# CA – Assignment 3: Argument Quality Assessment


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## Structure

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└── argument-quality-assessment-assignment
    ├── Documentation.pdf
    ├── README
    ├── requirements.txt
    └── code
        ├── conf_bias_evaluation.py
        ├── model.py
    ├── data
        ├── essay_corpus.json
        ├── predictions.json
        ├── sample_prediction.json
        ├── train-test-split.csv
```

### Scripts

- `essay_corpus.json`: Data corpus created in Data Acquisition assignment.
- `model.py`: The ML model that we use for generating predictions.
- `conf_bias_evaluation.py`: Script to evaluate the `F1` score of the `ML` model.

### How to run the scripts

- On a venv install the requirements specified in `requirements.txt`
- Make sure you have the same directory structure as above otherwise adjust the paths in the `model.py` script accordingly.
- Run `model.py` to generate the predictions in `data/` directory with name `predictions.json`
- Run `conf_bias_evaluation` script with the filepath to the `data\`.

## Model Selection

We selected SVM as the model for mainly these 3 reasons:

- In the paper `Recognizing the Absence of Opposing Arguments in Persuasive Essays` by `Stab and Gurevych` they used SVM for doing the identical task and the scores were pretty high.

- We read the paper titled: `Text categorization with Support Vector Machines: Learning with many relevant features`[1]. In the paper the author explores why SVM are suited for text-classification tasks.
- Even then we tried multiple other models: Logistic Regression, Naive Bayes, Random Forrest and the performance of SVM was the best.
- We used Linear SVM because text classification is mostly a linearly seperable problem[1] and using kernels(rbf, poly) to map the data to a higher dimensional space did not really improve the performance in this case.
- We used GridSearch for hyperparameter tuning.

[1] : https://link.springer.com/chapter/10.1007/BFb0026683

## Feature Selection

For features we used the following:

- `n-grams` + `TF-IDF` : In the range of 1-3 so that unique keywords and phrases are identified and given more importance. We used `TfidfVectorizer` of scikit-learn library to create n-grams.
- `Adversative transitional` phrases (adv): to identify conflict, contradiction, concession,and dismissal in the text which indicate presence of opposing argument. We first used all 47 adversative transitional phrases that are grouped in the following categories:
  - concession (18)
  - conflict (12)
  - dismissal (9)
  - emphasis (5)
  - replacement (3)

  For each of these categories, we added features for the upper and the lower case as well as for their presence in the surrounding paragraph (introduction+conclusion or in the body)but the results were even worse than just the approach with only `n-grams + TF-IDF`. So we did a deeper analysis of training data by finding the occurances of phrases in both the `true` and `false` classes (using `adv_trans_text_analysis` function in the code). As a result, we detected that the concession and conflict phrases are the best indicator for the `opposing arguments` in our training data. Consequently, we just used 15 phrases of these categories to get an F1 score of `.754`.
- We used 10-fold cross-validation on the training data for regularization.