Predicting Effective Arguments in an Essay

CSCI 5930: Machine Learning – Project Proposal

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Project Description

Argumentative Writing is a critical skill for a student to foster throughout their academic career. It is a method for students to organize and present analytical conclusions to persuade the audience. This type of skill teaches students to evaluate conflicting claims and assess testimonies. At the same time, it develops students to critically think and logically express their opinions in a scholarly fashion. Such skills should be reinforced with feedback so that students can consistently improve their argumentative writing skills. However, there is a lack of manpower for teachers to constantly read an essay and give feedback. Additionally, the resources available pertaining to Black and Hispanic students disproportionately impact their writing skills to be below the normal range compared to their peers. Although there are many automated writing feedback tools available, many of them have limitations within argumentative writing. These tools fail to assess the caliber of a student's argumentative format such as the elements of an argumentative writing. The tools that are available also are inaccessible to underserved schools due to the cost. The objective of this project will be to evaluate and assess student's writing into three categories: effective, adequate, or ineffective. Our model will be trained on data that represents argumentative writings from 6th to 12th grade in the United States. With automated feedback, students will be able to get instant reports of their writing which will allow students to get more practice and elevate their writing.

Motivation

There are numerous AI tools for writing feedback, but most focus on the grammar and syntactic structure of the writing. Although there are sufficient feedback writing tools out there, there are still limits to how effective the tool is. A significantly impactful feedback tool should be able to evaluate the quality of the writing such as how the student organizes the paragraph bodies, how effectively they present the evidence, and the way the student develops their idea into words. This type of AI tool will be beneficial to students as they will get insight on how effective their argumentative elements are. Moreover, this would be an alternative way for teachers to grade writing tasks and speed up the process. Students generally do not get enough practice and feel confident in their writing abilities because the time it takes to receive feedback on their paper takes too long. This tool will be able to help students practice their writing on their own.

Related Works

This was a competition hosted on kaggle. There were a lot of submissions to the competition. The related works include finding the discourse text from a given essay. These works include the segmentation tasks such that based on the discourse type, we are required to find a sentence that matches/gives us the sentence(s) of the effective arguments. Here, we are trying to predict whether the given discourse text is adequate, effective or ineffective. Not all the solutions/source codes are public on kaggle.

Goals, Methods, Platforms

The goal of this project is to classify argumentative elements in student writing as "effective," "adequate," or "ineffective." We would want to create a model trained on data that is representative of the 6th-12th grade population in the United States in order to minimize bias. The model built hopefully helps pave the way for students to receive enhanced feedback on their argumentative writing. With automated guidance, students can complete more assignments and ultimately become more confident, proficient writers.

We plan on using the Python programming language with a version greater than 3.8. We are thinking of using the Machine Learning algorithms like RandomForest, NaiveBayes, etc depending on the data statistics and

the model performance with respect to the data. We are considering it as a classification problem right now. Since this is related to the text processing tasks, we might also try to use some RNNs if needed. First, all the essays are cleaned, then try converting the words in the essay into tokens, or maybe try creating a sequential network with the words. The approach to the problem might vary depending on the trails that are done on the data.

Project Timeline

Milestone	Expected Timeline
Data analysis	09/20/2023
Data cleaning and pre processing	10/02/2023
Building ML model(s)	11/07/2023
Testing the model	11/21/2023
Scope of improvement(if any)	11/30/2023

Future Changes

We are still considering our problem as a partial classification and partial regression problem. We are planning to use the two models, one on top of the other. We first use the classification algorithm and on top of that we use a regression algorithm that can produce multiple predictions of a target. After our model has been created, we will evaluate the model based on the given test samples. If the model's performance is not as good as we think, we plan to improve the model's performance by fine tuning it. If this is still not helpful in the performance, we plan on using a different model as a backup such as DeBERTa which is helpful in predicting the effective arguments in an essay

References

- https://www.kaggle.com/competitions/feedback-prize-effectiveness/overview