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Exploring Perceptions of Algorithmic Bias in Video Interviewing Software: The Importance of AI Hiring Education

Theresa Fister
tfister@luc.edu

George K. Thiruvathukal
Loyola University Chicago, gkt@cs.luc.edu

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Theresa Fister
Loyola University Chicago
School of Communication
Chicago, IL, USA
tfister@luc.edu

George K. Thiruvathukal
Loyola University Chicago
Computer Science Department
Chicago, IL, USA
gthiruvathukal@luc.edu

ABSTRACT

Many employers across various fields are incorporating artificial intelligence into their hiring processes. Existing research suggests that although artificial intelligence is often perceived as neutral by its advocates, it can inadvertently perpetuate both implicit and explicit biases present in the engineers and designers responsible for its development through the machine learning process. To delve deeper into this issue, we conducted a research study involving 25 recent graduates from 12 different industries. Our aim was to gain insights into the workings of AI video interviewing software and to understand the reactions of recent graduates who have used this technology. Considering the pivotal role of computing and technology education in shaping future careers, we believe that our investigation can assist educators in better preparing their students for a workforce that increasingly relies on artificial intelligence, while also being mindful of its potential biases, particularly in the context of hiring.

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1 KEYWORDS

Artificial intelligence, implicit bias, algorithmic bias, video interviewing software, hiring education, career building

2 INTRODUCTION

At the conclusion of many interviews, a common question often emerges: "Is there any question you wished we had asked throughout this interview or anything that we missed?" This posed question acknowledges that ultimately, the scope of the interview questions is fundamentally limited, and cannot accurately portray every aspect of a candidate's identity and experiences. By asking this, the interviewer accounts that the questions were created with inherent biases, which could mean the interviewer neglected to ask certain essential questions. The prospective candidate can subsequently reflect and voluntarily offer any additional information in an open-ended manner. As many companies shift from strictly in-person interviews and human monitoring of application materials to utilizing artificial intelligence in the hiring process, the open space for dialogue and discussion between individuals changes as well. In this evolving landscape, there is a pressing concern regarding whether candidates have equal opportunities to share their perspectives, which has implications for both developers and employers. Additionally, the role of education in preparing individuals for a workforce increasingly reliant on artificial intelligence and its biases is a crucial aspect of this conversation, as highlighted through Figure 1, our promotional flyer.

Critically analyzing the equity of algorithmic hiring practices requires referencing systematic inequalities embedded in workplace culture and interviewing formats. When examining the history of discriminatory hiring practices in the United States, explicit and implicit bias intertwine with the employment process, persisting to current technology developments. These biases relate to race, ethnicity, gender, sexuality, religion, disability, and many other identities that a prospective employee possesses. According to the Kirwan Institute for the Study of Race and Ethnicity at Ohio State University, implicit bias is "the attitudes or stereotypes that affect [one's] understanding, actions, and decisions in an unconscious manner" [12]. Research has shown how this implicit bias manifests throughout the hiring process, such as through the resume-reading process. People who read resumes "weigh a few factors slowly, but hundreds of factors quickly, often unconsciously" and even if they "are working hard in [their] slow thinking to avoid discrimination, it can easily creep into our fast thinking, which is drawing from thousands of association and stereotypes [they] have forged over [their] lifetimes" [12]. Due to the nature of implicit bias, when employers are making decisions while reading resumes, many factors rooted in stereotypes and discrimination shape their perceptions and subsequent actions.

A prominent example of implicit biases in resume reading starts with the name of a candidate. Multidisciplinary research studies utilizing "faux candidate profiles or applications, with multidisciplinary scholarship showing that employers can form impressions of candidates based on merely names alone" [7]. Results from studies reflected that if a resume reader perceived the candidate as white, the candidate had a higher chance of achieving an interview than if the resume reader assumed the candidate was of another racial or ethnic background [7]. These long-forged stereotypes, such as ones associated with names "unconsciously influence perceptions

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Figure 1: The survey was distributed by email to professors and educators and through social media platforms like Facebook and LinkedIn.

and evaluations" such as through examples of studies that "have documented that in evaluating members of a stereotyped group, individuals pay more attention to information consistent with a stereotype than to inconsistent information" [3]. Studies highlight the lasting ramifications of stereotypes and their impact on the hiring process for individuals, as interviewers often rely on stereotypes rather than disassociate from them. The ongoing and persistent explicit and implicit biases of companies and employers highlight how the current workforce is not inclusive of individuals of all identities. These longstanding biases in the hiring process are not limited to employers and companies—but also to the software they utilize.

In this paper, building upon prior work done by individuals in the field of algorithmic bias, we assert that there is a need for greater education and awareness of artificial intelligence and its biases, particularly in how it manifests in the hiring process. In particular, given instances of discriminatory practices and outcomes through facial recognition software, AI video interviewing software is a crucial point of failure because it can stop the flow of candidates at the source. While our focus is on hiring, it is likely AI will diffuse to other settings, such as performance appraisal, promotions, and other dimensions of HR. We hope our study will inform students who are entering the workforce about the societal impacts of artificial intelligence and the crucial importance of *responsible and equitable implementation* in the hiring process.

We propose that to understand this implementation of artificial intelligence and critically analyze its impact, research must focus on the experiences of individuals in the hiring process, particularly those with marginalized aspects of their identity. Focusing on the experiences of those most impacted by implicit and explicit biases embedded in hiring software works towards the goal of understanding how the hiring process—whether operated by automation or humanity—can be more equitable, especially for historically underrepresented populations in the American workforce. This position—and the literature that informs it—is a key building block for our research study to understand the broad implications of AI-based interviewing while not overlooking the individual experiences of those who have been affected by the use thereof.

3 DECONSTRUCTING ALGORITHMIC NEUTRALITY

Analyzing and addressing algorithmic biases and their effects first requires a deconstruction of the concept of algorithmic neutrality—the notion that artificial intelligence exists without discrimination. This can be challenged in looking at the creation process behind AI algorithms. While the technology acts independently, the creation of artificial intelligence requires human input, including human biases. Programmers and developers create artificial intelligence software through the process of machine learning, which allows algorithms to make decisions from learned associations. The algorithms "learn from patterns," and as a result, can be "programmed to categorize or make decisions about different people or groups" [16]. The process of machine learning and the automation of algorithms ensure that independent actions occur as a result of the technology, but these algorithms nonetheless reflect the engineers building them and the datasets they mirror.

Problems arise in the accuracy and legitimacy of artificial intelligence when associations form that reflect harmful biases and stereotypes of specific identities or groups of people. When considering aspects of one's identity that might be analyzed through an algorithm, such as a university or job application, aspects "like race and gender are pervasive such that machine learning algorithms can learn their correlates when trained on past data" [16]. This highlights the importance of comprehensive and inclusive datasets, as the algorithms create patterns and associations. Statistical discrimination, as labeled by labor economists, occurs "when an algorithm is fed social category information but is not explicitly designed to avoid discrimination" bias emerges in the associations and outcomes [16]. This includes the overlap of certain identities, such as gender and race such as through algorithmic identification of two seperate photos of women getting married. While a photo of a white woman was identified as a "bride," a photo of a North Indian woman had the label of "performance art," revealing how the limited perspective of the algorithm enforces racism and sexism through a lack of geodiversity in the datasets [15]. Algorithms failing to recognize identity components based on limited datasets can contribute to exclusionary behavior, regardless of the developers' intentions.

A common defense of algorithmic implementation is the supposed neutrality of the technology as opposed to the partiality of humanity. That is, artificial intelligence presents itself as an impartial but fair judge, insusceptible to weaknesses of human-decision making. Many experts disagree with this notion, as supported by research. And some have even lost their jobs for conducting research on their own companies' AI development efforts [2], which strongly suggests the need for independent research outside of companies developing AI software. Instead, they "argue that the use of algorithms and artificial intelligence perpetuates socioeconomic divides and promulgate existing inequalities" [13]. This highlights how algorithms are not removed from systems of inequality and discrimination, but rather can contribute to them. Artificial intelligence, while not human, is created by humans, and therefore has limits. Legal scholar Anupam Chander "emphasizes that although algorithms are perceived as fair because computers are logical entities, their results may still bear the traces of real-world discrimination" and because "data are historically biased towards certain groups and classes, discriminatory results may still emerge from automated algorithms that are designed in racial or gender-neutral ways" [1]. Historical instances of discrimination through data persist today and consequently impact the development of technology.

4 ALGORITHMIC BIAS IN THE WORKFORCE

With the development of new AI and related technologies, e.g. business intelligence systems, many aspects of society are moving to digital formats and relying upon online analytics. This includes the use of artificial intelligence in areas such as the workforce. In particular, artificial intelligence has been viewed as an objective way to carry out the hiring process and eliminate implicit bias. However, research has shown this is not the case, such as examples of gender and racial discrimination in the hiring amplified through artificial intelligence.

In 2018, Amazon "disbanded its algorithmic hiring system" after engineers noticed that the results "were unfavorable to women applicants" and "the automatic hiring system preferred men" [1]. This manifestation of gender biases in Amazon's hiring software parallels historic instances of gender discrimination in hiring practices, especially in fields where gender minorities have been historically excluded, such as STEM fields. This includes discrimination against women in related fields, including medicine. Studies found that women in the medical field who are "clearly competent" in the roles they are applying for "may engender negative reactions and lower ratings" from employers "because their competence violates the prescriptive norms for female behavior" [10]. Societal gender norms regarding these male-dominated disregard the capabilities, strengths, and accomplishments of people of all gender identities, instead of favoring individuals who have held these positions historically, particularly cisgender white men. Unfortunately, these norms persist in hiring software today through gender bias. Worse, gender norms contribute to a challenging labor market, where many positions go unfilled. While the predominant problem remains with women and other gender identities, fields such as nursing struggle to hire men, since there are widespread perceptions that nursing is not a traditional career for men [14].

Not only do algorithms in the hiring process perpetuate gender discrimination, but additionally racism, and the intersection between the two. Algorithmic bias "is not limited to gender; algorithmic decision making can also produce disparate racial impact" [1]. Joy Buolamwini, a poet of code and founder of the Algorithmic Justice League, analyzes the impact of AI technology, particularly about the racism inherent in facial recognition software technology through research endeavors. Examples include software failing to recognize an individual's facial features, or providing misidentification, which can have harmful results. Ultimately, "the inability for any technology to generate a unique faceprint for each individual is at the heart of many face recognition system errors" [4]. One source of identity inaccuracy is a lack of diverse and inclusive datasets that include representation from all racial and ethnic backgrounds. The Algorithmic Justice League examines these forms of discrimination in artificial intelligence software in the hopes of "leading a cultural movement towards equitable and accountable AI" which "requires that people have agency and control over how they interact with an AI system" [11]. Movements towards greater equity in AI systems, led by organizations like the Algorithmic Justice League, reflect the importance of deconstructing algorithmic neutrality by highlighting cases of discriminatory software. This reflects the power of research and advocacy in artificial intelligence ethics fields.

5 VIDEO INTERVIEWING SOFTWARE IMPLEMENTATION

Despite existing research about racism, sexism and other forms of discrimination in facial recognition technology, companies and employers still utilize AI hiring methods. Video interviewing software takes multiple forms—from live videos recorded for later analysis to computer-led programs that prompt users to provide a response [8]. AI analyzes "facial expressions or eye contact" from interviewees and the "speed of an individual's response, in order to evaluate the quality of an applicant's answer" [8]. This quantification of facial features raises a question of how algorithms account for individual differences, especially concerning individuals with disabilities, physical or cognitive. This reinforces the notion that implemented hiring algorithms could be operating on limited datasets.

A leading company in this field of video interviewing software is HireVue, whose through software that evaluates each candidate "based on objective criteria, so [employer's] can ensure the totality of [the] talent pool is evaluated equally" [9]. HireVue "identifies facial expression, vocal indications, word choice and more" [1].

Some individuals have raised questions about "the legitimacy of using physical features and facial expressions that have no causal link with workplace success to make hiring decisions" [1]. As video interviewing artificial intelligence is an emerging field, some experts question the accuracy and reliability of this software, such as whether this software can accurately mirror a human interview, the significance of the data collected through the software, and whether these practices could be biased towards certain individuals. This includes individuals whose native language is one other than English, who are "likely to get lower scores" from the automated systems due to limited data training sets [5]. Building algorithms on limited data sets that do not take into consideration diversity and intersectionality of one's identity can further enforce that certain

identities are more employable—maintaining exclusionary practices and heightening existing inequalities across professions.

6 RESEARCH DESIGN

In our current technological age, external regulation of artificial intelligence is not prominent in the United States, allowing for widespread implementation of artificial intelligence technology, despite legal and moral concerns. Due to privacy and lack of information released by companies, it is "very difficult to prove any bias" that might occur throughout the hiring process, especially as many companies refuse to "release their data" or explain how the algorithms work" [5]. The anonymity of the structure of these hiring algorithms can prevent proving definitively the ways in which these algorithms enforce and perpetuate implicit biases and existing discriminatory systems of the hiring system in the United States. Because of this, we propose that employers critically examine and evaluate the use of video interviewing software in their companies. Close analysis could reveal the level of authority that software holds in hiring decisions and how this authority could enforce biases.

Despite the obstacles to researching artificial intelligence algorithms, gathering information about the impact of this software remains essential. To fully examine the impact of this implementation, qualitative interpersonal research provides an opportunity to gain insight from those interacting with this software and the results. Building upon this approach, that prioritizes human experience amidst artificial intelligence, we conducted a research study of perceptions of algorithmic bias in video interviewing software. We included input from individuals who have completed an interview using video interviewing software, regardless of whether they obtained employment. The goal was to analyze from the viewpoint of interviewees whether AI video hiring software provides a more equitable and fair interviewing experience than a traditional interview, based on their reactions and perceptions.

To support our study, we created an anonymous Qualtrics survey, where participants can rate their experiences using artificial intelligence software, which are shown in the following box.

Multiple Choice Questions to Rate Individual Experiences using AAI Interviewing Software

- **Q1** I was able to access the video interviewing software and complete the interview. [Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree]
- **Q2** The video interviewing software created an atmosphere where I was comfortable answering questions and providing information. [Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree]
- **Q3** I was able to express all information that I would have been able to express during an in-person interview. [Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree]
- **Q4** In the future, if given the option, I would choose an interview process through video interviewing software rather than an in-person interview.[Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree]

In addition, we provide opportunities for optional areas where participants can add further explanation and context to their ratings given in Q1-Q4. We believe that the ability to provide this additional context is essential—especially as we are working towards and inclusive and open-space for people to share their actual experiences (see box in the next column).

In order to distribute the survey, we contacted professors from community colleges, city colleges, and private universities in the Chicago area and region (a major urban area that is a top employer in many industries, including technology). We specifically focused on professors related to the areas of AI, ethics, and computer science. In addition to emailing individuals, we utilized the social media platforms LinkedIn and Facebook to recruit additional participants. By reaching out specifically to individuals in the fields of education and computer science, we hoped to gain insight about how these fields are preparing students for encountering artificial intelligence in the workforce.

Open Response Questions Aimed at Sharing Individual Experiences with AI Interviewing Software beyond the Multiple Choice Questions

- **Q5** What was your overall reaction to the interview conducted using artificial intelligence?
- **Q6** How does the AI interviewing process compare to any previous in-person interview process you have completed?
- **Q7** In the future, would you choose to do an interview using artificial intelligence as opposed to other interview forms?
- **Q8** Was there anything throughout the interview process that you wish the software would have accounted for?
- **Q9** Did you recognize or perceive any biases within the software during any portion of the interview process?
- **Q10** Was there any in-person communication follow-up with the interview, or was the interview conducted exclusively with artificial intelligence?
- **Q11** If there is any additional information you would like to share about your experiences with the video information software, please include it here.

This research raises awareness about the importance of uncovering the effects of interviewing with automated video software and moving towards a more holistic hiring process. This research, rooted in the human experiences of the participants, has a strong focus on ethics and social justice, contributing to the larger body of research about algorithmic biases in artificial intelligence. We believe that in order to address algorithmic bias, and produce a more ethical hiring process overall, prioritizing the experiences of individuals who possess identities that have been historically underrepresented and excluded from their fields of study is imperative.

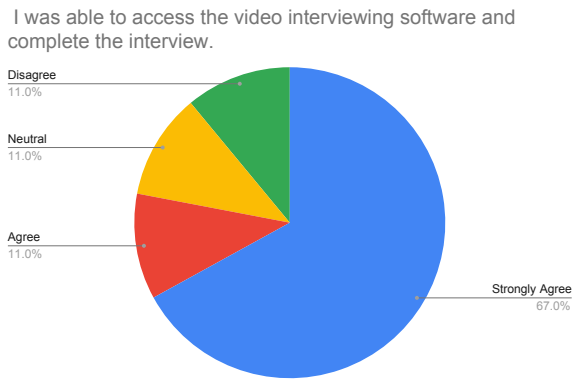

Figure 2: For Q1, the majority of respondents agreed that they could access the software, with 11 percent agreeing and 67 percent strongly agreeing. This suggests that AI interviewing software has reached a high level of technical maturity and is usable for its intended purpose.

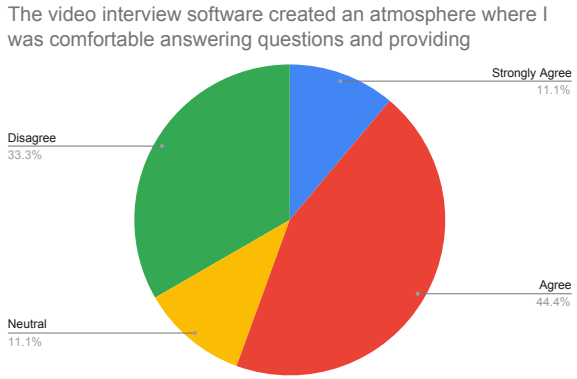

Figure 3: For Q2, there are mixed results about the atmosphere of the survey. 44 percent of corespondents agreed that they felt comfortable in the interview atmosphere, while 33 percent disagreed. Given that less than half feel comfortable, this suggests a need for improvement when it comes to making the applicant feel comfortable during interviewing, even if the technology (per Q1) is easy to access and use.

7 RESULTS AND ANALYSIS

After our survey launched in February of 2023, twenty-five participants responded about their experiences with artificial intelligence interviewing software. Of the participants who responded, twelve industries were represented—examples include software engineering, healthcare, financial services, marketing, and legal. Additionally, participants represented various areas of study and majors, such as political science, information technology, and graphic communication. The years in which these interviews were conducted from 2018 to 2022. The vast majority of interviews documented by survey respondents occurred in 2022.

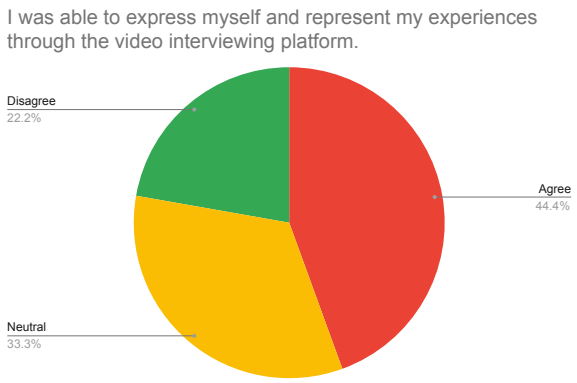

Figure 4: For Q3, there were varied results around whether the respondents felt they could express their experiences through the software platform. While 44 percent agreed, 33 percent of respondents felt neutral and 22 percent disagreed. Given that less than half agree that they can share experiences, this suggests an area in need of improvement. Our qualitative findings also strongly indicate that further improvements are needed when it comes to giving opportunities to share experiences not part of the algorithmic interview process.

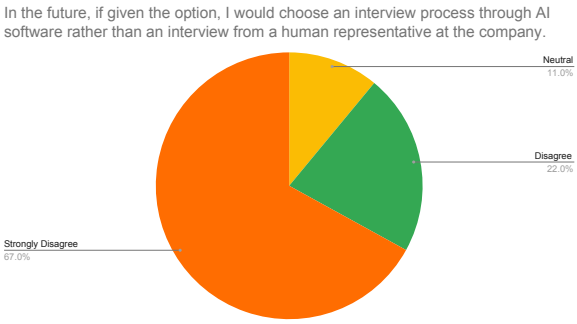

Figure 5: For Q4, this question stood out by having no affirmative responses were given on whether respondents would prefer AI interviews over traditional, in-person interviewing methods. The highest response at 67 percent, was strongly disagree. This strongly suggests that AI hiring software, while technically ready (per Q1) is not yet acceptable by humans making use of it.

7.1 Multiple Choice Responses

Throughout each of the multiple-choice selection questions, ranges of responses often varied. For many individuals, they felt they could access the software, 67 percent of participants strongly agreeing and 11 percent agreeing, as seen in Figure 2. As the multiple choice questions progressed, the results with “Strongly Agree” decreased—this highlights how many participants were less confident and satisfied with the software’s ability to create a comfortable and

supportive environment for an interview, as highlighted by the varied results in Figure 3 and Figure 4.

The most definitive results were found in the final multiple choice question—which was whether in the future, the participants would prefer AI technology to in-person interviews. There were zero responses that stated that participants strongly agreed or even agreed with the statement; the highest response, at 67 percent, was "Strongly Disagree", as displayed in Figure 5. While these results show that there are technological strengths to video interviewing software, ultimately, individuals seem to prefer in-person interviewing methods. These results aligned with our initial hypotheses—that despite its benefits, technology is no substitute for human interaction.

7.2 Short Answer Responses

Through the short answer responses, greater context was provided by participants, highlighting both positive and negative aspects of the interviewing software. *The results as a whole highlight the disconnect between in-person interviews and AI interviews—despite the ways they are similar, the experiences are not comparable.* The fact that participants across fields noted similar experiences highlights similar implementations and functionalities across various video interviewing software platforms.

The first open-ended short answer question gauged the overall reaction participants had to the software. As our study is based on human perceptions, we valued having short-answer responses to provide further clarity from our multiple choice results. When analyzing results from this section, there were varied responses, containing both positive and negative perceptions of the AI software. Many responses highlighted that people thought the software was "fake", one response noting how they were "not able to display [their] true intentions." However, another respondent noted that while they did not enjoy the process, they felt less pressure because the interview did not involve another person. One participant noted how they "enjoyed being able to take extra time to process additional questions but missed the personal connections with a real person and the opportunity to ask questions about the position." This detailed response emphasizes both negative and positive effects of the video interviewing software—highlighting the complexities of this software, and how in some instances it can be beneficial, while other in-person interviewing tactics are irreplicable. This is especially true of the process of question asking, which is an important part of the interviewing process where the interviewee has agency to learn more and assess if the position is a beneficial fit.

Not only did our survey seek to learn about general thoughts and feelings about the interview process, but the questions were framed to learn about how this experience compares to in-person interviews. In Short Answer 6, we made connections to Multiple Choice 4, which also compared AI and human interaction interviews. A key theme from responses in this section is that participants had very different experiences in previous interviews. Participants noted that the process through AI was "less personal" than in-person interviews and overall "loses a lot of the value" of in-person conversations. One participant had a more favorable view of the software, highlighting that this method can create a "smoother" interviewing process and allows for "more applicants" to a certain position. One response in this section seems to summarize the mixed feelings participants have about AI interviewing software overall. A participant noted this: "It's efficient however I don't believe it's authentic." *This response reveals a dichotomy of efficiency versus authenticity*—which remains a question for companies to ponder when deciding the format of their interviews.

As our study centers around perceptions of biases, in Short Answer 8 and Short Answer 9 focused on any biases respondents perceived or anything they wished the software would have accounted for. One participant raises an important question about accessibility in the software, and a shortcoming of artificial intelligence that fails to cater to individuals needs. They notice that "Time restrictions can cause the person being interviewed to be nervous or become rushed in delivering answers" and there is "no time to elaborate." This directly connects to another person's response, as they wanted "more time to process questions." Due to the structure of AI interviewing software, there are barriers to providing answers that puts people at a disadvantage. Not only can time limits be inaccessible and limiting in AI interviews, but another drawback of the software is the *inability for participants to analyze the perspectives and actions of the interviewer*. They say "the dynamic of being able to read body language and vocal tone is key to help me guide my answers in my interview delivery."

While there were positive comments about these various interviewing experiences, *many participants had negative perceptions of the video interviewing software.* Multiple responses highlighted that the process felt inauthentic; they missed the personal connections of face-to-face interviews. They felt they could not express their full personality in ways they could through a conversation with a company representative. Additionally, participants noticed biases that emerged—often, there are time restrictions that can make the person feel rushed. This is a concern for accessibility especially, as some individuals might need additional time to process a question and adequately reply. The results of this study affirm that for many people, while there are perceived merits of video interviewing software, the lack of authenticity and humanity of the process makes face-to-face interviews more favorable and accessible.

8 THREATS TO VALIDITY

The potential threats to validity in our study primarily stem from the limited sample size of 25 responses, which may raise concerns about the generalizability of our findings. This limitation arises due to our focus on recent graduates entering the job market using algorithmic hiring software. We mitigated this threat to some extent by reaching out to universities and professional networks. Furthermore, the relatively small number of students entering the job market each year–who would also have been subjected to AI interviewing software–constrains our sample size. Despite these limitations, our study's focus on the unique experiences of early career professionals is essential, as early negative experiences can have a long-lasting impact on one's career. We also expect to be in a position to update this study as AI interviewing software becomes even more prevalent, since it has only started to see greater uptake in the the past couple of years. While future research could

consider a broader professional network to enhance generalizability, our study's findings remain valuable and provide significant insights into the individual experiences of recent graduates in the context of algorithmic hiring software.

9 CONCLUSION

Prior research in the emerging field of algorithmic bias, primarily focusing on facial recognition software, has shed light on how algorithms can perpetuate existing inequalities and reflect both explicit and implicit biases in human society, despite their purported neutrality. These biases often stem from skewed datasets and the implicit biases of the engineers and developers responsible for creating this technology. Ensuring that current software is socially responsible, as outlined by Cheng [6], means that artificial intelligence should protect and inform users, prevent and mitigate negative impacts, and maximize long-term beneficial impacts.

Despite these concerns and the body of research highlighting the potential negative consequences of widespread technology implementation, companies across the United States are increasingly incorporating artificial intelligence into their hiring processes, often without fully comprehending the potential harm associated with it. This includes the use of facial recognition software for candidate interviews. Our research study has brought to light some of the adverse implications of this video interviewing software, such as the absence of a personal connection and time constraints for responses, which can have detrimental effects throughout the interviewing process. In essence, our study underscores a central theme: while video interviewing software may be perceived as efficient, it is often not perceived as authentic.

In light of these findings, it becomes evident that educating individuals about the nuances of AI and algorithmic bias is crucial. As with any emerging technology, to comprehensively assess the effects of this software, we propose additional complementary research efforts focused on the experiences of individuals who use the software, particularly those from historically underrepresented backgrounds in their respective fields. The overarching goal of this research, along with necessary adjustments and reforms to the hiring process, is to prioritize the agency of interviewees throughout the hiring process. To achieve greater transparency, equity, and inclusivity in the hiring process, we believe it is essential for humanity to ask questions rather than solely relying on artificial intelligence to provide the answers.

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