the role of both species in the shared pursuit of progress.

Keywords: *women's lives, AI systems, feminist epistemology, tech industry*

Tinatin Mşvidobadze
Qori Dövlət Universiteti
texnika üzrə elmlər doktoru
https://orcid.org/0000-0003-3721-9252
tinikomshvidobadze@gmail.com

Elmdə qadınlar: problemlər və imkanlar

Xülasə

Son 10–15 il ərzində elm, texnologiya, mühəndislik və riyaziyyat (STEM) sahələrində qadınların əhəmiyyəti ilə bağlı müzakirələr böyük maraq qazanmışdır. Bu məqalə texnologiya və kompüter elmləri sahələrinə əhəmiyyətli töhfələr vermiş bir neçə görkəmli qadının hekayələrini vurğulayır. O, qadınların texnologiya dünyasını necə formalaşdırdığını araşdırır və davam edən bərabərsizliklərə işıq salmaq məqsədi ilə texnoloji sahədə qadınlarla bağlı cari statistikanı təqdim edir. Bundan əlavə, məqalədə tədqiqatçı Francesca Ferrando tərəfindən cinsiyyət və süni intellekt (AI) arasındakı əlaqəni araşdıran tədqiqat təhlil edilir. Tədqiqat həmçinin robotların və süni intellekt sistemlərinin inkişafının gözlənilməz və unikal yollarını vurğulayır. Bu baxış texnoloji sahəni məlumatlandırmaq və insandan sonrakı epistemologiyanı inkişaf etdirmək üçün feminist qnoseologiya, tənqidi irq nəzəriyyəsi və postkolonial tədqiqatlar kimi kritik çərçivələrin daxil edilməsinin vacibliyini önə çəkir. İrəliyə nəzər salsaq, insandan sonrakı inteqral qnoseoloji yanaşma insanlara və robotlara bir-biri ilə əlaqəli potensiallarını həyata keçirməyə imkan verə bilər. Bu əməkdaşlıq bəşəriyyətin daha geniş ekzistensial axtarışına töhfə verə bilər və hər iki növün ümumi tərəqqi axtarışında rolunu yenidən müəyyən edə bilər.

Açar sözlər: *qadınların həyatı, AI sistemləri, feminist epistemologiya, texnologiya sənayesi*

Introduction

Women play an important role in the technology industry. Although male-dominated, women have made significant contributions to the development of the field, and their role in technology is becoming increasingly important.

Engineering has long been considered a male-dominated field, where women face many barriers. However, in recent years, women have been breaking gender stereotypes and excelling in engineering disciplines.

Being a woman in tech means courage and growth — in yourself and in others — and there is no space that girls and women shouldn't explore.

In this article, we will discuss the future of gender in the discourse of artificial intelligence, cyborgs, and robotics.

To address these issues, Francesca Ferrando conducted a study on gender and artificial intelligence in the Department of Cybernetics, University of Reading, together with Professor Kevin Warwick, one of the pioneers of cybernetics. In this paper, we discuss the results of this study (Ferrando, 2024). The aim of the questionnaire was to explore the long-term consequences of such epistemological choices.

Research

Feminist theory is theorizing about women's experiences and perspectives, and the theory itself is as diverse as these experiences. One of the main goals of feminist methodology is to focus attention on the invisible and unvoiced experiences, attitudes, and opinions of women who have been historically excluded and marginalized from dominant metanarratives (Javakhishvili, 2004).

Today, feminist theory has moved beyond the argument for universal experience to raise a number of philosophical and political questions about the differences between women.

Technology is a major challenge in the process of forming feminist theories, as technological innovations and artificial intelligence are changing the nature of work and workers. Feminist theory also provides new ideas and unconventional approaches. Feminist theories challenge the ways of cognition and knowledge production and suggest fundamentally alternative ways of cognition (Antelava, 2002).

Historical Narrative of Women in Technology

Since the early days of engineering, women have made significant contributions to the field. These pioneering women paved the way for future generations and proved that gender is no barrier to success.

We will discuss how women have shaped the world of technology and delve into the latest statistics on women in technology.

- **Ada Lovelace (1815–1852) –** the world's first computer programmer. Ada Lovelace's notes on the *Analytical Engine* were used by Alan Turing in the 1940s when working on the first computer.
- **Barbara Bairamashvili (1888–1982) –** a pioneer of clinical medicine, one of the founders of medical science in Georgia.
- **Grace Hopper (1906–1992) –** a pioneer of computer programming; she worked on the first commercial computer in the United States.
- **Annie Easley (1933–2011) –** NASA rocket scientist and researcher on gender and racial diversity in STEM.
- **Nettie Stevens (1861–1912) –** geneticist and biologist. She earned bachelor's and master's degrees in biology and later discovered the X and Y chromosomes through cytological research on regenerative processes.
- **Adele Goldberg (1945–present) –** played a significant role in the development of the programming language *Smalltalk-80*.
- **Karen Spärck Jones (1935–2007) –** a pioneer in information science. She created *Inverse Document Frequency (IDF)*, which is now standard for modern web search engines and is used to assess the relevance of a document to a search query.

- ***Radia Perlma(1951- now)*** – His Spanning Tree Protocol (STP) algorithm helped shape the Internet today. His work has had a profound impact on how networks organize themselves, how data is moved, and how basic rules are implemented for Internet traffic.

These women have broken barriers and overcome challenges in the engineering industry. They are role models and inspirations for the next generation of female engineers.

Women in Tech Statistics Today

According to research by the U.S. Bureau of Economic and Statistical Affairs, men hold 30% more jobs in the technology sector than women. According to research by *Woman 2.0*, the imbalance is also evident in the case of start-ups — less than 15% of new projects submitted to large companies are created by women.

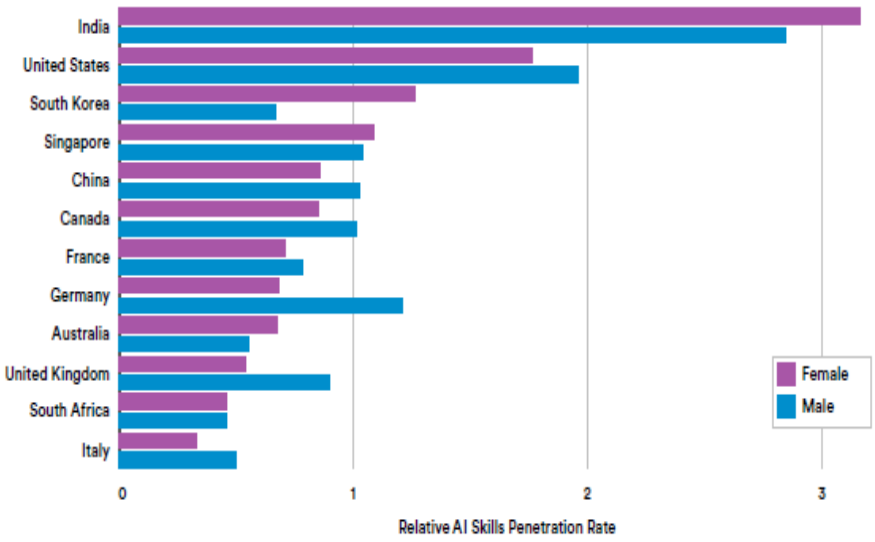
A 2020 study by *Accenture* found that the percentage of women in tech was 32% in 2019, and research from the *Women in Technology Network* found that women currently account for 35% of STEM employees in the U.S.

There are many successful female start-ups around the world. Over the past 20 years, the number of female entrepreneurs has increased by 114%. In 2024 alone, 10 companies led by women became so-called unicorns (*European Commission*, 2020).

Women in the AI Workforce

Figure 1. Shows the adoption of AI skills by country, with a comparison of women and men. The data suggest that in most of these countries, the penetration rate of AI skills is lower for women than for men.

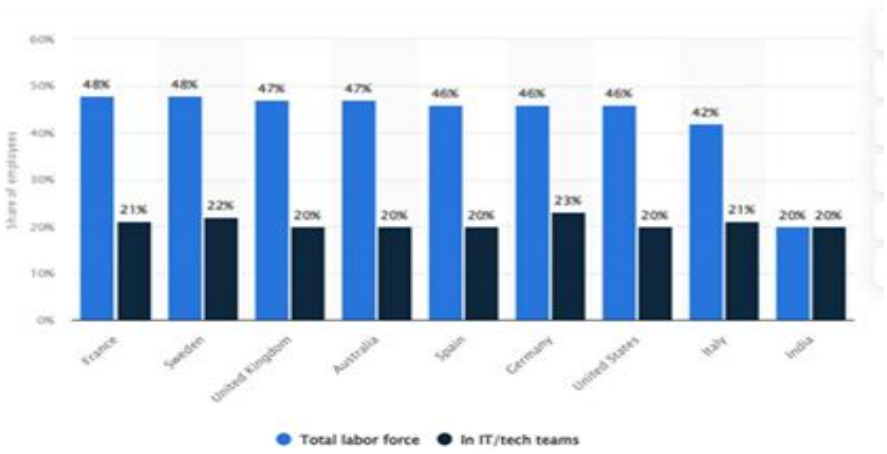
Figure 1. RELATIVE AI SKILLS PENETRATION RATE by GENDER, 2019-2024.



Source: Artificial Intelligence Index Report.

Among the 12 countries surveyed, India, South Korea, Singapore, and Australia are closest to achieving parity in AI skills penetration rates between women and men. According to statistics, worldwide female representation in tech companies ranges from 43% to 48%, except in developing countries like India, where women make up only 20% of the total workforce (Figure 2.).

Figure 2. Female representation in technology organizations in 2024.



Source: Statista

Women in Technology (Georgia)

The startup ecosystem in Georgia is just beginning to develop, and along with various startup programs, initiatives are emerging to support female startups. One important initiative that is opening up new opportunities is the program called "Georgian Women in Technology", supported by Prospera Women, which the U.S. Market Access Center (USMAC), in collaboration with the USAID Economic Security Program, is launching right now. The U.S. Market Access Center is a leading accelerator in Silicon Valley, helping international startups to enter the global market through Silicon Valley. This rapid economic growth program will help female leaders of Georgian startups develop (Surmanidze, 2020).

Cyborgs and Robots

We will discuss a study on gender and artificial intelligence conducted by Francesca Ferrando and Professor Kevin Warwick from November 2022 to January 2023 at the Department of Cybernetics at the *University of Reading*, with over a hundred students participating in the study. The aim of the study was to highlight the biological, cultural, and symbolic frameworks of sex and gender, as they shape the development of the technological future. The questionnaire was answered by more than one hundred doctoral students in the Department of Cybernetics at the *University of Reading* (England). The average age was twenty years. The main questions were about the interaction between cyborgs and robots and the role of gender in the production of AI (Ferrando, 2024). When asked these two questions, the questionnaire results clearly emphasized male characters: while cyborgs were thought of as neutral or masculine by more than a hundred respondents, no one thought of robots in terms of femininity. In the words of Albert Einstein: "Imagination is more important than knowledge. Knowledge is limited. Imagination encompasses the universe." (Einstein, 1952). Thinking about the future does not in itself create the future, but it can influence people's perceptions and, ultimately, actually play a role in the constitution of reality. Feminist epistemology, which views the world from different angles, offers a vision of how formulations and future directions should evolve (Tsintsadze, 2003). Thus, the cyborg is our ontology — a high-tech culture confronting dualistic issues such as the logic of domination over women, people of color, nature, workers, and animals in interesting ways. In the relationship between man and machine, there are no roles of maker and made; what is the body in machines that are reduced to coding practices? As we recognize ourselves in formal discourse and everyday practice, we will see that we are cyborgs and hybrids.

Feminist Epistemology and AI

Since the 1960s and 1970s, as a result of feminist efforts, women have begun to speak out about the neglect of women's experiences in various fields of theoretical, creative, and practical activity — in politics, medicine, business, the natural sciences, and the social and humanities. In academia, feminist researchers have exposed the inconsistencies between lived experiences and established

theoretical frameworks. Thus, contemporary feminist approaches to research, knowledge creation, and cognitive theory aim to bring women's experiences, which have been ignored for centuries, to the forefront. The goal of this endeavor is to authentically represent women's lives. One such model of knowledge creation is the epistemology of the feminist position. Proponents of this approach argue that the starting point for the search for knowledge is experience and that it is from women's perspectives and experiences that researchers should study the social world. The epistemology of the feminist position is based on the Marxist idea of the role of the proletariat (HMSO, 2016). Feminist epistemology provides a constitutive framework for the development of posthuman epistemological approaches. Based on these theories, Francesca Ferrando formulated the following questionnaire and showed mixed results. Some respondents answered "yes" to these questions because they believed: "It seems that more men are interested in artificial intelligence," and "Robots designed by women are probably more beautiful." The answers seem to emphasize design as one of the signs of gender difference in technology (Clough, 2017).

Conclusion

Thus, if we want the country's economy to develop and offer equal opportunities and fair competition to everyone, regardless of gender, new programs that aim to include women in technology and support women are vital. The results of the questionnaire used in the study by Francesca Ferrando reveal AI as a field that is mainly developed in the male imagination: for example, while the majority of respondents thought of cyborgs as neutral or masculine, none of them thought of robots in feminine terms. On the other hand, gender as a social code contradicts its biological inheritance.

Robots will develop in unique and peculiar ways that are difficult to predict. Technological developments have significantly increased the availability of hardware and software tools needed to create AI-based services. AI has the potential to transform traditional approaches to managing virtually every work or business process for the better. We believe that the involvement of women will leave a significant mark on the development of AI in the future.

References

1. Antelava, L. (2002). *Culture and gender*. International Center for Women's Education and Information.
2. Clough, P. T. (2017). *The affective turn: Theorizing the social*. Duke University Press.
3. Einstein, A. (1952). The foundation of the general theory of relativity. In *The principle of relativity: A collection of original memoirs on the special and general theory of relativity* (pp. 109–164). Dover.
4. European Commission. (2020). *Women and science – Mobilizing women to enrich European research*. CEC COM.
5. Ferrando, F. (2024). Cyborgs, robots, artificial intelligence and the futures of gender: A case study. *European Journal of Futures Research, 2*(1), 64.
6. HMSO. (2016). *Realising our potential: A strategy for science, engineering and technology* (Cm 2250).
7. Javakhishvili, N. (2004). *Research methods in psychology*.
8. Surmanidze, L. (2020). Woman in Georgian mentality. In *Women in developing process* (pp. 3–28). UN Development Program.
9. Tsintsadze, N. (2003). *Women's everyday and social role in different ethnic groups* (pp. 218–237). Caucasus Institute of Peace, Democracy and Development.

Received: 29.06.2025
Accepted: 08.10.2025