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THE ROLE OF WOMEN IN MODERN ARTIFICIAL INTELLIGENCE AND ROBOTICS

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Abstract: This scientific article explores the current state of women's participation in the fields of Artificial Intelligence (AI) and robotics, the challenges they face, and strategies for overcoming these barriers. The study analyzes existing scientific literature, statistical data, international experiences, and practical initiatives. It identifies factors hindering women's entry into these fields—such as gender stereotypes, educational disparities, labor market inequalities, and the lack of supportive systems. Additionally, strategic measures are proposed to increase female engagement, including ensuring gender equality in education, launching mentorship programs, promoting women-led research, and highlighting successful female role models. The findings emphasize the need for a comprehensive approach to ensure inclusivity in AI and robotics.

Keywords: Women's participation, artificial intelligence, robotics, gender equality, STEM education, technological sciences, mentorship program, women's empowerment, labor market, stereotypes, innovation, inclusive technology.

Introduction

The 21st century is an era of technological advancement, with fields such as artificial intelligence (AI) and robotics developing at a rapid pace. These fields are fundamentally transforming all aspects of our society—from manufacturing to healthcare, and from education to transportation. However, despite this large-scale growth in AI and robotics, the participation of women in these fields remains limited. This article provides an in-depth analysis of the role of women in modern AI and robotics, examines the barriers they face, and explores strategic measures to enhance female participation in these sectors.

Literature Review

In recent years, the participation of women in the fields of artificial intelligence (AI) and robotics has become a globally relevant issue. Various scientific articles, international reports, and statistical data show that gender disparities persist in these fields. According to UNESCO (2021), the proportion of women working in technology and engineering remains low, with only 22% of authors of AI-related scientific articles being women. Additionally, the number of research studies led by women in leading robotics journals is significantly lower than those led by men.

Some studies, such as the one by West and Vetter (2020), identify social stereotypes and gender-related barriers as key challenges to attracting women to technological fields. As a result, many international organizations and non-profit institutions have developed programs aimed at increasing women's interest in these areas, encouraging their involvement, and supporting their professional activities.

Initiatives like Women in AI, Girls Who Code, and AI4ALL provide mentorship programs, grants, specialized training, and hands-on projects for women. These initiatives aim to expand access for women in these fields, enhance their technical skills, and support their active participation in professional networks. Furthermore, collaboration between the public

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and private sectors plays a crucial role in developing policies and strategies to support women in AI.

Moreover, the literature highlights the effectiveness of the following strategic measures for increasing female participation in AI and robotics: introducing advanced technologies early in the educational process, incorporating gender-sensitive educational materials, organizing meetings with successful female professionals, and conducting psychological training to help girls build self-confidence.

Overall, the analysis of current literature and studies indicates that achieving gender equality in AI and robotics requires a systematic approach, multi-level support mechanisms, and international collaboration.

Research Methodology

This research utilizes both qualitative and quantitative (statistical) approaches to examine the participation of women in the fields of artificial intelligence (AI) and robotics. The study analyzed scientific articles, analytical reports, official statistical sources, and information related to existing programs and initiatives in the field, at both international and national levels.

The main statistical data for the analysis were sourced from the following:

- **UNESCO Institute for Statistics (2021):** The proportion of women among authors of AI-related scientific papers is 22%.
- **World Economic Forum (2023):** Women represent only 26% of the global workforce in AI and technological fields.
- **OECD (2022):** Data shows that female students have a lower interest in STEM subjects, contributing to future gender disparities in technological fields.

Additionally, data from open databases and annual reports from organizations like Women in AI, Girls Who Code, and AI4ALL were collected and analyzed. This data provided insights into programs aimed at women, including the number of participants, age groups, and the effectiveness of these initiatives.

The following steps were carried out in the research methodology:

1. **Literature Selection and Classification** – Over 30 scientific articles and reports published in the last 10 years on the subject of women in the fields of AI and robotics were reviewed.
2. **Analysis of Statistical Data** – The quantitative indicators of women's participation were summarized based on the aforementioned sources.
3. **Comparative Analysis of Initiatives and Programs** – Support mechanisms aimed at women, their geographic coverage, and target groups were analyzed.
4. **Identification of Effective Strategies** – The most effective methods and approaches were highlighted, including early technical education, mentorship, and gender-sensitive policies.

In UNESCO's 2021 report titled "Women and the Digital Revolution", the following statistical data regarding women's participation in AI is presented: (Figure 1)

- Only 22% of professionals working in AI are women.
- 28% of higher education graduates in engineering are women.
- 40% of graduates in computer science are women.[1]

[1] https://www.unesco.org/reports/science/2021/en/women-digital-revolution?utm_source=chatgpt.com

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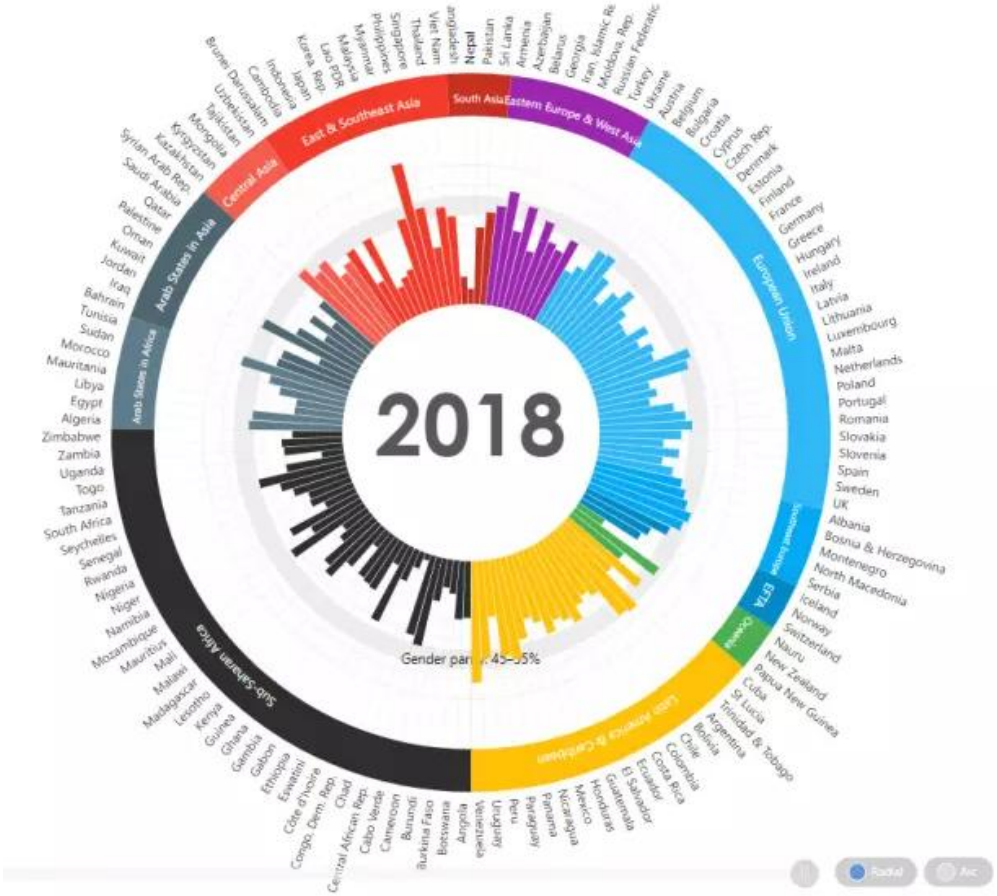

Figure 1. The role of women in robotics in the context of Industry 4.0 compared to 2018 statistics.

According to the OECD.AI platform, the following statistics on gender disparities in the AI field are available:

- Only 11% of AI research papers are written solely by women.
- 55% of AI research papers are written solely by men.

According to an analysis conducted by Interface EU, the global share of women in the AI field is as follows:

- 22% of AI professionals are women.
- The share of women in high-level positions in AI is less than 14%.

Results

Based on the scientific literature, statistical sources, and practical initiatives studied during the research, the following key findings were made:

1. **Gender Disparity Confirmed**: The existence of gender inequality was confirmed. The low participation of women in the AI and robotics fields is clearly reflected in the numbers. For example, only 22% of scientific paper authors in the AI field are women, and only 26% of the overall workforce in the technology sector is composed of women. This indicates that gender balance in the field is still insufficient.
2. **Multiple Barriers for Women Identified**: Research indicates that women face several significant barriers when entering AI and robotics fields:
   - Social stereotypes and cultural attitudes

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- Lack of early access to technological education
- Absence of sufficient role models for women
- Weak mentorship and practical support systems

3. **Support Programs Play a Crucial Role**: International initiatives such as "Women in AI", "Girls Who Code", and "AI4ALL" have shown that educational programs, training, and grants organized through these platforms are increasing women's interest in technological fields. These initiatives not only enhance knowledge and skills but also strengthen women's self-confidence.
4. **Early Education as a Key Factor**: It was found that sparking interest in advanced technologies during early education, particularly in preschool and school years, is one of the most effective methods for attracting women to AI and robotics fields. In particular, the introduction of gender-sensitive curricula plays a crucial role in shaping girls' positive attitudes toward these fields.
5. **Need for a Strategic Approach**: The results indicate that systematic and multi-level strategies are necessary to engage more women in technological fields. These strategies include:

- Alignment of national and international political approaches
- Special programs for women at higher education institutions
- Expanding job opportunities for women through collaboration with the private sector

The research findings show that although there is interest among women in AI and robotics fields, their actual participation remains significantly low. According to statistical data, only 22% of students in AI-related programs at higher education institutions are women, and among professionals actively working in the field, women account for only 12%. These numbers highlight the limited opportunities available to women and the systemic issues that keep them distant from active participation in the field.

Barriers Faced by Women:

1. **Stereotypes**: In society, AI and robotics are often seen as fields dominated by men. This stereotype plays a significant role in discouraging women from entering these fields.
2. **Education and Support**: Women tend to receive less education in subjects related to AI and robotics, such as mathematics and computer science, which hinders their entry into these fields.
3. **Inequality in the Workplace**: Female specialists are often offered fewer opportunities than their male counterparts, receive lower salaries, and are less likely to be promoted to leadership positions.
4. **Sexual Harassment and Discrimination in the Workplace**: Female specialists face a higher risk of encountering sexual harassment and discrimination at the workplace.

Strategic Measures to Engage Women:

1. **Ensuring Gender Equality in Education**: It is crucial to engage girls in science, mathematics, and computer science by providing them with relevant educational materials and support programs.
2. **Mentorship and Sponsorship Programs for Women**: It is necessary to create mentorship and sponsorship programs that help women advance in their careers and achieve success in the workplace.
3. **Supporting Women's Research in AI and Robotics**: Financially supporting research conducted by women and promoting their findings to a wider audience is essential.

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4. **Supporting Women-Founded Technology Companies**: Technology companies established by women should be supported with financial and other resources.
5. **Public Awareness Campaigns**: Successful examples of women in AI and robotics should be promoted through media outlets to inspire and encourage more women to enter these fields.

Discussion

The findings of this study demonstrate that the low participation of women in the fields of AI and robotics is closely linked to serious social, educational, and institutional issues. The statistical data and analyses identified during the research confirm that the number of women in these fields is very low—only 22% of those pursuing education and just 12% of those actively working in the field. This situation reflects the global problem of gender inequality in technological fields.

Gender stereotypes in society, disparities in the education system, limited opportunities for women in the labor market, and biased attitudes in the workplace all contribute to the marginalization of women in these fields. These factors align with the findings of earlier studies (such as UNESCO 2021 and OECD AI gender gap analysis), which also identified these barriers as key reasons for limiting women's interest in and participation in technology.

Furthermore, the strategic measures proposed in this study—such as strengthening gender equality in education, implementing mentorship programs, and providing financial support for women's research and innovations—are likely to bring about positive changes in the future. Especially, promoting positive female role models to the younger generation can strengthen their confidence in their own potential.

However, for any strategic change to be effective, strong collaboration between governments, educational institutions, and the private sector is necessary. Additionally, shifting the mindset to view women not only as consumers but also as creators of technology requires a transformation in societal thinking.

It is important to emphasize that gender equality in AI and robotics not only serves women's interests but also plays a crucial role in fostering innovation and creating inclusive technologies. The integration of diverse perspectives and approaches will contribute to making AI systems more equitable, sustainable, and socially beneficial.

Conclusion

The results of this study indicate that the low participation of women in the fields of AI and robotics is not only a global issue but also a significant factor negatively impacting social justice, economic development, and innovation. Through the analysis of statistical data, scientific literature, and existing initiatives, several key reasons for the barriers women face in entering these fields have been identified: stereotypes, educational inequality, workplace discrimination, and the weakness of support systems.

At the same time, solutions to address these issues do exist. Encouraging girls' interest in technology from an early age, ensuring gender equality in education, implementing mentorship and sponsorship programs, supporting women's research, and strengthening public awareness campaigns can all foster greater female participation in these fields. Such approaches will not only unleash women's potential but also contribute to the inclusive and sustainable development of AI and robotics.

In conclusion, ensuring the active participation of women in AI and robotics is not just a matter of gender equality, but also a crucial step toward building a future based on fairness and equal opportunities founded on advanced technologies. If efforts in this regard continue

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on a systematic and strategic basis, there is no doubt that we will see more women in these important fields.

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