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Biases in AI-Based Hiring Algorithms: Effects on Minorities and How It Can Be Eradicated

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ABSTRACT

In today's society, many companies are utilizing artificial intelligence to hire people, making this process much easier and more efficient. This has deeply changed and impacted the way that companies look for potential employees. However, the hiring algorithms have received extremely biased datasets containing inaccurate or incomplete information, putting minorities at a disadvantage because their application reveals their gender and race. This has cost many applicants opportunities, while also giving opportunities to people who may not be qualified. To understand the biases much more deeply, this paper discusses examples of the types of biases that can be seen, multiple AI-based hiring technologies developed, and the advantages and disadvantages of them. It also discusses a study utilizing both quantitative and qualitative aspects that was conducted. Surveys were sent out to employees of the technology industry to gain feedback about the algorithms, while data showing the percentage of ethnic groups, females, and males hired from multiple companies was analyzed. The companies are compared and contrasted with each other to show better insights on which hiring algorithm for each company is more effective. It is found that there is not a significant difference in the profile of the technology industry. However, in some areas, there was data that did not account for hiring patterns in certain ethnic groups due to biased datasets. Ultimately, a plan is devised to enhance current hiring algorithms and potentially develop a new one to promote inclusivity and fairness.

Introduction

Many recruiters have found the usage of AI-based hiring algorithms very helpful. To be exact, 68% of recruiters said that AI hiring algorithms were helpful and 37% of them responded otherwise in a survey taken by TechMonitor (Noone, 2024). The process of selection is very simple. AI scans the job applications submitted by people and searches for worker qualifications and keywords that highlight certain qualifications that the person might have used to write their application. This process makes it easier for companies to manage large numbers of applications while also trying to ensure that candidates are considered for the job.

However, there are some issues regarding the algorithms being used. The artificial intelligence-based hiring algorithms can exhibit bias due to the datasets a person in charge of the hiring process feeds it. For example, in any male-dominated field, a person responsible for hiring might give a dataset of current workers to the AI based hiring algorithm, so that it knows what to look for in the hiring process. However, the data set used by the company will have very few female workers. This was discovered in a survey conducted by TechMonitor (Noone, 2024).

Improvements to existing algorithms would be to completely debias or clean the datasets provided to them. Any data, such as place of birth, that may reveal a person's gender or race, will be completely disregarded by the existing and new platforms. In doing so, the algorithm can solely focus on the qualifications and will not bring bias into play when it comes to selecting candidates. Another way would be to create new AI platforms with debiased and clean datasets, so that a person's qualifications are evaluated fairly.

After selecting prospective hires, this platform can send the job applications that were analyzed, to the person in charge of the hiring process. They can then look over them and ensure that the people selected are well qualified for

their positions. By implementing this system, companies can reduce bias and nepotism, increase diversity, and give many qualified people opportunities. Trust amongst job seekers will also start to increase, especially since they will know that their applications are being judged fairly (Rainie et al, 2023). Lastly, the technology workforce will also improve as a whole by having qualified workers, resulting in a much more effective and diverse workforce while also benefiting the American economy.

Types of AI Hiring Techniques

The Advantages

AI has been improving many tasks in everyday life by improving efficiency and productivity for many people globally, whether it is at school, work, or in daily activities like cooking or planning a trip, through tools such as ChatGPT and Gemini. Additionally, it has also led to significant advancements in various fields, including healthcare and technology.

An example of such advancements has been for recruiting purposes, which are being utilized by many companies in the United States and around the world. Some of the recruiting algorithms include Arya, ICIMS Talent Cloud, Oracle Recruiting, Phenom, Skillate, TurboHire, Fetcher, SeekOut, XOR AI Recruiter, Eightfold AI, Fuel50, HireVue and Paradox (Jones, 2024). These tools offer many comprehensive features, allowing them to effectively source, screen, and select candidates. Candidates can also use them for their benefits as well to increase their chances of getting a job. They can find out what qualities companies are looking for through these algorithms, and then shape their applications as well as perform in their interviews much more easily, allowing them to appeal to recruiters, and thus easily obtain the position that they want. The tools also have a potential to reduce biases and increase efficiency. Others include Qureos, Elevatus, Manatal, Workable, Linkedin Recruiter, Recruitee, iSmartRecruit, Holly, HireYaY, and HireLakeAI (Malik, 2023).

HireVue partnered with Unilever and Pymetrics, allowing for the effective usage in AI integration for hiring (Hu, 2023). This partnership allowed for the effective analysis of applications by using advanced AI-based tools, making the hiring process much easier. Qureos can examine everything about candidates in just about 24 seconds or less, has multilingual capabilities, meaning that it can understand any language the applicant uses, and can conduct AI video interviews. AI video interviews are interviews where candidates record themselves responding to questions that an interviewer has created for them, and the AI algorithm analyzes their responses to those questions. If the responses are appealing, then the candidate will be hired. Elevatus automates the entire talent acquisition cycle, or the process of sorting, finding and selecting ideal candidates for the position, making the lives of recruiters much easier. Manatal automates repetitive tasks like filtering out candidates, and provides recommendations for the candidates themselves. Some of these recommendations would include tips on how to improve applications, for example. Workable posts job listings on over 200 web sites and allows recruiters to explore recommended candidate profiles. LinkedIn Recruiter allows recruiters to look through about more than one million candidate profiles on LinkedIn. Recruitee lets people post multiple job openings on many sites such as LinkedIn. iSmartRecruit contains an Applicant Tracking System and Recruiting CRM software. Holly looks through job descriptions, links candidates to the company they are looking for, and books interviews. This makes the process much simpler for candidates. HireYaY includes AI-guided job descriptions, salary insights, and many applications. Lastly, HireLake AI has AI based job description matching, resume extraction, psychometric test analysis, and audio/video interviews.

All of the hiring algorithms mentioned contain features including instant job matching, sending questions to suitable candidates, and having unique job application options, like QR codes. It has led to a decreased use in favoritism and nepotism (Delecraz et.al, 2022), giving a lot of talented people many opportunities that they could have missed out on, has helped save some time and money, and has also increased talent engagement and mobility. However, there are some drawbacks that can affect both the workers and companies. The main one is bias, which can be

caused by the data sets provided to it (Chakraborty et.al , 2021). Companies such as Mastercard, Electrolux, Kuehne+Nagel, Bon Secours Mercy Health, Brother International Corporation, Stanford Health Care, and Thermo Fisher Scientific (Blehar, 2023), Delta, Unilever, Amazon, Microsoft, and Google have started using these algorithms. A start-up company that builds AI based tools, known as Rocket, had even developed their own hiring algorithm to help people negatively affected by the pandemic back in 2020 find jobs (Perry 2020). It has done this by gathering data sets regarding layoffs during the pandemic, had the software they owned effectivly clean the data so that it was more organized, and later released a portal called Parachute. This helped so many people find jobs who were laid off during the COVID-19 pandemic. Amazon, however, faced some issues. There are very few women working in the company, which means that the hiring algorithm that Amazon has will reflect that due to the database provided. Amazon had to end the usage of its hiring algorithm, having identified this issue. This could have been prevented had the database been debiased or cleaned. There is not much information from the other companies regarding their hiring algorithms.

This table compares the AI hiring algorithms and their benefits. The top five that are used are Oracle Recruiting, Hirevue, Phenom, Eightfold AI, and Paradox (Jones, 2024). Although five algorithms offer many advantages,they also have some drawbacks. Oracle Recruiting has limited use when it comes to smaller organizations. There are potential biases when HireVue conducts video interviews. Phenom has limited scalability when it comes to larger hiring operations. Eightfold AI has a very complex setup which can be challenging to those not in the Technology industry. Lastly, Paradox focuses more on basic qualities for candidates.

Table 1. AI Hiring Algorithms and Their Advantages

AI Hiring Algorithm	Advantages
Oracle Recruiting	- Allows data sharing - Candidate matching - Do tasks faster
Phenom	- Manages talent cycle - Creates personalized experience for workers and recruiters - Candidate matching
Eightfold AI	- Provides insight on candidate qualifications - Identifies good candidates
Hirevue	- Analyzes applications accurately using advanced tools
Paradox	- Large scalability - Personalized communication

Arya	- Matches candidates to their preferred job opening - Helps recruiters find ideal workers by matching them with candidates
ICIMS Talent Cloud	- Covers recruiting process - Personalized communication
Skillate	- Scans resumes using AI tools - Candidate communication
TurboHire	- Candidate communication - Recruitment outcomes
Fetcher	- Engagement with potential candidates - Improves quality for searches
Seekout	- Offers a wide range of profiles - Candidate matching
XOR AI Recruiter	- Uses AI chatbots to find candidates - Schedules interviews - Resume screening
Fuel50	- Personalized career pathing experiences - Identifies and matches potential employees
Qureos	- Examines worker qualifications in less than 24 seconds - Understands multiple languages - Video interviews

The Limitations

Bias

There are many disadvantages to all of the hiring algorithms discussed. They can perpetuate or exacerbate existing biases if the training data is biased. This can lead to unfair hiring practices and discrimination (Raghavan et al., 2019). In 2023, 51% of women and 30% of men reported having faced discrimination very frequently. Given that this data was collected during the time when AI hiring algorithms were being used, it is likely that the results were highly influenced by it. To solve this problem, data sets must be debiased and cleaned, especially if there are incomplete values or even rows. This process can help enhance their organization and diversity. Processes such as data cleaning can accomplish this. An example of this occurring is in Amazon's hiring algorithm. Currently, less women work at Amazon. So, the dataset fed to its hiring algorithm can reflect this gender disparity, and as a result, discard any applications suspected to be from a woman (Chang 2023). This is not beneficial, as many qualified women can lose out on job opportunities at Amazon. This outcome will not only reinforce gender biases even more, but will allow Amazon to miss out on talent, which will not benefit the company as much as it can miss out on growth. Amazon did test this out when they first started using their hiring algorithm. After making these realizations, they stopped using it.

Technical Challenges

AI tools may encounter technical issues such as inaccuracies in parsing resumes, difficulties in understanding context, and limitations in handling complex decision-making (2024). Additionally, AI algorithms are often considered "black boxes," lacking transparency in the decision-making process. This opacity can make it difficult for organizations to understand decision-making and hold the technology accountable (Binns, 2018).

Transparency and Accountability

AI might select less qualified workers simply due to the kind of language they use in their applications, which can impact linguistic diversity, which is a term used to describe the differences in language and communication styles, and how many people working together interact with each other. This is a factor that has had a severe impact on the ways that coworkers cooperate with each other in a work setting during team projects (AI, 2023). When artificial intelligence scans job applications, they do it by using NLP to create clusters of words. It then compares the words to what is written on the application, which helps indicate the closeness between the application and the job description. If the closeness is high, the applicant will be hired. Those who have difficulty with English may be negatively affected by this, especially if their vocabulary is not quite strong yet, since they could not conform to the ideal patterns required by the algorithms. The closeness between their application and the algorithm will be low, causing them to not be hired. This can result in racial and ethnic biases in the hiring algorithms (Lee, 2018). Simply because of these biases, many people who are well-qualified for the job will not be selected. As for those who are selected, not much is known about how effective they are when working for the companies involved in this process. Given the effects of the biases involved, the use of AI in recruitment raises legal and ethical considerations in terms of compliance with employment laws and ethical standards (Hunkenschroer et al., 2020). Moreover, the use of large datasets in AI recruitment raises significant data privacy concerns.

Methodology

A mix of both quantitative and qualitative research methods was utilized in this study. Quantitative research involves many computations and deals with numbers and statistics. Qualitative research is non numerical and describes qualities of variables and outcomes involved. The quantitative method was used to measure and analyze statistics gathered by the companies themselves regarding the racial and gender of workers in the Tech industry. The data was from publicly available diversity reports regarding technology companies such as Microsoft and Google while the qualitative method was effectively used to gather opinions and feedback from workers regarding its fairness. Combining both methods allowed for validity and reliability, which allowed for the results to be generalized towards the population. There was also much better understanding, which can lead to improvements in the algorithms being used. The

research questions used in this study to gather findings were: What is the profile, including race and gender, of the employees of the technology industry before and after the use of AI-Based recruitment strategies? ; and Is there a significant difference in the profile of the technology industry in companies such as Amazon, before and after the use of AI-Based recruitment strategies?. These questions were developed to obtain crucial information regarding this subject, which would aid in the analysis and understanding of the algorithms. By gathering this information, it would be much easier to identify potential biases and evaluate how effective the algorithms are.

This study took place in the United States when it comes to sending out surveys, but data analysis from many companies included many findings from not only the United States, but from other regions around the world, given that there are people in those areas who work in the companies involved. In recent years, the nation has prioritized and promoted diversity, equity, and inclusion in the workplace in all industries through many programs, legislation and acts. This allowed us to analyze how well the hiring algorithm works across different demographics and both genders. The US has the third largest workforce in the world, so the results of the study can be generalized to any and all industries that use AI based hiring algorithms. Lastly, the United States has a huge global influence. So, the findings from this study can be applied to other countries' workforces in many ways, making this study much more relevant.

Current employees from the technology industry were selected for the study. This industry was chosen because it is known for utilizing advanced technology to complete certain tasks, some of which would include the usage of artificial intelligence programs. Quantitative data was collected by assessing data sets regarding any racial and gender backgrounds in Google and Microsoft. This was done by using data from 2022 and 2023. The qualitative data was collected through a survey process and sent out to employees of the technology industry. There were five participants in total. They contain questions regarding racial and gender biases that they or anyone they knew could have experienced, AI hiring algorithms that their companies have used, the personal experience regarding those aspects, and their thoughts on how these algorithms could be improved to suit employees. The survey was created as a Google Form, which allowed for the identities of all participants and the companies they work at to be protected.

For this study, data sets from multiple companies and surveys were chosen. By using data sets, the quantitative data could then be arranged into a data table or multiple data tables by me if not already arranged by the companies involved, allowing for it to be analyzed on how well the hiring algorithm worked. If graphs, histograms, or pie charts were created, then those were analyzed as well. Surveys were sent out to gain insight on how the current employees, hiring managers, and new employees of the technology industry felt about the algorithm, allowing for a deeper understanding of certain aspects of the hiring process and how fair the hiring algorithms really are.

Results

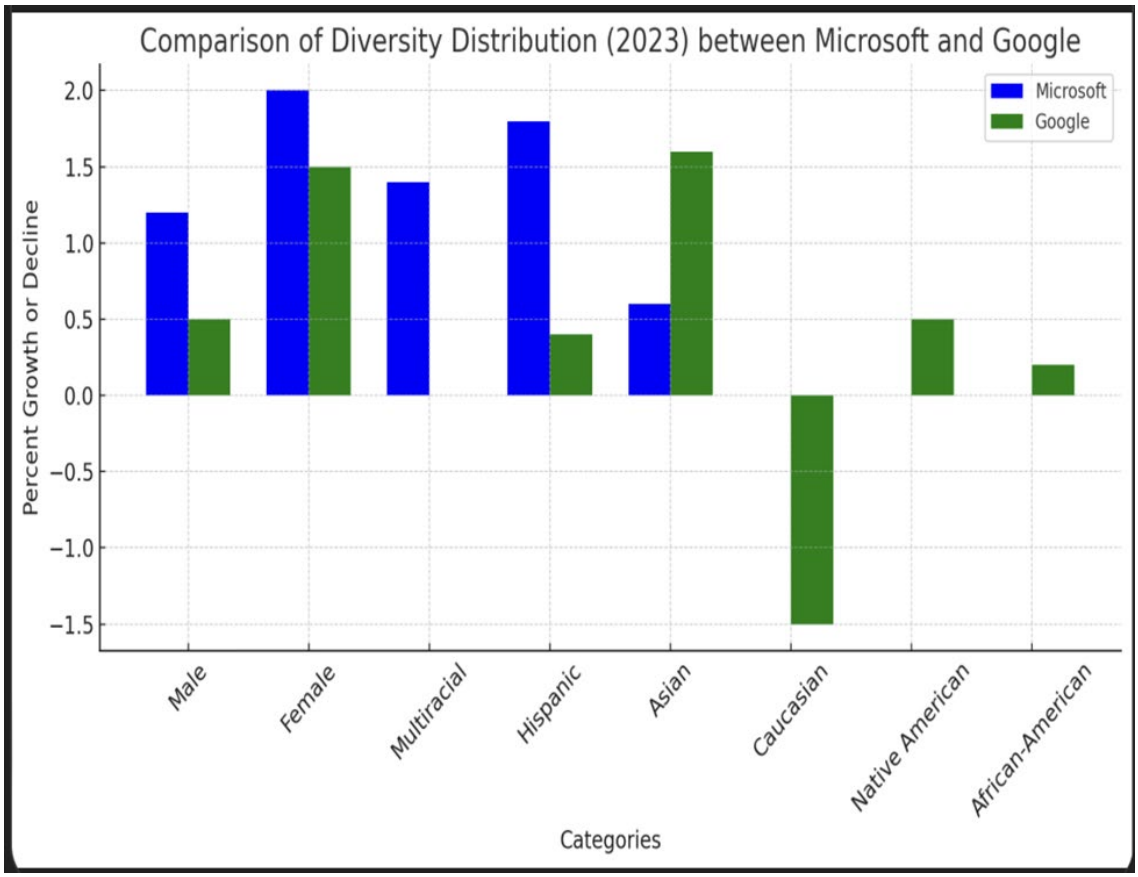

Figure 1. shows the gender and race distribution of Microsoft and Google

The results of this study were found by comparing data from two technology companies, which were Google and Microsoft. Both companies showed a lot of growth. Compared to Google, Microsoft has had less growth.

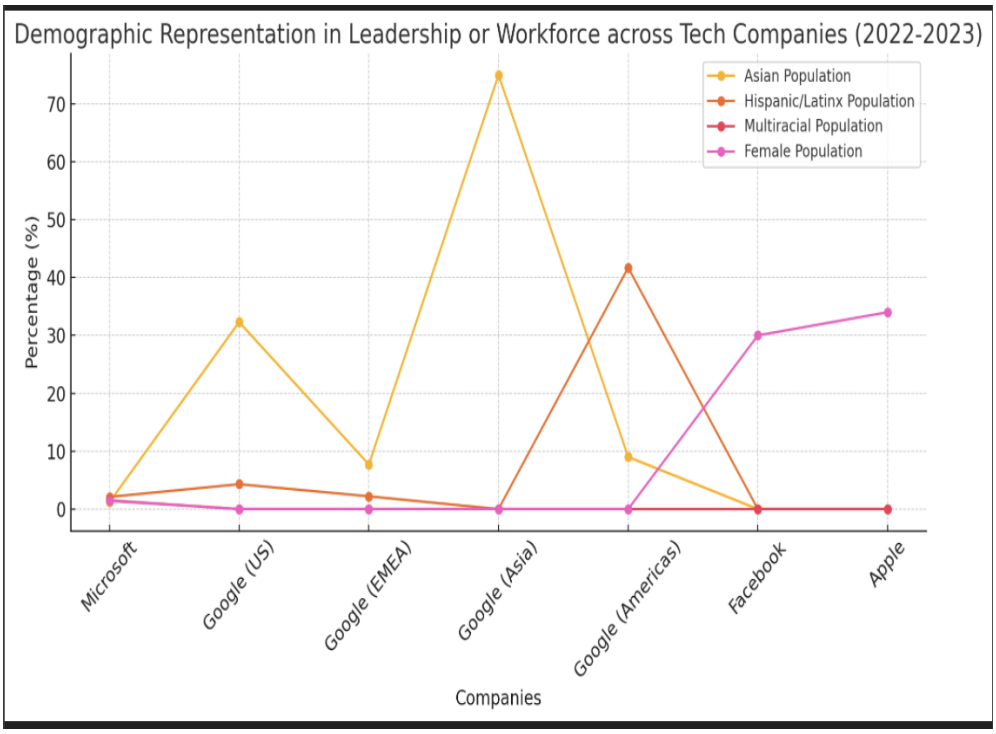

Figure 2. Shows demographic representation of leadership across tech companies.

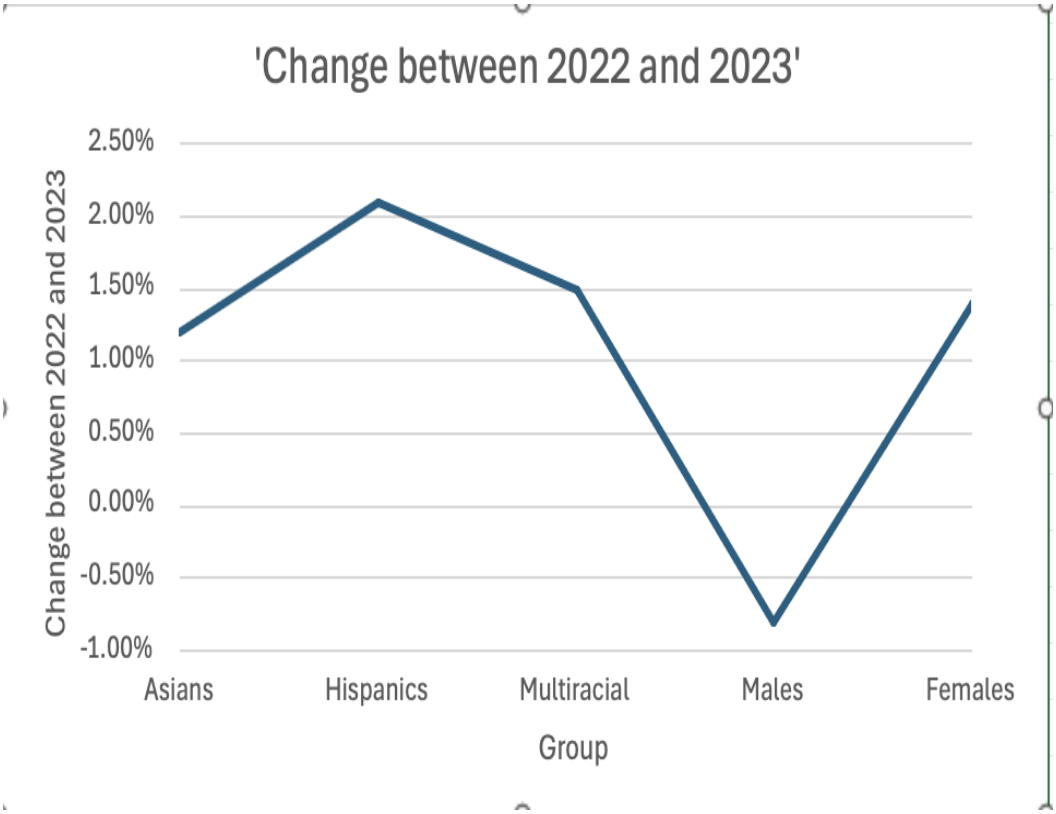

Figure 3. Shows the percent changes of each group for Microsoft.

For Microsoft, the Asian population grew by 1.2%, the Hispanic population grew by 2.1%, and the multiracial population grew by 1.5%. As for gender, the female population grew by 1.4%, and the male population dropped by 0.8%,between the years 2022 and 2023. As for Google, the same thing occurred. There was a growth in the minorities hired between the years of 2022 and 2023. While diversity has increased overall in both companies, there is still some stunt in growth related to the leadership in Google. In both 2022 and 2023, the leadership in certain areas were mainly made up of men, which was 67.9%. However, there is something shocking regarding the races. In the U.S., the leadership in Google is made up of 32.3% of Asians, 5.2% African-Americans, 4.3% Latinx, 0.8% Native Americans, and 60.3% white. In Europe, Middle East, and Africa, there are 7.7% Asians, 4.1% Africans, 2.2% Latinx, no data regarding the Indigenous population, 6.9% Middle Eastern or Northern African, and 83.5% European. In Asia, there are 75% of Asians and 25.3% European/American. However, there is no data regarding Africans, Latinx, Indigenous, Middle Easterns, and North Africans. In the Americas, there are 9% Asians, 41.7% Latinx, and 57.6% Europeans. However, there is no data regarding Africans, Indigenous, Middle Easterns, and North Africans. The fact there is no data on certain ethnic groups in different parts of the world can be heavily influenced by the AI hiring algorithms used in those areas. There could have been data bases used in the Americas and Asia where they contained pre existing biases against certain ethnic groups, allowing it to not be representative enough. These biases in turn could have resulted in those ethnic groups not considered for hiring purposes by the hiring algorithms, which could have resulted in zero data as none of them would have been hired.. Facebook, another technology company, has also utilized AI hiring algorithms. However, nearly 70% of its employees are male, with 57% being white from the U.S., even when hiring algorithms have been used. This statistic highlights the biases ingrained in the hiring algorithms used at Facebook, which is starting to get addressed. In Apple, another company that uses AI Hiring algorithms, only 34% of women make up the total workforce as of 2023. This suggests that the hiring algorithms used there could have contained data sets with gender and possibly racial biases.

Qualitative data was also collected through surveys, which gathered information regarding personal experience with these hiring algorithms. Out of five responses, three responses reported to have not used them. This suggests that there is a limited interaction between AI-based tools and employees of the technology industry. Two other responses reported the opposite. The first that reported stated that since the algorithm was used for about 9 months, they have not had enough data points to make a conclusion regarding the diversity of candidates hired by them. They also stated that when using the algorithms, they have had to make job descriptions inclusive by making the wording of them gender neutral. Despite this, they said that in order to be improved, there needs to be trial and error via constant feedback loops, making corrections as needed and most importantly, evolving as the usage and adoption grows. The second response stated that the algorithm is under a testing process. They also reported that they knew someone who was negatively affected by these algorithms by facing gender and racial biases, but they also reported that filtering, or sorting ideal candidates into a list, can be done much more easily, which is beneficial. They did note, however, that these algorithms can lose candidate trust and cost employees their dream job if not handled effectively. These insights provided demonstrate the many, often negative consequences that can result from AI based hiring algorithms that are being used.

Regardless, this shows that there is still a long way to go when increasing diversity, and that starts with improving the AI hiring algorithms or even developing some more of them to be less biased towards minorities all over the world. It is very essential to all technology companies using these algorithms, as this will ensure that all candidates, regardless of gender and race, will be given equal opportunities.

Conclusion

In conclusion, there is still need to make numerous improvements made on many of the AI-based hiring algorithms so that what happened in Amazon does not happen again. Some of these improvements can include debiasing the datasets, replacing empty values, or even cleaning and deleting any invalid or incomplete values, rows, or columns.

While there have been some benefits, such as time and money saved, there are still many biases being displayed due to faulty datasets being provided, which can be easily fixed. Many ethnic groups are not counted in data in many regions around the world, due to a lack of diversity, which can be caused by the hiring algorithms used in those areas. Some people have reported in the surveys that there have been existing biases towards certain groups of people in the algorithms used in their companies of employment, and that they or someone they knew was negatively affected by it in terms of racial and gender biases. All of these findings emphasize a need for overall fairness and transparency and possibly a development of an AI-based hiring algorithm that will solely focus on worker qualifications and disregard any keywords revealing ethnicity or gender in applications. Only then will a fair and equitable hiring process be created that values merit and hard work over gender and race.

There are many recommendations to go about this subject. First and foremost, start by collecting data on all minority groups globally for the industries that research will be conducted on. Second, more effective data cleaning strategies can be developed, and existing ones can be used to clean and debias datasets. Third, policies aimed at reducing gender and racial discrimination can also be created and enforced in the workplace.

Lastly, the insights gathered can be used to develop an AI hiring algorithm that will only scan applications regarding qualifications only, while disregarding information that gives a clue about the gender and race of the applicants. After development, it can be presented as a proposal to any competitors. This would result in a more fair and inclusive hiring environment.

Limitations

The study had limitations in both the quantitative and qualitative aspects of the methodology. Quantitatively, while Microsoft and Google released diversity reports at the end of 2023, many companies had not done that, so they could not be discussed in the paper. Another constraint of using the already available data was having no control over how it was collected. It is recommended that companies will provide more scope for greater transparency and diversity reporting.The use of only four company datasets made it a little bit challenging to discern the impacts of their hiring algorithms. Qualitatively, another limitation was that some people who had responded to the surveys had worked in companies that had not yet started using AI-based hiring algorithms, so not much information could be provided. Others included a small number of responses, and most of the participants had either identified as Asian Indian and female or had not included both their ethnic background and gender. These were some limitations in the qualitative aspect of the study. All of the limitations demonstrate that it is recommended for more diverse participation in the technology industry in order to gain insights from multiple groups of people to gain a much better understanding of how the algorithms can affect certain groups of people.

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