**Section 1 - Intro**

We live in an information age in which many decisions are made by various software programs that use data annotated by humans. These types of decision-making are seemingly sterile and free from prejudice. That perspective gives software decision-making a huge public validation since software programs are unbiased, but is that so?

In this project, we decided to focus on the field that is known as “Algorithmic bias”. The reason we chose this subject is that it has an enormous impact on us as a society daily. In ways of equality in many types of fields, for example, research on [Racial-Bias in Health Care](https://www.science.org/doi/abs/10.1126/science.aax2342) published in Science AAAS, another work on the subject is [Gender-Based Discrimination](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2852260) research published in SSRN. You may see why this is such an important subject as its concerns 2 of the 17 UN SUSTAINABLE DEVELOPMENT GOALS, [Goal 5: Gender Equality](https://www.un.org/sustainabledevelopment/gender-equality/) & [Goal 10: Reduced Inequalities](https://www.un.org/sustainabledevelopment/inequality/)

Supervised learning models that are used in various software programs use train sets – or in other words, annotated data. The question we wish to ask is: “Could there be a significant biased connection between the annotator’s background and the way they will rate hate speech? If so quantile its intensity”.

### what is our innovation

To try and answer this question, we used a dataset from a paper published by Berkeley University. Indeed, we found a bias in the annotating data as will explore late on in section 3. The innovation in this field is that we need to label data with more supervision to reduce this bias.

Hate speech definition: “bias-motivated, hostile and malicious language targeted at a person/group because of their actual or perceived innate characteristics, especially when the group is unnecessarily labeled.”

Section 2 – Data overview

The data we used has been published in an [article](https://arxiv.org/pdf/2009.10277.pdf) from Berkeley University. The data contain 131 variables, most of them were binary and for our project, we transform them into categorical variables, alongside some irrelevant to us variables we ignored. The variables we focused on are the ones that were filled by the annotators.

The way the data was collected – 7912 different annotators were given posts and to every post, they were asked to rate this post as follows:

* Identities of the target group – such as race, religion, gender, sexual orientation, etc.…
* Whether the comment is Hate-Speech – 0 for not 2 for yes and 1 for unclear.

When finished annotating, the rater was asked to fill in the flowing information about himself:

* Yearly income, Gender, Political ideology, Race, Religion, Education, and Sexuality.

The Dataset we used after filtering the unnecessary variables hold

1. "sentiment", "respect", "insult", "humiliate", "dehumanize", "violence", "genocide", "attack\_defend". variables scaled from 0 to 5 for the comment.
2. "target\_race", "target\_religion", "target\_gender", "target\_sexuality", categorial variable that specify the identity of the target in the comment.
3. "annotator\_gender", "annotator\_educ", "annotator\_income", "annotator\_ideology", "annotator\_age", "annotator\_race", "annotator\_religion", "annotator\_sexuality" categorial variable - specify the identity of the annotator of the comment.
4. Hate speeches, hate\_speech\_score, std\_err

Section 3 - Methods and results:

To understand the influence that backgrounds have on annotating data we try exam the different people annotated data and find the common denominator between them. To do so we fitted two types of logistic regressions models,

* General population model – predict hate speech.
* Sectorial models - predict hate speech for a given sectorial background.

Graphical user interface

Description automatically generated with medium confidenceGraphical user interface

Description automatically generated with medium confidenceIn research to find the best features to train the models, we found that the best features are target\_race, target\_religion, target\_gender, target\_sexuality, and annotator\_age. Lets the models

Graphical user interface

Description automatically generated with medium confidence

Key results –

1. it is easy to see, that by addressing the data through the different categories of the annotator’s background the models achieve a better prediction.
2. Significant coef - …

Section 4 - Limitations and Future Work:

Appendix