

Fine-Grained Fake News Detection

Harsh Goyal
harsh20562@iiitd.ac.in

Ayush Sharma
ayush20042@iiitd.ac.in

Anupam Narayan
anupam20030@iiitd.ac.in

Shivam Jindal
shivam20125@iiitd.ac.in

Anas Ahmad
anas20023@iiitd.ac.in

March 13, 2023

1 Motivation

False or misleading information presented as news is known as fake news. Most of the time, fake news aims to hurt someone or something's reputation or make money from advertising. Of late, fake news has been in the spotlight of mainstream journalism and the general public because it can affect a country's political scenario. In this project, we attempt to detect the authenticity of specifically political news. Social media is the primary channel for disseminating such content, though it occasionally makes its way into mainstream media. Because fake news can significantly impact an election's political outcome, it is becoming increasingly important to identify and classify it as such. The loose definition of "fake news" presents the primary obstacle to resolving the problem. For instance, fake news can be broken down into sub-categories: a statement known to be completely false, a speech that presents statistics as facts that have not been thoroughly investigated, or satirical writing. Our main aim of the project is to detect and classify fake news.

2 Problem Statement

Fake news is false or misleading information presented as news. Multiple strategies for fighting fake news are currently being actively researched for various types of fake news. Our task is to determine whether a news statement/speech is fake or not given an input statement using Natural Language Processing and associated language models. We aim to design some novel and hybrid

models using pre-trained large language models to integrate the original news statement/speech with the metadata. Fake News is a text-classification task. Since the news statements are very short in length and the text from the speech is noisy and contains grammatical errors, the task becomes more challenging and exciting.

3 Literature review

3.1 Liar, Liar Pants on Fire

The author proposed a hybrid Convolution Neural Networks Framework for integrating text and metadata. Hybrid CNN consists of two parallel Convolution Layers in which the input to the first Convolution Layer is the word embeddings for the given statement, followed by the MaxPooling, while the input to the second convolution layer is the metadata like speaker name, subjects of the speech/statement, speaker's party, etc., followed by a Bidirectional-LSTM layer. The output of both layers is then concatenated and fed into a fully-connected layer with softmax on the output layer.

3.2 A Retrospective Analysis of the Fake News Challenge Stance Detection Task

The author uses a fake news challenge dataset which is a 4-class classification task. The author used two stacked LSTMs with 50-dimensional GloVe word embeddings as input and a three-layered neural network with 600 neurons each. The output from a three-layered neural network is

fed into the output layer consisting of 4 neurons to estimate the class-wise probabilities to estimate to which class it belongs.

3.3 Exploring Text-transformers in AAI 2021 Shared Task: COVID-19 Fake News Detection in English

The author proposed two solutions to the problem. The first solution consists of the use of RNNs (also called Bidirectional-LSTMs) as the LSTMs are based on previous text information while the RNNs are based on both previous and later text information, which helps in getting a better context of the sentence. The second solution consists of using 3 different techniques - namely, a Five-Fold Single-model ensemble, a Five-Fold Five-model ensemble, and a Pseudo Label algorithm. In the Five-Fold Single-model ensemble, the author used the same transformer-based pre-trained models (like BERT, Roberta, etc.) on all the five-folds of the dataset. The author used different pre-trained models for fine-tuning each fold in the Five-Fold Five-model ensemble. In the Pseudo Label algorithm, the author proposed that if the test data sample is classified to some class with a probability greater than 0.95, then the author proposed to use that test data sample as the training data sample for future test samples.

3.4 On the Benefit of Combining Neural, Statistical and External Features for Fake News Identification

The author proposed how using three different word embeddings in parallel and then concatenating them can benefit fake news detection. The author combined neural embeddings, statistical features, and external features to similar types of models (with a little difference in activation functions) in parallel and concatenated them to get the combined features. The author defined neural embeddings as the skip-thought vectors which encode the given sentences to vector embedding of length 4800. The statistical features are defined as the vectors obtained from the text using Bag-of-words (BOW), TF-IDF, and n-grams techniques. The external features include heuristics such as the similarity between headline-body pairs, the num-

ber of similar words in the headline and the body, etc. All these three types of features are then combined using pre-trained models and then fed into dense layers to predict the correct label for the given input sentence.

4 Models and Evaluations

We plan to use Machine Learning algorithms like Logistic Regression, Support Vector Machines, Random Forests, etc., and Deep Learning based pre-trained models like BERT and other such state-of-the-art language models and fine-tune them for our purpose and aim to create a novel architecture from them to get desirable results. We will use the standard metrics such as F1-score for evaluation and also explore benchmarks made explicitly for this task which have been proposed by papers that we came during the literature survey.

5 References

- [1] William Yang Wang. 2017. “Liar, Liar Pants on Fire”: A New Benchmark Dataset for Fake News Detection. In Proceedings of the 55th Annual Meeting of the Association for Computational Linguistics (Volume 2: Short Papers), pages 422–426, Vancouver, Canada. Association for Computational Linguistics.
- [2] Andreas Hanselowski, Avinesh PVS, Benjamin Schiller, Felix Cappelherr, Debanjan Chaudhuri, Christian M. Meyer, and Iryna Gurevych. 2018. A Retrospective Analysis of the Fake News Challenge Stance-Detection Task. In Proceedings of the 27th International Conference on Computational Linguistics, pages 1859–1874, Santa Fe, New Mexico, USA. Association for Computational Linguistics.
- [3] Li, X., Xia, Y., Long, X., Li, Z., Li, S. (2021). Exploring Text-transformers in AAI 2021 Shared Task: COVID-19 Fake News Detection in English. ArXiv. <https://doi.org/10.48550/arXiv.2101.02359>
- [4] Bhatt, G., Sharma, A., Sharma, S., Nagpal, A., Raman, B., Mittal, A. (2017). On the Benefit of Combining Neural, Statistical and Exter-

nal Features for Fake News Identification. ArXiv.
<https://doi.org/10.48550/arXiv.1712.03935>

6 Contributions

Motivation - Anas Ahmad, Shivam Jindal

Problem Statement - Anupam Narayan, Ayush Sharma

Literature Review - Harsh Goyal, Anas Ahmad

Models and Evaluations - Harsh Goyal, Ayush Sharma,
Shivam Jindal, Anupam Narayan