

Project for CS421 – University of Illinois at Chicago

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-----Setup-----

We are not including the Stanford NLP folders as it takes a huge amount of time to upload over blackboard. Please add the CoreNLP file of Stanford in resources folder, i.e. 'stanford-corenlpfull-2018-01-31' in the path "executable/resources/".

In the execution folder, give the following command on your command prompt:

The training and testing data files have been separated into 2 for the ease of use while using data from 2 different paths as well as for the ease of adding new essays to test on the fly in the testing folder.

For training data:

```
python essay_grader_training.py
```

For testing data:

```
python essay_grader_testing.py
```

External installations:

Please make sure to install the 'neuralcoref' module from your command prompt. We were not able to determine with certainty that the bash scripts would install the module seamlessly on every machine.

Following are the steps required to install the module:

- git clone <https://github.com/huggingface/neuralcoref.git>
- cd neuralcoref
- pip install .

In the execution folder, give the following command on your command prompt terminal:

sh run.sh

In case the bash file doesn't work, please install required libraries using the following commands:

```
pip install nltk
pip install numpy
pip install -U spacy
python -m spacy download en
pip install enchant
```

-----Techniques Used-----

Spelling mistakes and Sentence count:

- a) The number of sentences counted using sentence tokenizer. Some discrepancies identified in punctuation locations and sentence count adjusted accordingly.
- b) Spelling mistakes identified and a count of spelling errors maintained. Pyenchant python package used to check tokenized words against dictionaries for spelling mistakes.

POS tagging to evaluate the essays for common mistake patterns.

Mistakes of this and these:

This is the most common type of mistake that is found in general and thus we make use of POS tagging to check whether there is NNS(plural noun) after 'this' since there should be a singular noun after this.

This is also used for tackling the problem in c.(i)

Example:

Incorrect: this people

Correct: these people

Subject verb agreement:

Here we check whether the sentence satisfies subject verb agreement. In order to do this we check for tokens in pairs in order to check which pairs of tokens are incorrect and this incorrect tokens are considered to be not satisfying subject verb agreement.

The subject and verb of a sentence must agree with one another in number whether they are singular or plural. If the subject of the sentence is singular, its verb must also be singular; and if the subject is plural, the verb must also be plural.

An example of subject verb mistake is given as below:

1. General Example for subject verb disagreement:

Incorrect: An important part of my life have been the people who stood by me.

Correct: An important part of my life has been the people who stood by me.

2. Pair mistakes that we detected by experimenting and doing some research:

Some patterns of error we found:

'NNP VBP', 'MD VBN', 'DT DT', 'DT VBP', 'DT VB', 'DT PRP', 'MD VBD', 'JJS PRP'

All the above pairs of tags were found out to be incorrect when found together in a sentence thus we go through each of the sentences in a essay in order to find out whether the above pairs occur together. If they occur together then we found out in general that it causes a subject verb disagreement.

3. Examples of a few incorrect pos tag pairs and their corresponding sentences detected:

- NNP VBP:
Ex: India have come first in olympics.
- DT DT:
Ex: We have done this a many times

Verb Mistakes:

For this case we check whether the sentence contains the main verb or not using spacy, if there is a missing verb in the appropriate context then with the help of spacy we are able to find it out.

This is primarily used for c.(ii)

Tense mistake: Also we find the tense mistakes in the essay by making use of pairs of tags technique. In this technique we detect the pairs of tags that occur together and cause mistakes in the tense of the sentence.

Syntactic well-formedness:

For c(iii), some common pairings in the parse trees were used. Firstly, the sentences were parsed using CoreNLP parser and then particular tags like 'SBAR' and 'FRAG' were perused along with their children and parents to find mistakes in sentence formation.

E.g. A POS tagged sentence having SBAR tag with a VP as a parent and IN as a child is grammatically correct, whereas one without VP or IN is incorrect.

Text Coherence:

This part focused primarily on the correct use of pronouns in the sentences in the form of gender, number (singular or plurality) and time. A small part of the algorithm from the instructor's recommendation was used with an external module called 'neuralcoreref' was used. All the pronouns were checked with antecedents from the previous sentences. If a word like 'him' or 'they' did not resolve to some person or a group respectively were resolved from the context. The module takes the previous sentence with the context (usually a previous sentence). This covered the d(i) score in the formula.

Topic Coherence:

For score values in d(ii), we searched all the possible synonyms or expressions of the essay topic and stored them in a dictionary. After this, all the common noun tags in the essay were scanned talking about those topics. Wordnet from nltk library was used to find the important words in the topic which are used later to find similar words in essay and used for matching.

Scoring:

We have assigned the scores for each of the modules individually based on a given distribution found and then using this we have assigned a low or a high score and the final score is calculated and stored in a text file.