

Fake News Detection with Deep Learning

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Abstract

As media becomes the main source of important news, the authenticity of those news becomes one of the most important things. The ultimate goal of the fake news challenge is meant to identify fake news through computers automatically. In this project, we check whether the headlines and the bodies are related. The baseline method is gradient boosting classifier. We will use convolutional neural network to identify whether the relationship between the headlines and bodies are agree, disagree, discuss or unrelated.

1 Progress

1.1 Achieved so far

So far, we have already run the baseline method provided on <http://www.fakenewschallenge.org/>. And we have looked at the code and the dataset provided by the website. There are some useful functions that we can use for this project such as reading dataset and creating train and test sets. We are discussing what kind of convolutional neural network to implement. So far, we find that there is a deep learning model named Siamese model, which contains two convolutional neural networks, that could be useful for this project.

1.2 Encountered issues

We have not learned too much about how to get the word embeddings and the details of the convolutional neural networks such as the dimensions of each layers.

2 Plans

2.1 Remaining steps

The remaining steps will be divided into the following steps:

1. Determine the details of the convolutional neural network including the dimensions of each layers, the number of layers. And also the word embeddings we will use.
2. Implement the neural network for the first running.
3. Tune parameters to achieve the best result.
4. Change different word embeddings to find the best one for this project.

2.2 Plans for addressing issues

We will address issues mentioned above through checking others' papers. And since the competition of this fake news challenge ended in 2017, we decided to check the top-3 teams' method and make some changes to their models.

3 Data

The data provided is (headline, body, stance) instances, where stance is one of unrelated, discuss, agree, disagree. The training dataset contains 49972 instances and 1683 bodies and the test dataset contains 25413 instances and 904 bodies. The bodies contain the body text of articles with corresponding IDs. The IDs is used to make pairs between headlines and bodies. The instances contain the labeled stances for pairs of article headlines and article bodies.

4 Results

4.1 Summary of preliminary results

Scores on validation set (Left: actual label, top: predicted label):

Scores on test set:

	agree	disagree	discuss	unrelated
agree	115	8	557	82
disagree	16	3	128	15
discuss	60	3	1530	207
unrelated	5	1	96	6796

Score: 3540.0 out of 4448.5
79.57738563560751%

	agree	disagree	discuss	unrelated
agree	167	11	1439	286
disagree	36	7	416	238
discuss	228	14	3546	676
unrelated	9	5	364	17971

Score: 8748.75 out of 11651.25
75.0885098165433%

4.2 Remaining results in the plan

Remaining results will also display as the above table. And the results will be the performances of the deep learning model we will use for this project.

5 Introduction

5.1 Motivation

As the media becomes easier to spread the news around the world, only one piece of news can have a sensational response. However, there are many people making up stories with an intention to deceive for a secondary gain. And this is one of the most serious challenges facing the news industry today. Deep learning has the power to detect whether a story is real or not.

So far, it is difficult for AI to detect fake news using any existing technologies since the dataset is not available and sometimes some fake news are even plausible from human perspectives. Due to the difficulties of directly detecting whether a story is real, we decide to work on stage I of the fake news challenge, which is to classify whether the content of the news is related to the headline.

5.2 Goals

In this paper, we will use deep learning to train a model that can estimate whether the stance of a body text from a news article relative to a headline. We will try to construct a model similar to XLnet, which is one of the most popular neural networks in the NLP field. And for dataset, we will use FNC-1 to train and test our model. And the labels for this task are unrelated, discuss, agree and disagree.

1. **Agrees:** The body text agrees with the headline.

2. **Disagrees:** The body text disagrees with the headline.

3. **Discusses:** The body text discuss the same topic as the headline, but does not take a position

4. **Unrelated:** The body text discusses a different topic than the headline

5.3 Findings (will write in the final write-up)

6 Approach

The baseline mode is indicated in the <http://www.fakenewschallenge.org/>, which use hand-coded features and a GradientBoosting classifier. We will use deep learning model (the details will be decided in the future) to finish this task.

7 Experiments

7.1 Data

The data provided is (headline, body, stance) instances, where stance is one of unrelated, discuss, agree, disagree. The training dataset contains 49972 instances and 1683 bodies and the test dataset contains 25413 instances and 904 bodies. The bodies contain the body text of articles with corresponding IDs. The IDs is used to make pairs between headlines and bodies. The instances contain the labeled stances for pairs of article headlines and article bodies.

7.2 Evaluation

We plan to use the weighted accuracy indicated in the paper(Bhatt et al., 2017).

$$Score_1 = Accuracy_{Related, Unrelated}$$

$$Score_2 = Accuracy_{Agree, Disagree, Discuss}$$

$$Score_{FNC} = 0.25 * Score_1 + 0.75 * Score_2$$

8 Future work

The next we will decide the details of the convolutional neural network including the number of layers and the dimensions of each layers. And we will search for some papers and methods that other teams have done before and try to get some inspirations.

References

Gaurav Bhatt, Aman Sharma, Shivam Sharma, Ankush Nagpal, Balasubramanian Raman, and Ankush Mittal. 2017. On the benefit of combining neural, statistical and external features for fake news identification. *arXiv preprint arXiv:1712.03935*.