A Context-Aware System for Bias Identification in Job Advertisements using Natural Language Processing (NLP)

Master's Research Project

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Do you smell it?

Have you been in a situation where you had a feeling of exclusion? This situation could happen when you see a picture, read a paragraph, or attend a job fair. Your brain is sensitive and identifies the bias in the situation. Such kind of feeling is annoying, especially during the stressful job-seeking period.

Bias in Job Descriptions

The hiring process can be influenced by bias. Simply speaking, bias means that people or groups with certain labels would be liked or disliked by others just because of their labels. People are the ones that makes decisions but humans are biased. So the very first step of the hiring procedure, creating job advertisements, is also likely to be associated with biased language. For example, in the job description, if HR use the word "bravery", the male candidates would have more possibility to consider themselves eligible whereas females might think the position is not for them. The unconscious use of such words in job advertisements would discourage members of the minority classes from applying to the job. Thus the company could not fit the most suitable candidates.

A Job Description

We are looking for a young and driven candidate who can bring innovation to our organization, and is a true team player for the rest within the organization. Are you the master of technology and passionate person we are looking for? We are still only 1% done at Facebook – this team is inventing every day and it takes tenacity, bravery and the ability to see the big opportunities to thrive.

For the word "bravery"
Potential male job seekers would have more possibility to consider themselves eligible whereas females might think the position is not for them.

Example of a bias situation in a job description

Take actions

Stand aside can not make things better. This project will focus on investigating approaches to identify and replace biased language in job advertisements. Another important point of this project is that context plays a key role. Some words are biased in some contexts, but they

can also be unbiased in certain contexts. Our goal is to build a product that can identify and classify biased words. After that, our product would be able to provide suggestions to replace the biased word and create a new grammar-correct sentence.

How?

To achieve our goal, the context-aware system has three components:
1. Bias Identification System
   - With natural language processing techniques, we will design a algorithm that can read job advertisements in English and is sensitive to biased terms.
   - This algorithm can identify the biased words or phrases in a job advertisement, which make potential job seekers feel prejudiced.
2. Suggestion system.
   - For each biased word or phrase, the suggestion system will provide several alternatives and rank them according to a predefined criteria.
   - At the same time, the bias identification system will filter out the alternatives which may show discrimination in the specific context.
3. Replacement and Correct Grammatical Errors
   - After replacing the biased terms in the original job description, we will use some open source tools to correct grammatical errors.
   - At last, output a job advertisement with bias identification and suggestion alternatives.
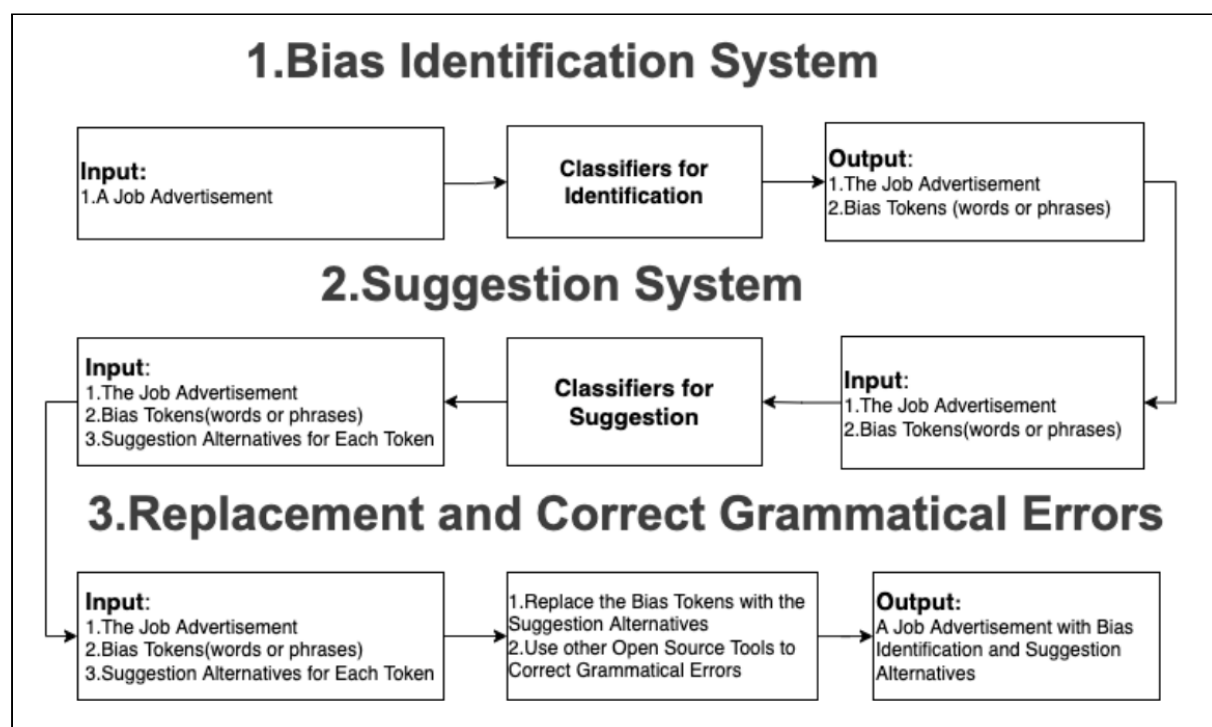
The flow chart of the whole system

Difficulties

Before implementing the algorithm, having sufficient data is a must. Algorithms and machines are not human beings. They cannot literally think and understand but just follow the commands of the people who use them. Our algorithm needs tons of examples to study how to classify different biases and propose suggestions. These examples should be annotated based on a trustworthy standard. Collecting enough data and confident data annotation is one of the most challenging difficulties of this project.

Bias Type	Example
Generic He	A programmer must carry his laptop with him to work.
Generic She	A nurse should ensure that she gets adequate rest.
Societal Stereotypes	Senators need their wives to support them throughout their campaign.
Behavioural Stereotypes	The event was kid-friendly for all the mothers working in the company.
Explicit Marking of Sex	Chairman, Businessman, Manpower, Cameraman

The five bias types we use in our data annotation

In a nutshell, our project helps reduce bias in job advertisements and has contributed to the reduction of inequality in recruitment.