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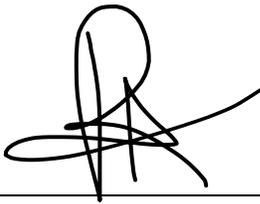
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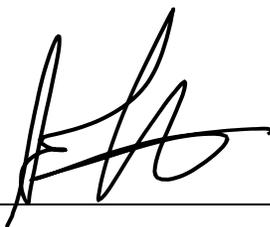
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**SYNOPSIS**

In this paper, we researched implicit bias encoded in job advertisements. Focusing on the linguistic bias, we looked at the annotation words give, and how they affect potential job seekers. Although companies strive to create a diverse workplace, underrepresented groups are affected by viewing a job advertisement. A semi-structured interview was conducted with twelve participants, providing us with an insight into the impact in language usage. Through the observations in the interviews, it was clear that the language usage was a hindering for the participants when it came to connecting with the job advertisments. As a solutions, CrowdCorrector created as a concept that would, through the use of crowdsourcing, detect and mitigate implicit bias in the job advertisement.

# CrowdCorrector: To Recognize and Mitigate Implicit Bias

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## ABSTRACT

The call for increasing diversity during the recent uprising and social justice movement has put pressure on companies to expand their inclusivity [1][2][3]. Although statistics show that diversity creates an improved work environment, creativity and innovation [4]diversity is not commonly represented in organisations. Job seekers can experience implicit bias that stems from cultural stereotypes, and it is reflected in how HR managers connect with job seekers. This paper can help recognize and mitigate implicit bias, and contribute to creating a diverse workforce. To investigate how job seekers interact and perceive job advertisements, semi-structured interviews, followed by implicit bias tests heavily inspired by IAT, was conducted to develop an understanding of how language use can impact their view on the job advertisement. To support this contribution we have developed CrowdCorrect, a crowdsourcing concept, which will support the collective power of workers to make the corrections in job advertisements to mitigate implicit bias.

## Author Keywords

Crowdsourcing; Human; Implicit Bias; Linguistic bias; IAT;

## INTRODUCTION

In Human Computer Interaction (HCI), there has been an increasing interest in how design can perpetuate unconscious bias, which embodies values and norms relating to each designer's own identity. In this study, we refer to 'implicit' bias rather than 'unconscious' bias. There is a small difference in meaning between these wordings. Unconscious bias refers to the bias that we are unaware of, and which happens outside of our control. [5]It is influenced by background, cultural environment and personal experience. Implicit bias refers to matters of the level to which biases are unconscious as we are being made aware of them.

Jobseekers from underrepresented groups can experience the effects of implicit biases that are derived from cultural stereotypes [6]. A well known case of this type of

discrimination, is the case of Wal-Mart v. Dukes, where roughly 1.5 million women were accused Wal-Mart of a systemic gender discrimination, with an unequal pay and lack of promotion [7]. Human Resource Management [8] made a study that examined the impact of diversity, and employee development policies. As an indicator of the intent behind applying for a job, they looked at the surface (demographic characteristics) and deep-level differences (attitudes or values) within organisations.

The methods described in this study can help recognize and mitigate implicit biases and possibly create a congenial environment for jobseekers to apply for possible vacancies. Implicit bias influences all human interactions, affecting attitude and behavior [9] Implicit bias is heavily connected to our perception of stereotypes, and how information is processed regarding certain individuals. The association of characteristics of individuals of certain groups could be implicit or explicit, where explicit is a deliberate thought, whilst implicit is without being aware of it being presence. [10]The consequences of unintended decision making based on implicit biases affect potential job seekers applying for an open vacancy due to the fact that they cannot identify themselves with the presented description of the open position.

In order to understand the human mind when specifically looking at job advertisements, we investigated the linguistic structure of the text in order to acquire knowledge about the language describing the open vacancies. Textio, which is an augmented writing platform , shows key language patterns in companies hiring and recruitment process [11][12]. The philosophy behind Textio is when building a company where every person is valued and celebrated, what essentially makes the difference is the language usage, and how it will impact how job seekers will react. [11] In the works of Richards & Hewstone [13], they emphasize how labels are used to refer to social categories, and how it influence public opinion towards individuals. The theory, in relation to job advertisements is used to look at how a generalised view of roles and performance is embedded in the language. In order to reduce the occurrence of bias, the theory was used to recognize social-category labels.

In this paper, we argue that implicit bias is reflected in language use, specifically by: (1) biases in linguistic labeling, specifically in formulating information regarding categorised individuals, and (2) biases in describing the characteristics of individuals. Since this is extensive work, it requires a larger pool of workers to highlight the implicit bias

in the language which is used in the job advertisement. The crowdsourcing platform works as an effective tool to solve large scale tasks by outsourcing to a large pool of workers. [14]Crowdsourcing is based on the idea that a large number of individuals can provide insight or value, even if some individuals are wrong [15]The tool is an optimal data collection method since the large pool of workers

In this paper, we present 'CrowdCorrector', a concept that makes it possible to detect biased words within job advertisements through the collective power of workers. A literature overview of implicit bias through the lens of linguistic analysis will be presented, followed by an overview of crowdsourcing and the necessity of the tool for large scale tasks. Based on the literature, semi-structured interviews provided data for further analysis. The collected data was coded and analysed to gain an insight into the participants' ability to detect implicit bias in a linguistic context.

## RELATED WORKS
Although it is difficult to measure implicit bias, several studies have been published, researching how to tangibly collect and contextualize implicit bias. Research below shows how implicit bias is reflected in language use has been a factor that negatively impacts job seekers [16]. Crowdsoucing is a powerful tool that can drive participation and engagement[15]. It will be employed to assist companies to detect implicit bias.

### Implicit Bias
In this study, we refer to 'implicit' bias rather than 'unconscious' bias. There is a small difference in meaning between these wordings. Unconscious bias refers to the bias that we are unaware of, and which happens outside of our control. It is influenced by background, cultural environment and personal experience. Implicit bias refers to questions about the level to which biases are unconscious as we are being made aware of them.

The U.S. Equal Employment Opportunity Commission (EEOC) enforces federal laws which make it illegal to discriminate based on race, color, religion, sex, national origin, age, disability or genetic information[17]. It focuses on solving two issues, which are creating talent pipelines for both women and underrepresented minorities (URMs) in various levels of management. The method for tackling the lack of diversity, has been diversity training, which essentially consists of explaining to employees and managers their biases, in order to divert from them. Unfortunately, training can cause unintentional damage to the workplace. Studies show that this method makes women and URMs think that their coworkers are biased [18]]. However, research shows that when informing employees about bias as unconscious, they feel unable to change their behavior as bias is human nature [19][9]. Focusing on the issue of bias has been proven to result in more qualified applicants, better hires, and more promotions [20].

An organisation made to detect implicit bias is Project Implicit, which was founded in 1988 by the scientists Drs. Mahzaring Banaji, Anthony Greenwald and Brian Nosek with the goal of educating the public about hidden biases [21]. They developed a psychological tool called *The Implicit Association Test* (IAT) that measures attitudes and beliefs. Various versions of IAT are accessible online which assess bias by measuring the strength of associations between concepts (such as black or white) and evaluations (such as good or bad*)* [21]. The findings were that "White Americans, on average, show strong implicit preferences for their own group and relative bias against African Americans" [22][23]. The IAT tool makes it possible to detect hidden cognitive biases, which could work as a beneficial way to tangibly collect and contextualize our individual implicit biases in regard to attitudes we each have towards objects.

### Linguistic Bias
The emotional state to which group(s) we feel connected to, and the shared representation of any social categories we implicitly associate with people, are revealed in the words we choose to express ourselves. Linguistic bias can be defined as "a systematic asymmetry in word choice as a function of the social category to which the target belongs*"* [24]. Linguistic bias focuses on labels used to refer to social categories.

*Social-category labels*
Social-category labels can range from broad level (e.g., gender, racial groups, age groups) [24] to narrow level (e.g., specific and specialized professions) [13]. For instance, research on sexist language is focused on the generalised view about roles and performance of females and males. When referring to an individual that is inconsistent with the expected role for their gender, an explicit mention occurs of the referred to gender (e.g., female software engineer, male nurse). This occurrence is, however, not shown when the individual fits the stereotypical expected gender role. Another variation is the use of nouns compared to adjectives to describe an individual [24]. A study by Carnaghi et al. showed [25] that nouns used to refer to individuals (e.g., Linda is a heterosexual) exhibit stereotypically expected characteristics of a social category, compared to labels using adjectives (e.g., Linda is heterosexual). An example of this phenomenon presents in a case filed in 2017 by a 28-year male regarding a discrimination based on age and gender [26]. A single father got dragged to court for a discrimination case because the aforementioned man was denied the babysitting role for his two kids. The man claimed that the sole reason for this refusal was due to his gender. This case shows a clear example of how social-category labels affect individuals.

### Crowdsourcing
Crowdsourcing is an effective paradigm for human-powered solving of large-scale problems within domains such as image classification data entry, optical character recognition and proofreading. Crowdsourcing systems are electronic tasks distributed to a pool of "workers". The people who

contribute to the tasks are defined as the workers and devise solutions. The workers submit these contributions to the task owner, referred to as a requester, where the posted contributions' quality is assessed [27] [28]. Crowdsourced tasks are typically tedious, repetitive and the reward is small; errors can occur often, even among the workers who make an effort. In some extreme cases, workers can be perceived as spammers by submitting arbitrary answers independent of the questions in order to collect their award or fee for answering questions within a specific task. As the pool of workers is not only large, but also anonymous and transient, it is generally difficult to build trust relationships with these workers. If payment is involved, it is difficult to condition payment on correct answers, as the perception of a correct answer may differ from each worker. For our study, it is important to recognize that the different workers who contribute to crowdsourcing have different levels of life experience and perceptions of the words which can have an effect on the results.

Effective quality control (QC) is a determination factor to ensure the success of any data collection venture [15]. Quality is a subjective issue in itself. Efforts have been proposed within models and metrics to quantitatively and objectively assess quality. The quality of a crowdsourced task's outcome can be affected by workers' abilities and quality [15]. As Figure 1a shows, a worker's quality is characterized by his or her reputation and expertise.
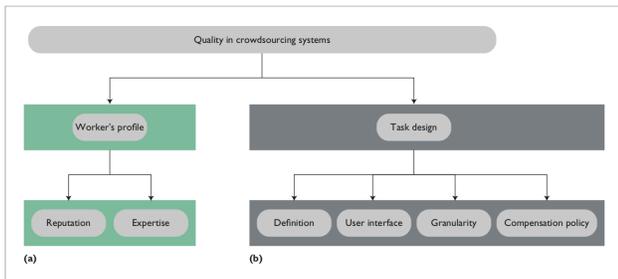


**Figure 1. For this study we are interested in Figure 1a shows, which worker's quality is characterized by their reputation and expertise.**

Note that these attributes are correlated; a worker with high expertise is expected to have a high reputation as well. Amazon Mechanical Turk (MTurk) is an Internet service that gives developers the option of including human intelligence as a core component of their applications.[15][29][28] Amazon describes their service as an "artificial intelligence" system, meaning that instead of AI accomplishing a task with the means of artificial intelligence, it can ask a human. A unit of work in Mturk is called a Human Intelligence Task (HIT), and after each HIT the worker will collect a payment.[15] The requesters can create qualification tests that workers must complete before they are eligible to work on HITs. If the task requires familiarity with rock music, the workers can be asked names of bands or songs to test their knowledge. This means that workers who fail the tests are excluded.

**Interface**

Micro-Task platforms such as Amazon MTurk cultivate human computation, which describes tasks that are easy for humans to complete but complicated for computers [29]. Crowdsourcing presents an approach to solutions to complex problems. While there are many studies of usability of systems in software design that affect cognitive load, there are fewer studies that address the effects of the user interface design in a crowdsourcing context. The research that has been done has shown that the monetary incentive is the primary motivation in MTurk. A study by Rahmanian et. al. [30]showed that increasing monetary rewards decreased the time required for the HITs to be picked by workers. However, cases [29]have been reported that showed that an increased payment resulted in reduced demand for the tasks, since high reward usually means higher complexity.

The study by Rahmanian et. al. [30] designed image ranking tasks to test their hypothesis. They asked the workers to rank ten images based on their similarity to the given query image. They designed three different UIs: ranking, direct sorting (drag-and-drop) and rating. The study created several HITs using the three UIs, where the workers got a $0.05 reward for all three types.

*Rank UI design*
For the rank interface, they provided workers with ten random images and asked them to assign a number from 1 (least similar) to ten (most similar) to each image, according to its similarity to the query image.

*Sort UI design*
For the next UI, the workers were asked to sort images. jQuery UI functions were used to create a drag and droppable list of images and ask workers to sort images based on their similarity to the given query image, using the drag-and-drop functionality of the HTML page.

*Rate UI design*
For the last UI, the workers were again provided with a selection of 10 random images to compare the given query image. They had to assign a number between 1 and 5 according to the degree of similarity, where 1 was the lowest and 5 the highest. Unlike the Rank method, for which

workers had to compare all images to provide the ranking, they were able to focus on each image and rate its similarity to the query image. The study expected the cognitive load on the workers to be lower.

The results of the study showed that the Rate UI design was the most efficient compared to the other UI designs. The reason that the workers perform better with the Rate UI design is that it enables them to focus on each image by isolating and assigning scores of similarities without reference to the other images. This reduces the burden of making comparisons, resulting in lower cognitive load. The critical implication of the study is that careful attention in UI design to reducing the cognitive load of crowdsourcing workers can lead to significant performance benefits.
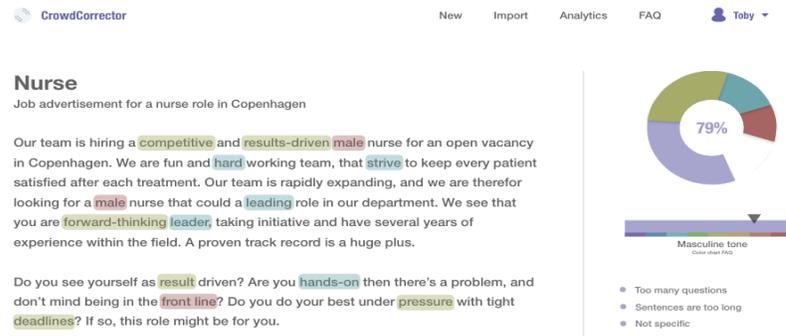
**Illustration 1. This illustration showcase how workers have highlighted words that include implicit bias.**

## CONCEPT

For this section, the concept of CrowdCorrector - a crowdsourcing web platform concept designed to run on web browsers, will be presented. As the name suggests, CrowCorrector is based on the Crowdsourcing approach that engages a "crowd" of workers to efficiently complete the task of ridden job advertisements of implicit biases (Figure 1).

### Features

At this point, at this point, it is important to note that CrowdCorrector is in the stage of being a lo-fi prototype. Some of its features can be engaged with while others are still concepts for further development. it will be presented to illustrate how the theory will be applied.

Upon launch, the users' will be met on the index page which in this case, is the homepage. There will be an option of registering as a user requires an email and password. They will also be required to disclose their gender and occupation. The users can register themselves as either workers or requesters in this step. When logged in, the users, who are registered as workers, are met with the main screen where they have the option to select crowdsourcing tasks, and detect words in the advertisement that are implicit bias by highlighting them (Illustration 1). For the requesters, their main page will have buttons that encourage them to upload documents for improvement. An editor on the webpage also enables them to write out their job advertisement in CrowdCorrector if that is preferred.
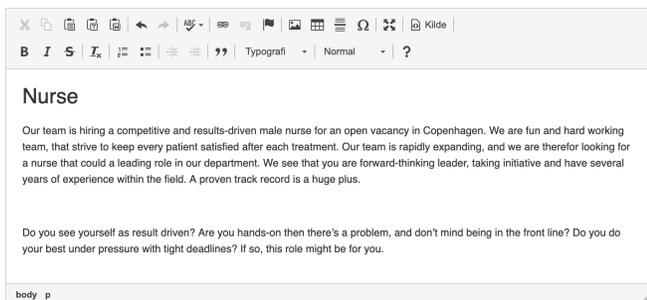


**Illustration 2. This illustration showcases the CKEditor, which in action. Requesters can type in the platform and send it to CrowdCorrector for reviewing.**

Furthermore, the requesters will have options for correcting other requesters' documents. Upon the first worker correcting the job advertisement, the requester will receive a notification. They are then able to click on an overview of the job advertisement where certain words are highlighted. There will be a spectrum of colors ranging from lilac to red that indicates in percentage how severe the implicit bias is the job advertisement. Requesters are kept up to date with the number of engagements that the job advertisement receives from each worker. An additional feature is to rate the overall job advertisement. This allows the requesters to gain insight into how job advertisement is preserved by the community.

Additionally, they have access to previous interactions within CrowdCorrector, involving completed tasks and the number of rewards collected. As the workers continue to take on tasks, they can build a reputation, representing previous performed tasks, that is illustrated through a banner in their profile. The reputations will enhance their credibility and ensure that workers are not viewed as spammers or illegitimate. Users of CrowdCorrector also have the option to read additional tips and helpful facts regarding the process by clicking 'information'.

### Technical considerations

The technical considerations surround the building of the platform, and the future of the application will be mentioned in this section. The structure and front end are made using HTML, CSS, and JavaScript. The work was powered by the code editor application Visual Studio Code. For the block-styled editor (see illustration 2), a plugin from CKEditor was implemented  It is written in JavaScript, is responsive, and easily customizable with HTML using mods. The usability of the platform was heavily considered in the planning stage. The placement of the features needed to make sense without increasing the difficulties of creating the platform. This process involved several iterations, before settling on a design. The purpose of this semester was not to complete the webpage but to have a somewhat responsive framework. For the next semester, the platform will be fully responsive and compatible with browsers, and it will be explicitly tested on several of those browsers to ensure that there are no issues.

## METHOD

The purpose of the study was to gain insight in implicit bias into job advertisements by viewing how implicit bias is

reflected in language use; specifically, in formulating information regarding categorised individuals, and biases in describing the characteristics of individuals. In order to do so, a semi-structured interview was conducted, followed by a debriefing.

**Participants and Interview**
The twelve participants were recruited with the specific focus of providing their unique understanding of how they interpret biased language in the job advertisements. The participants' ages ranged from 20 to 42 and a collection of their demographic details is seen in Table 1.

| Participants | Age | Gender | Occupation |
|---|---|---|---|
| P0 | 24 | Male | Law student |
| P1 | 25 | Female | Nurse |
| P2 | 26 | Female | Unemployed |
| P3 | 42 | Female | Pedagogue |
| P4 | 20 | Male | IT student |
| P5 | 30 | Male | Architect |
| P6 | 29 | Female | Unemployed |
| P7 | 24 | Male | Hairdresser |
| P8 | 30 | Male | Unemployed |
| P9 | 21 | Female | Graphic designer |
| P10 | 29 | Female | Sales assistant |
| P11 | 28 | Male | Web developer |

**Table 1. Overview of the demographic of the participants which includes their age, occupation and gender.**

The participants for the interview were recruited through Facebook, LinkedIn and our own network. Due to the nature of our topic, it was important that we had a diverse set of participants to get different perspectives. Diverse meant that differences in gender, orientation, race and age should be present when the interviews were conducted.

**Data Collection Procedure**
The data for the study were collected through semi-structured interviews and debriefing [31][5][32] .We drew inspiration for the selected job advertisements from common job ads that can be found on JobIndex and JobNet. The interviews were collected through audio recordings, then later transcribed, and coded for data analysis. The participants were interviewed individually through a Zoom call, and each interview ranged from 20 to 35 minutes. To ensure that we did not influence the data, the purpose of the study was not revealed in the beginning of the interviews. The participants were given the job advertisements [see Appendix 1 and 2]] for review and asked for inputs about the use in language of the job advertisement. As the interviews progressed, we directed their attention to specific parts of the advertisement for elaboration.

The two job advertisements which were presented to the participants were developed based on the research on linguistic bias. There was a focus on how the variations of nouns compared to the adjectives [see Related Works] were implemented in the advertisements.

In the debriefing, the participants were made aware of the purpose behind the study.

**FINDINGS**
The use of certain words to describe the characteristics one should possess for a position is often stereotypical, especially within the IT field, which is mainly male dominated. Certain words such as *lead, competitive, active* and *confident* are characterised as male-gendered words, whilst words such as *support, responsible* and *committed* are female-gendered words. Using two different job advertisements within the fields of: science (62% male bias) and secretarial (67% female bias), we analysed gender equality with the possibility of other factors affecting job advertisment such as background, national origin e.g.

**IT Specialist job advertisement**
P0, P1, P2, P3, P6 stated that phrases such as *'we're looking for a strong candidate with 5 years in the field..'* were viewed as highly demanding and intimidating. The implicit bias in the job advertisement impacts the number of advertisements that the company will get for the open position. A majority of the statements from the female participants consisted of something like *"The required years of experience was too much.."* since it was a requirement to be considered for the position.

P1 with an occupation as a nurse could not see herself as a candidate for the advertisement (see Appendix 1) because of the lack of interest in IT. When given the other advertisement that was looking for a nurse, she could relate more to the advertisement. However, she could not see herself as applying since they were seeking a male candidate. She also felt as if the role was too intimidating and could not see herself as fitting the description as a 'confident' candidate.

P4, P9, P11 focused on the non-technical aspects of the job advertisements, whilst the rest stated that the position was directed toward a candidate that is highly specialized and had technical skills. P9, P11 mentioned that they did not look at the requirements for skill sets when applying. As they are both within the IT field, they stated that showcasing personal projects provides more insight, which companies look at to see whether or not the skills match their areas of interest.

P11: *"The majority of ads are filled with requirements and qualifications, but I think it is important to look at how the company works. I ask myself if I am a good match based on my previous projects. Then I apply, I don't look at requirements.."*

P4, P8 viewed the advertisements as confusing. Participants stated information such as 'Newly graduate' followed with 'Minimum 2 years expertise' as misleading. This factor

made them hesitant to apply since they did not know which level of expertise the company was looking for.

P4: *"I can't really tell if they are looking for a newly graduate or someone that has experience within the field.."*

A common statement which was repeated throughout in the interviews, was that the job advertisement was not within their academic field so it was difficult for them to imagine themselves as a candidate for the job advertisement.

P5: *"There are many words, which i'm sure makes sense for someone who is applying for this job. I myself am not sure if i understand the meaning of it, though."*

**Nurse job advertisement**
The intention of this job advertisements (see in Appendix 2) was to investigate how a more inviting language with emphasis on soft skills like communication and direct participation with people could affect how the participants felt about the job advertisement.

P1 stated that since it was within her academic field and could see herself applying for this position since she had worked many years as a bedside nurse. She emphasized that every job advertisement is different according to which role they would work as, and the setting (e.g. hospital setting)

P1: *"I would apply for this position, since they do not describe tasks that I have not experienced doing before.."*

P2, P3, P7 felt that the advertisement put some effort into creating a "cozy" work environment. It is stated, that since nurses have close communication with patients and their families, it is essential that they have the right character when interacting.

P7: *"It seems like a calm environment to work in since they are looking for nurturing characters rather than a track record of expertise.."*

P7 did clarify that it is still evident that the hospital was looking at a skilled candidate for the position as nurse, but the tone of the job advertisements was more 'inviting' compared to the job advertisements of the IT specialist.

P5 stated that the tone in which the qualifications are described is different. In this nurse job advertisement, there is an emphasis on the soft skills qualifications such as communication, collaboration, and flexibility.

P5: *"It is clear that there is a greater focus on the Nurse's personality in this one compared to the IT one, which is understandable.."*

Although there is a mention of soft skills in both advertisements, the softer skills were noticeably more pointed out compared to the IT specialist.

P3 stated that the mention of a so-called "Friday Bar" which works as a social gathering between co-workers was not in her interest due to religious reasons. When asked if it could hinder social connection with her coworkers, she stated that her absence would not affect her connection with coworkers.

P3: *"I am not for gatherings that include alcohol, so it would be a pass from me."*

While P3 was opposed to this factor, some had a different answer. A repeated statement throughout the interviews was that the job advertisement described a weekly coworker gathering. P3 that this would be a great way to connect with other coworkers, noticeable since starting in a new workplace is intimidating, if they so choses.

**Debriefing**
In the debriefing, the participants were made aware of the purpose behind the study. P3 stated that it was not clear in the execution. P3 mentioned in the debriefing that she felt her input was not valid, and the different terms threw her off since she did not know whether or not she was "right". During the interview, we had to affirm to P3 that there was no right or wrong, but the participants seemed hesitant and had to word a disclaimer for most of the answers she gave. This sentiment was shared with P11, P8, P4.

Some surprising observations during the interview was that a couple of the participants did not enjoy the layout of the job advertisement (See Appendix 1 and 2). The job advertisements which we provided were modelled after the one that is normally seen in job searching sites. Their advertisement had a description of the position along with desired adjectives and a set of qualifications in bullet points.

P8: *"The text was a little overwhelming to read. It was packed with information and it seemed confusing.."*

Firstly, they had to correlate specific words to what they believe have similar attributes, pinpointing their implicit bias towards concepts.

This study was as aforementioned, heavily inspired by the concept in the IAT test [21], however, the response time was not the focus in this study. The main purpose was to investigate if participants see specific words in the job advertisements as gendered. Rather than measurement, we wanted the dialogue to achieve more insight into our research. We asked them to categories the words "leader", "driven", "competitive", "pressure", "ambition", and "deadline" in a multiple-choice assessment. The choices consisted of "Female", "Male", "Gender neutral"(see Appendix 3).

The test results [see attachment x] showed that words such as leader, "drive", and "competitive " are more masculine even though their difference is narrow. For this section, we will focus on a few of those words, and the response from the participants. P2 associated the word competitive as characterised in men, however, she briefly mentioned that females also possess those traits. P9 agreed with this association and believed that the word had a negative connotation. Specifically, she emphasised that it is not healthy to be competitive and is usually a male trait. P1

backed up the claim stating that competitiveness can lead to a toxic mindset, in which she claims many men have.

P8 associated the word leader as characterised as gender neutral. He stated that everyone can be a leader and based on his experience cannot pinpoint a certain gender. When questioned in-depth about his past experience regarding leadership, he stated that he mostly has experienced women as leaders. P5 states that women have become more competitive now due to things such as maternity leave. It has become more socially expected for men to claim their maternity leave, giving women the chance to return to the job market faster.

Even though both job advertisements had language which should be perceived as biased, the participants were more inclined to pick job advertisements seeking a nurse candidate.

## DISCUSSION
This paper explored the effects of implicit bias which occurs through the linguistic challenges within job advertisements. Different approaches to data gathering were followed, consisting of focus groups and debriefing, followed by separate interviews for each participant. Throughout the project, a webpage was under development. The purpose of the webpage was to support crowdsourcing services that enabled jobseekers to proofread job advertisements and detect implicit bias.

### Implicit Association Tool (IAT)
Throughout the year, there have been different methods of making an implicit bias more visible, and one of these is the IAT. By measuring the strength of association between concepts [21] the response is relatively easier to take action when the related items are implicitly co-related.

As a result of our test in the debriefing, we can see that negative and positive terms in language are co-related to the way people showcase biases in regard to different subjects. It could be argued that had the IAT been taken by participants before the interview, their cognitive would be prepared before analysing the job advertisement since it would be clearer that the task was to correlate different words with positive and negative attributes. Furthermore, since there was no measurement of response time, the occurrence of possible implicit bias could not have been detected precisely. Had it been done, we would have collected data that could have been beneficial for an in-depth analysis.

### Crowdsourcing
Although crowdsourcing was heavily based on the final product aspect, and it was under development, the theoretical basis of it was constantly present when developing CrowdCorrect, it has not been explored through testing. Currently, we do not know how well this concept will perform with participants, that is something that will be further invested as the project progresses. Through our research, it has been clear that features such as a ranking system were more effective when it comes to image ranking.

We have still included that in our concept, so that the workers can express to the recruiters, what times of biases are included in the word or wording. This is a feature that we wish to evaluate with users, and observe if it is just as effective with our language-based platform.

## EVOLUTION
In the section of Findings, it was clear that several of the participants were hesitant to fully engage in criticism of the job advertisements which were presented to them during the interview. It led to some reflection of the design of the final webpage. One participant felt that they could not give adequate criticism because the job role in the advertisement was outside of their scope of knowledge. Another participant mentioned that they did not understand some of the terms which were included in the job advertisement, and that discouraged them from being too critical of it. It is important to note that this was before they were debrief about the purpose of the interviews, which is detecting implicit bias in job advertisements. The group discussed if the job seekers in the application should be matched with a job advertisement through a tagging system. As for now, the prototype will include the profession of the job seeker, but to easier match the individual's expertise, a tagging system where they can tag "UX", "coding", "communication" and "social work", and where the job advertisement also have tags so they can easier be matched. The algorithm would prioritize a match between these two subjects. However, it is important to add that the participants did not have a prior understanding of what they were looking for when given the job advertisements. The participants mentioned that they were looking for grammatical errors, if the setup was done correctly or if there was something misleading in the text. The lack of confidence could have occurred due to the participants not knowing the true purpose of the study until afterwards. Upon reflection, it could've helped the participants focus on the purpose of the exercise, if they've known what they were looking for.

Through the debrief it was possible to have a more informed conversation about the linguistic biases. It was a big hindrance that the participants did not know the purpose of the evaluation. After the reveal, it was found that participants were more sensitive to linguistic information that is associated with the implicit bias each had. It was quite clear that many of the participants had a strong association with what words were gendered or not. A participant called the word "ambition" elegant when describing its ties to femininity. The second half of the evaluation was very fruitful, and for a future evaluation, we would like to present the purpose of the study from the beginning.

## CONCLUSION
The focus of this paper is to gain insight in how implicit biases are reflected in the language of job advertisement. Through our literary research it is evident that the presence of biased reflection in the language can be a hindrance for

job seekers since it will indicate them from applying to these open slots. This correlates well with our findings. Linguistic labelling can be viewed in several job advertisements [13], however, the implicit bias has not been easy to pinpoint. By doing a study involving participants, it was observed where the occurrence of implicit bias occurs. Most of the participants did note at some point in the interview that the IT Specialist job advertisement, was more intimidating, and some even felt that they were not adequate to even comment on it. All of the participants who made such comments argued that it was either outside of their field so they could not relate to the job advertisement or the wording was difficult. Similar comments were not made for the nurse job advertisement even though it had the same years of experience. Job advertisement language was more neutral and was intended to be more "open". Rather than including phases like 'leader", it was more focused on the job seekers' soft qualifications. Through our debriefing, it was evident that participants associate certain words with a gender. It is clear that a platform such as CrowdCorrector is necessary in order to recognize and mitigate implicit bias in job advertisement.

## ACKNOWLEDGMENTS

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