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Gender bias and robots
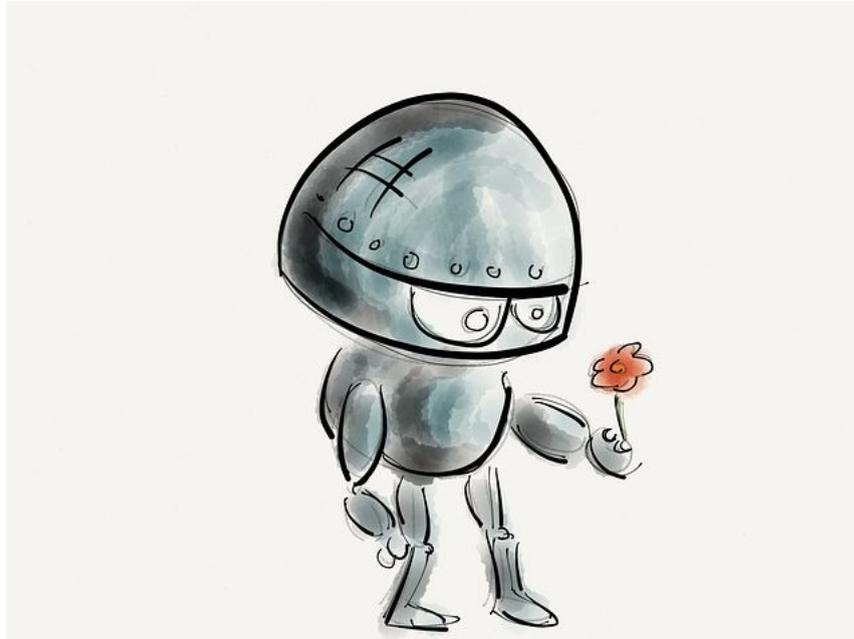
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Abstract

This paper examines on the one hand, the way the robotics working field can hold bias against women scientists, tremendously under represented in teams developing AI in general, and on the other hand, how gender bias affects the manufacturing process in the field of robotics.

Biases in robotics manufacturing processes

In a recent United Nations study[1] report attempting to answer why most voice assistants have female names, the results show that to this day, there are hardly any women included in the technical teams that develop these digital tools.

In robotics and AI, similar to almost all tech fields, one of the most pressing aspects, and yet one of the most subtle and challenging is gender. How gender biases manifest for example, in the design of voice assistants is not a new debate. Insofar, research shows that users tend to favour, or to have more confidence in a male voice when an authoritative presence is needed and in a female voice when receiving helpful guidance. Scientists are just beginning to consider how these

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[1] 'Are robots sexists?' UN study report available at https://news.un.org/en/story/2019/05/1038691

gender biases materialize in the actual production of physical robots. As Nomura[2] states, the gender stereotype that females are usually weaker in engineering, including the operation of robots, than males may lead to the construction of a robotics-based system of science and technology in education, that focuses only on male students by referencing to studies which suggest that females show more negative attitudes toward robots than males do. This situation, the author finds, can lead to reproduction of the stereotype.

The issues that might arise from this perspective is that robot makers, "consciously or not, may exploit gender stereotypes to try to make their machines more effective—designing a receptionist robot to be more feminine and therefore more "welcoming," or a security robot to be more broad-shouldered and therefore more "authoritative."[3]

To exemplify, we will examine the following research study[4]: In a comparison experiment between a mechanical humanoid robot and an android with a female appearance, suggested that participants (19 university students in the United States; male N= 9; female N = 10) preferred the female robot for in-home use. Another Question & Answer (QA) Study system with computer graphic (CG) characters on a computer screen (so-called virtual robots or agents) with three types of heads:feminine; masculine; and gender-ambiguous. The researchers found that participants were more comfortable, more confident, and less tense when using the system with the feminine character, compared with the other systems.

In the current context, in which gender equality is promoted at a global level, gender bias as the one described may come across as paradoxical. Furthermore, the proliferation of robotic voice assistants with female names and voices continue to add to this gender bias.

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[2] 'A possibility of inappropriate use of gender studies in human-robot Interaction'; Nomura, T.; AI & Society, 2019

[3] "It's time to talk about robot gender stereotypes?", M. Simon, in Wired, Science
https://www.wired.com/story/robot-gender-stereotypes/
[4] "Diversity and Inclusion in Engineering Education: Looking Through the Gender Question
Educational Robotics for Inclusive Education"; Daniela et Lytras, Springer 2018

Gender bias and robotics as a working field

This paper focuses on the gender gap in robotics as a working field, which follows the same well-known and much debated disproportionality as for other STEM related fields. As mentioned in the above, having gender balanced developing teams, in which women working in STEM are included is crucial for the technical processes involving robots.

Firstly, we could consider the formal definition provided by the IEEE[5] of what constitutes a robot, in order to further understand why gender balanced developing teams are so important:

"A robot is an autonomous machine capable of sensing its environment, carrying out computations to make decisions, and performing actions in the real world."

In this respect, according to Pillinger[6], robots are "mostly equipped with what is often called an artificial intelligence or the ability to "learn", e.g. via machine learning algorithms. Many people from this field also claim that in order to be considered a robot, it must have some kind of "artificial intelligence". Given these comprehensive definitions, it becomes useful to narrow the subject of the current review. Gender bias is a frequently discussed topic in literature surrounding the field of algorithm studies.

Another important aspect and as Robertson[7] points out, most of the literature that can be found when looking explicitly for gender and robots are studies dealing with human-robot interaction, on the one hand, the interaction of people towards feminine versus masculine robots, and on the other hand, differences in the interaction of females versus males towards robots; or a hybrid of those, an observation still valid nowadays as it was ten years ago. However, Robertson highlights also fields such as Gender Studies or Culture Studies. What the author suggests is in fact that it is an interdisciplinary field of research, all the while with the need to be an inclusive one.

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[5] "What is a robot?" IEEE (Institute of Electrical and Electronics Engineers), 2019
[6] "Gender and feminists aspects in robotics?"; Pillinger, A., GEECO Review, Sept. 2019
[7] Robertson, J. (2010). Gendering Humanoid Robots: Robo-Sexism in Japan. Body & Society, 16(2), 1−36.

Inclusiveness is key in this context in terms of gender parity in the technical developing teams, together with forming a multidisciplinary and a diverse developing team. Thus gender parity is seen as a crucial way to tackle gender bias in robotics.

According to a Financial Times article, giving AI-driven technologies gendered names, for example Amazon's Alexa and IBM's Watson, perpetuates long-held stereotypes. Gendered names can affect how users interact with technology. In these early days of voice-driven AI, studies have found that users are more likely to ask Amazon's Alexa to play them a song, but IBM's Watson to pull the data required to solve a difficult business problem. This situation is just one example of bias which could have been avoided if more women would have been involved from the first stages of development. Robots ought to primarily reflect the diversity of what they actually mirror or want to help (e.g. care robots) that is the human, be it man or female.

Conclusion

To summarize, the case of artificial intelligence deployed in case of voice assistants constitutes nowadays a good example on how gender biases manifest both from a manufacturing perspective as well as the final product itself (the robot-assistant). The female gender continues to be underrepresented both in STEM, as it is in robotics teams responsible for designing and conceiving the robots, regardless of their end use destination, be it voice assistant robots or learning robots.

This paper concludes that until gender reaches a fairer balance in all STEM fields, gender inclusion and robotics will be subjected and will have to overcome the same challenges as the STEM fields are facing in general in regards to gender bias.

References

'Are robots sexists?' UN study report available at https://news.un.org/en/story/2019/05/1038691

"It's time to talk about robot gender stereotypes?", M. Simon, in Wired, Science
https://www.wired.com/story/robot-gender-stereotypes/

"Diversity and Inclusion in Engineering Education: Looking Through the Gender Question Educational Robotics for Inclusive Education"; Daniela et Lytras, Springer 2018

"What is a robot?" IEEE (Institute of Electrical and Electronics Engineers), 2019

"Gender and feminists aspects in robotics?"; Pillinger, A., GEECCO Review, Sept. 2019

Robertson, J. (2010). Gendering Humanoid Robots: Robo-Sexism in Japan. Body & Society, 16(2)

'A possibility of inappropriate use of gender studies in human-robot Interaction'; Nomura, T.; AI & Society, 2019