

Advancing women's leadership in AI research and innovation

Learning Brief No. 4 • Lucía Mesa Vélez and Lorena Fuentes (Ladysmith) • January 2024

Objectives of this resource: To describe the issue of gender disparity in AI-driven research and innovation and spotlight effective strategies to bolster women's representation, leadership, and influence in the field. *This brief's synthesis of the available literature is far from comprehensive, and is meant to serve as a starting point for discussions and actions around gender and intersectional diversity excellence for AI4D labs and hubs.*

This is the fourth resource in the **AI4D GEI Support Team's learning brief series:**

- **Learning Brief No. 1** summarizes priority GEI considerations for the design of AI4D calls for proposals.
- **Learning Brief No. 2** provides an operational definition of gender-responsive projects in the context of AI-driven research and innovation, and synthesizes available research that illustrates why GEI considerations matter for the design and use of algorithmic decision-making.
- **Learning Brief No. 3** identifies key action areas for advancing gender-responsive AI research and innovation.

From [gender stereotypes becoming embedded in virtual assistants](#), [translation software](#), and [image recognition systems](#), to [hiring software that deprioritizes women's applications](#), to the [underdiagnosis of women's heart conditions by algorithms that analyze chest radiographs](#) —a growing evidence base shows the many ways in which AI applications, which are spreading to many aspects of our daily lives, can exacerbate gender and intersecting inequalities.

While the lack of participation of women is by no means the only factor driving such biases, emerging research identifies that the absence of gender (and intersectional) diversity in AI development teams is contributing to gender bias in AI-based decision-making systems,¹ which often reflect and perpetuate existing societal inequalities. As **AI cannot exist without the humans who create it, train it, or indeed produce the data that trains it**,² diverse AI teams are essential for ethical AI algorithm development. Homogeneous teams tend to

¹ [Nadeem et al., 2022.](#)

² [Manasi et al., 2022.](#)

produce biased algorithms that negatively affect marginalized groups, and the active involvement of women and their rise to decision-making and leadership roles, can bring different viewpoints, experiences, and insights, leading to more comprehensive, equitable and well-informed AI systems.³ Furthermore, **a lack of diversity hinders creativity and innovation, limiting AI's problem-solving potential.** Therefore, to ensure that AI is put in the service of benefiting individuals and the societies within which they live equally, it is necessary to examine which groups are 'calling the shots' in the processes central to AI research and development– and, ultimately, to course correct not only the representation (having a seat at the table) but also the influence (shaping the conversation and its outcomes) and leadership of women where needed.

Mapping the problem: women's under-representation in AI research and innovation

Gender disparity in the fields of data science, AI and innovation

- Women represent approximately 30% of the AI workforce, with only 24% holding leadership positions within the technology industry⁴.
- In the broader scope of STEM academic fields, 78.7% of new AI PhD graduates were male in 2021, and only 30.2% of faculty hiring were female⁵.
- As with other industries, there is a gender pay gap for computer science, with women earning 94 cents per dollar that men earn for doing the same job⁶.
- The percentage of women in technical roles at the biggest tech companies in 2020 was: Apple 23%, Google 21%, Microsoft 20%, and Meta 23%⁷.
- Even in cases where women assume entrepreneur roles in technology-based startups, a mere 2.3% of venture capital funding is directed towards startups led by women⁸.
- Notably, data for non-binary, trans or other gender minorities is not available. Therefore, the gender-diverse people and intersectional dimensions of which women are excluded are often missing from assessments and analyses of gender disparities in STEM fields.

³ [Fazelpour y De-Arteaga, 2021.](#)

⁴ According to the World Economic Forum's Gender Gap Reports: [2021](#), [2022](#), [2023](#).

⁵ [Stanford's Artificial Intelligence Index Report 2023.](#)

⁶ As per the [UNESCO Science Report 2021](#).

⁷ UNESCO Science Report 2021.

⁸ According to [a 2020 comprehensive survey conducted by Trustradius](#) involving 700 firms on a global scale.

The notable underrepresentation of women in tech fields is often explained using a **“pipeline” perspective**,⁹ which sheds light on the barriers that girls and women face at various stages in their education and career pathways. It is important to acknowledge that women are not a homogenous category and that gender discrimination intersects with other discriminatory systems of racism, colonialism, ableism, among others, and that the barriers to women's equal participation vary across time and space.

Beginning as early as K-12 education, gender stereotypes discourage girls from acquiring computer skills and pursuing STEM careers¹⁰, which is exacerbated by their limited access to computing resources and supportive networks compared to their male peers¹¹. Further down the ‘pipeline’, biased tech recruitment practices stall women’s entry, by favoring male candidates even when their qualifications are identical to female candidates¹², and workplace conditions such as lack of parental leave and childcare impede their retention. Women face a “glass ceiling”¹³, or invisible barriers that prevent them from rising to leadership positions despite their qualifications and abilities.

Women in STEM fields struggle to balance work with family responsibilities and are disproportionately affected by sexual and gender-based harassment, which can lead to talented women leaving these careers, resulting in a loss of talent¹⁴. Workplace bias and discrimination affect hiring, promotions, salaries, grant funding, peer reviews, and opportunities for presentation at conferences.¹⁵ Due to the higher standards and scrutiny in grant applications, peer reviews, and tenure reviews, women often receive less funding and fewer citations in their publications despite equal productivity and outcome quality. These challenges intensify for those facing intersecting discrimination. These gender disparities in education, recruitment, and workplace conditions underscore systemic issues hindering women in AI and STEM, demanding comprehensive solutions.

⁹ While it does provide some important descriptive power, it is worth highlighting that the pipeline perspective often trains our attention on individuals, rather than systems, and thus can bolster approaches that shift responsibility for resolving discrimination issues onto the shoulders of the marginalized, rather than addressing the root causes of discrimination. For instance, when tech companies are criticized for their lack of diversity, they often use “pipeline studies” as evidence to support their claim that there are not enough qualified women and people of color available for hiring. Therefore, it is important to avoid framing the problem as a lack of achievement on the part of girls and women, and instead acknowledge the barriers created by male-dominated social institutions that hinder the success of women and marginalized genders.

¹⁰ [Babirye et al., 2022](#).

¹¹ Margolis & Fisher, 2001.

¹² [Manuti et al., 2015](#).

¹³ Carnes et al., 2008.

¹⁴ Greider et al., 2019.

¹⁵ West et al., 2019.

Why does it matter?

From a standpoint rooted in women's rights and feminist principles, the argument for tackling the barriers to promoting women's leadership is a normative one: women have an internationally recognized right to equal participation¹⁶. Thus, upholding gender equality and inclusion in the domain of AI research and innovation is essential for ensuring that the specific needs and challenges faced by marginalized and disadvantaged groups are met and addressed. This perspective skirts the often-used utilitarian argument, which seeks to “make the case” for women’s participation and leadership by pointing out the broader benefits that can accrue to societies. Reflecting on other fields such as politics, law, and economics, however, feminists have highlighted **the underlying gender bias that underwrites these efforts to “prove” the value of women's equal representation let alone leadership in fields traditionally dominated by men, noting that “no equivalent empirical scrutiny” is given to male overrepresentation.**¹⁷

Notably, and turning towards a more utilitarian perspective, **promoting women's leadership not only aligns with normative human rights standards and principles but also significantly enhances the quality of research and AI development.** Numerous studies have shown that the integration of diverse perspectives and knowledge can enhance problem-solving, creativity, and decision-making processes,¹⁸ and thus improve overall group performance. Indeed, research quality improves when gender equality considerations are meaningfully integrated into research teams.¹⁹

Strategies for change: dismantling the barriers to women’s leadership in AI

Addressing the barriers to women's leadership in AI requires first acknowledging that these barriers, as well as the ones most ‘ripe’ for nudging or change, **will often differ according to context.** Furthermore, it requires acknowledging that **barriers to change are often deeply ingrained within systems and wider societies** (e.g., institutions, laws, and policies), **as well as nestled within the “hearts and minds” of individuals who exist within those societies** (e.g., specifically those who exercise some power within institutions, or who craft and uphold relevant laws and policies).²⁰ Practically speaking, this means that **efforts that target**

¹⁶ The Sustainable Development Goals (SDG) are an example of this international recognition. For instance, SDG 5 focuses on achieving gender equality and empowering all women and girls and SDG 16 aims to promote peaceful and inclusive societies, for which women's rights to leadership is paramount.

¹⁷ [Berryhill & Fuentes, 2021.](#)

¹⁸ [Knippenberg et al., 2004.](#)

¹⁹ [Bouman, 2018;](#) [Nishii, 2012.](#)

²⁰ See [Cookson et al., 2023.](#)

individual-level or even group-level dynamics related to gender relations should be bridged with broader efforts to enact (and implement!) laws, policies and norms that provide an enabling environment for more system-wide and sustainable change.

In the pursuit of advancing women's leadership, it's crucial to recognize that the benchmark for women's leadership should extend beyond mere numbers; it should encompass the ability to influence and shape the trajectory of research and technology. A critical concern is steering clear of a technocratic approach that suggests that increasing the number of women in technology roles will, on its own, resolve broader technology-human rights dilemmas. Instead, it is important to go beyond mere representation (occupying a position in the team) into effective influence (shaping the discourse, the decisions and their results).

The following is a non-comprehensive list of proposed strategies to bolster women's representation, leadership, and influence in AI-driven research and innovation, based on literature and learnings from STEM and other fields²¹. Even if there is not a silver-bullet solution, they are a starting point to mobilize conversation and change. It is suggested to combine them, especially those that are intended to change structures and norms with those that aim to support individual women.

- **Increasing transparency and equity** in areas such as compensation, opportunities, and hiring practices across all job categories²² to impact retention of women and breaking of “glass ceiling”. This includes publishing data about hiring processes, compensation, bonuses, and evaluations or promotions. Furthermore, organizations are encouraged to adopt more inclusive hiring and promoting practices, targeting under-represented groups and facilitating pathways for contract workers to transition to full-time roles. For academic settings, ensuring diversity in all AI-related spaces is emphasized, spanning research departments and conference committees.
- **Addressing sexual harassment with rigorous responses**, including mandatory counseling, suspension, and even termination of employment, particularly in cases where institutional negligence is evident. Establish institutional and governmental offices to handle substantiated sexual misconduct claims, educate institutions on sexual harassment policies, and define clear reporting chains and investigation protocols²³. Promote best practices for handling such cases and issue public apologies in cases of institutional harm.

²¹ Berryhill y Fuentes, 2021.

²² West et al., 2019.

²³ Greider et al., 2019.

- **Addressing unconscious bias and cultural prejudices that affect women's career progression.** The contributions women make through activities such as committee work, mentorship, and teaching should not be minimized during evaluations. Also, family-related issues such as childcare and domestic labor, which disproportionately affect female scientists, ought to be urgently addressed.
- **Increasing fairness and transparency in resource allocation,** including start-up packages, salaries, and internal grant funding. Gender-balanced representation in promotion and award-nomination committees is crucial.
- **Implementing work-life balance and family-friendly policies** can expand access to participation and achieving decision-making roles for women and marginalized groups. In particular, gender-sensitive workplace policies, such as parental leave, child care assistance and flexible work arrangements are crucial to support women.
- **Gender parity policies:** In many contexts, gender parity policies have proven effective in increasing women's statistical and substantive representation, strengthening institutional accountability to gender equality, and promoting investments in areas that disproportionately affect women. In politics, for example, gender quotas have been particularly effective in advancing women's participation and representation.
- **Network-building and capacity-strengthening programs** play a vital role in supporting women's access to leadership positions. Formal mentorship programs, training opportunities and leadership development programs have shown a significant positive impact on women's career trajectories. Women's associations help women deepen their networks, build confidence, and enhance their professional profiles.

Organizations learn by doing—a variety of paths may work but what is important is that there is a **sustained effort** to actually change rules, practices and norms that disadvantage women and other marginalized groups.

Annex A: Promising practices for advancing women's leadership in AI

CASE STUDY: Addressing structural gender inequalities and barriers.

Gender in STEM (GIST) Research Initiative, funded by IDRC, addresses the knowledge gap regarding the participation of women in science leadership positions, particularly in low- and middle-income countries.

How it Worked: Launched in 2020, **Breaking Barriers** projects analyzed gendered participation in Southern science systems, exposing the embedded systemic and systematic inequities that prevent women from advancing to leadership positions. In 2021, funding expanded for GIST, aiming to understand barriers, identify effective strategies, promote women's leadership, and integrate gender analysis into scientific research.

Achievements: The two iterations of the initiative support diverse projects worldwide, such as:

- [Advancing gender inclusion in STEM in Haiti and Cuba.](#)
- [SISTARS: Lessons on women's leadership from Ghana and Kenya.](#)
- [Towards Gender Justice in STEM Research in Africa \(GeJuSTA\).](#)
- [Strengthening gender inclusion in agricultural research in West Africa.](#)
- [Latin American open data for gender-equality policies on STEM leadership.](#)
- [Removing barriers to women in science and technology for green industries in Colombia.](#)
- [Supporting Indigenous women in STEM in Peru.](#)
- [Breaking barriers to women's participation in STEM in Ethiopia.](#)
- [Gender disparities, career choices and wage dynamics in STEM occupations in Brazil.](#)

CASE STUDY: Network building and capacity strengthening.

African Girls Can Code (AGCCI) aimed to train and empower a minimum of 2000 young girls across Africa aged between 17-25 to become computer programmers, creators, and designers in the ICT, education, and coding sectors.

How it Worked: The initiative used two key strategies: coding camps and mainstreaming ICT, coding, and gender into national curricula. It also involved national media campaigns with role models and an online platform for networking, mentorship, and courses.

Achievements: In its first phase, AGCCI trained 600 girls through coding camps, developed a guide for mainstreaming ICT and gender in the national curriculum, and established an eLearning platform. The second phase focused on Training of Trainers, setting up AGCCI Learning Centers, providing equipment, mainstreaming ICT, gender, and coding into curricula, and revitalizing the e-learning platform. It was commissioned by UN Women and the African Union Commission (AUC) in collaboration with the International Telecommunication Union (ITU), and supported by various partners and donors.

Other cases include:

- [ZimbaWomen](#).
- [Asikana Network](#).
- [The panAfrican Data Science Africa network](#).
- Deep Learning Indaba.
- Django girls (Nairobi, Kampala),
- Women in Technology (Johannesburg),
- Gitgirl (Nigeria).

CASE STUDY: Mentorship and peer learning.

The [She Code Africa](#) Mentoring Program is a year-long initiative aimed at providing mentorship to women across Africa interested in various technology fields, enhancing their knowledge, technical and soft skills.

How it Worked: For its third cohort, it incorporated feedback from previous cohorts to improve the program. Existing mentors evaluated technical assessments, and new learning tracks, including cross-platform mobile development, were introduced. The program had dedicated learning paths, internal persons-of-contact (POC) for mentoring groups, and monthly evaluations of mentors and mentees.

Achievements: [Cohort 3](#) onboarded 117 mentees and 22 mentors. The program saw the technical growth of mentees, who created various projects as part of graduation requirements. It also encouraged technical writing among mentees, fostering the sharing of knowledge within the community. The program continues to follow up with mentees and offers ongoing support and opportunities through their Slack community.

Other cases include:

- [Women in Machine Learning and Data Science, Nairobi.](#)
- [AI Research Mentorship, Uganda.](#)

CASE STUDY: Employment opportunities.

[Women in Technology Uganda \(WITU\)](#)'s Digital Jobs Center is a program launched in 2020 to address Uganda's unemployment rate, particularly among young women, by connecting them to remote work opportunities. The program aims to prepare participants for professional advancement and empower them to contribute to Uganda's future digital economy.

How it Works: In partnership with the private sector, the platform arranges positions in global firms for young women and provides readiness training, including mock interviews, mentorship, and coaching. It leverages global exposure to create opportunities for young women, aiming to boost their livelihoods, education, and contributions to society through remote work.

Achievements: The initiative has made a significant impact, with current statistics indicating that 74% of alumni are in gainful employment in various sectors including ICT, reporting a 1200% increase in income. Participants have experienced a 100% improvement in confidence, education in sexual health, and digital literacy. The program has reached over 8000 women and girls across 30 districts in Uganda, serving six slum communities.

Annex B: Recommended resources

- “We Shape Our Tools, Thereafter Our Tools Shape Us: Artificial Intelligence, Automated Decision-Making & Gender” ([Women at the Table 2019](#))
- “How AI bots and voice assistants reinforce gender bias”. ([The Brookings Institution, 2020](#))
- “AI’s white guy problem isn’t going away” ([MIT Technology Review](#))
- Gender bias in AI-based decision-making systems: a systematic literature review. ([Nadeem et al., 2022](#))
- AI4COVID Technical Brief 1: Designing gender-responsive data projects ([Ladysmith 2021](#))
- AI4COVID Technical Brief 2: A guide for more gender-responsive health research ([Ladysmith 2021](#))
- AI4COVID Technical Brief 3: Stakeholder engagement for gender-responsive health research ([Ladysmith 2021](#))
- AI4COVID Technical Brief 4: Connecting Gender Data to Action ([Ladysmith 2022](#))
- Discriminating Systems: Gender, Race and Power in AI. AI Now Institute ([AI Now 2019](#))

For more resources, we recommend visiting [this Google Drive folder](#) organized by IDRC, along with the [AI4D program website](#). IDRC and the AI4D gender support team will continue adding publicly available resources to both of these pages throughout the AI4D program.

Annex C: Key terms

- **Gender:** Gender refers to the socially-constructed roles, responsibilities and relationships that society considers appropriate for women and men. It also has implications therefore for individuals and groups who identify as gender non-conforming. Gender is upheld by political, economic, social, and cultural institutions. Gender is context and time-specific, and thus changeable as well.
- **Sex:** The sum of biological and physiological characteristics that typically define men and women, such as reproductive organs, hormonal make-up, chromosomal patterns, hair-growth patterns, distribution of muscle and fat, body shape and skeletal structure.
- **Intersectionality:** A theoretical approach or framework for understanding individuals' lived experiences (of privilege or oppression) which highlights that social categories and identity factors (such as gender, sexual orientation, age, class, race, caste, ethnicity, citizenship status, migration status, religion and disability) are mutually constituted and overlapping in dynamic ways rather than operating in isolation from one another (e.g., gender as separate from race) or in an additive way (e.g., gender plus race equals greater disadvantage).
- **Inclusion:** A process or approach in which diversity is leveraged and different forms of exclusion are addressed to create fair, healthy and high-performing individuals, groups, organizations or societies. Inclusion aims to embrace all people irrespective of race, gender, disability, medical or other need. It is about giving equal access and opportunities and getting rid of discrimination and intolerance (removal of barriers). It affects all aspects of public life.