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Classification of Fake News and Real News Using CNN Algorithm

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Abstract:
With the increasing amount of news and information shared on social media platforms, the problem of fake news has become more prevalent. The ability to automatically distinguish between fake news and real news is important for preventing the spread of misinformation. In this study, we propose a Convolutional Neural Network (CNN) based approach for classifying news articles as either fake or real. The proposed CNN model utilizes a combination of convolutional and pooling layers to extract meaningful features from the input text data, followed by fully connected layers for classification. We experimentally evaluate the proposed approach on a dataset of news articles and compare its performance with other machine learning and deep learning based approaches. The results show that the proposed CNN-based approach outperforms other methods in terms of classification accuracy, precision, and recall. The proposed method can be used as a valuable tool to assist in detecting and preventing the spread of fake news.This study uses a deep learning method with several Algorithms such as CNN, Adam optimizer, combined with pre-trained word embedding, trained using four different datasets. Each data goes through a data augmentation process using the back- translation method to reduce data imbalances between classes. The results showed that the CNN architecture outperformed CNN on all tested datasets.
Keywords: Machine Learning, Deep Learning, Convolutional Neural Network, Neural Networks, Data Pre-Processing, Natural Language.

I. INTRODUCTION

Fake news is written in an intentional and unverifiable language to mislead readers. It has a long history since the 19th century. In 1835, New York Sun published a series of articles about "the discovery of life on the moon". Soon the fake stories were printed in newspapers in Europe. Similarly, fake news widely exists in our daily life and is becoming more widespread following the Internet's development. Exposed to the fast-food culture, people nowadays can easily believe something without even checking whether the information is correct or not, such as the "FBI agent suspected in Hillary email leaks found dead in apparent murder-suicide. These fake news frequently appear during the United States presidential election campaign in 2016. This phenomenon has aroused the attention of people, and it has a significant impact on the election. Fake news dissemination is very common in social networks Due to the extensive social connections among users, fake news on certain topics, e.g., politics, celebrities and product promotions, can propagate and (incorrect) observations rapidly in online social networks. According to the statistical results reported by the researchers in Stanford University, 72.3% of the fake news actually originates to a large number of nodes reporting the same from the official news media and online social networks .The potential reasons are provided as follows. Firstly, the emergence of social media greatly lower down the barriers to enter in the media industry. Various online blogs, "we media", and virtual communities are becoming more and more popular in recent years, in which everyone can post news articles online. Secondly, the large number of social media users provide a breeding ground for fake news. Fake news involving conspiracy and pitfalls can always attract our attention. People like to share this kind of information to their friends. Some news datasets available online involve a small number of the instances only, which are not sufficient to train a generalized model for application fake news is written by human. Most liars tend to use their language strategically to avoid being caught. Despite the attempt to control what they are saying, language "leakage" occurs with certain verbal aspects that are hard to monitor such as frequencies and patterns of pronoun, conjunction, and negative emotion word usage. Thirdly, the limited data representation of texts is a bottleneck of fake news identification. In

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the bag-of words approach, individual words or "n-grams" (multiword) frequencies are aggregated and analyzed to reveal cues of deception. Further tagging of words into respective lexical cues for example, parts of speech or "shallow syntax", affective dimensions , and location-based words can all provide frequency sets to reveal linguistic cues of deception .appropriate treatment. However, further research and validation is needed to ensure the reliability and generalisability of these models for clinical practice. The simplicity of this representation also leads to its biggest shortcoming. In addition to relying exclusively on language, the method relies on isolated n-grams, often divorced from useful context information. Word embedding techniques provide a useful way to represent the meaning of the word. In some circumstances, sentences of different lengths can be represented as a tensor with different dimensions. Traditional models cannot handle the sparse and high order features very well.

(a) Cartoon in fake news. (b) Altered low-resolution image.

(c) Irrelevant image in fake news. (d) Low-resolution image.

II. LITERATURE REVIEW

[1] Kaliyar et al. proposed a different approach to detecting fake news than . Kaliyar et al. chose a pre-trained word embedding called Glove, which was later combined with a Convolutional Neural Network (CNN), rather than TF–IDF and classical machine learning algorithms. They use Fake News Dataset , and as a result, their proposed method is outperformed Ahmad et al. study where the accuracy, precision, recall, and F1- score are 98.36%, 99.40%, 96.88%, and 98.12%, respectively.

[2] Bahad et al., even before the study of Ahmad et al. This research also uses GloVe pre-trained word embedding. It combines it with several deep learning architectures such as CNN, Recurrent Neural Network (RNN), Unidirectional Long Short-Term Memory (LSTM), and Bidirectional LSTM. The study also tested it using the Fake or Real News Dataset and obtained 91.48% accuracy using Unidirectional LSTM

[3] Deepak & Chitturi conducted a similar study using the same dataset, namely Fake or Real News Dataset . Deepak & Chitturi examine secondary features such as news domains, news writers, and headlines to measure fake news detection performance. Then, they utilize word embeddings such as a Bag of Words (BoW), Word2Vec, and GloVe combined with a Feed-forward Neural Network (FNN) and LSTM. As a result, Deepak & Chitturi reported that the use of secondary features positively affects an increase in performance

[4] Shabani et al proposed the idea of using a hybrid machine- crowd technique to tackle the problem of fake news detection. Their approach is better than machine learning algorithms as it provides better accuracy with low cost and latency as compared to machine learning algorithms. The approach also works in places where the machine learning algorithm fails. The paper mainly focuses on distinguishing Fabricated and Satire content by applying the approach mentioned above.

[5] Shu et al initiated a framework named defend, Explainable Fake News Detection. It has four parts, first is the news piece encoder, second is the user comment encoder, third is a sentence-comment co-attention component and fourth is fake news predictor. In the report the author studies the expandability of fake news detection

[6] Saikh et alused Textual Entailment (TE) and ML. The project was broken into two parts, first it uses the features of TE with various ML classifiers and the second part is to integrate features of ML with Deep Learning (DL) network and use it as a load for feed-forward neural networks. The author used supervised learning classifiers like SVC and Multi-Layer Perceptron (MLP) for the experiment. The TE features used in the model are Modal verbs, Longest Common Overlap, Cosine Similarity, Numerals, Hypernyms etc

[7] Ahmad et al. also conducted similar research to They compared individual learning algorithms and ensemble learning algorithms performance. Ahmad et al. tested the performance of the LogisticRegression (LR), LSVM, Multilayer Perceptron (MLP), and KNN algorithms individually. They then compared them with ensemble learning such as Random Forest (RF), Voting Classifier, Bagging Classifier, and Boosting Classifier Khaled Alqallaf, Ibrahim Abualhaol, and Mohammed AlAyyoub proposed "A Hybrid Approach for Identifying Fake News Using Deep Learning and Shallow Semantic Features" in the year of (2019)

[8] Zhang et al. proposed a framework to address the rights management of contents in MSN, security, and ease of use. While online and multimedia social networksprovide advantages in communication and technology, these innovations severely impact the social aspect.

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III. METHODOLOGY:

Methodology includes image data cleaning, pre-processing, augmentation, and word embedding. The next sections provide a full discussion of the proposed method employed in this study for Classification of fake news and real news to validate the proposed model.

i. Data Cleaning

Data cleansing or data cleaning is the process of correcting or removing low-quality data from the database.Data cleansing in this study was carried out by deleting data with no content or label because it could interfere with the analysis and decision-making process.

ii. Data Augmentation

Data augmentation is a process that is usually performed to balance a dataset by creating synthetic data using the information in that dataset . Data augmentation is often used in activities involving the learning process to reduce imbalance classes. This study applies back-translation as a data augmentation method where English data is translated into German and then translated back into English. The newly generated data is different from the original data but still has the same meaning. This study chooses Back-translation English ↔ German because the study showed a substantial improvement

iii. Data Pre-processing

The augmented data will go through pre-processing, where the text data is converted into a more understandable form to simplify the feature extraction process . According to Etaiwi &Nay mat pre- processing consists of three stages: punctuation removal, stop word removal, and stemming or lemmatization. Additional steps, such as case folding and number removal, are sometimes carried out depending on the problem .The pre-processing carried out in this study consisted of several stages, namely the tokenization process to facilitate processing ,then case folding is applied to each word token by converting it to a lower case . Then, characters non- alphabet will be removed from the token because they do not significantly impact the analysis process . Words that are included in the stop word are also drawn to reduce computational load. Finally, lemmatization is carried out to convert each token into its common root word.

iv. Word Embedding

Word embedding or distributed word representation is a technique that maps words into number vectors, where words that have similar meanings will be close to each other when visualized That can be done because word embedding can capture a word's semantic and syntactic information in a vast corpus Word embedding is increasingly used in sentiment analysis research, entity recognition, part of speech tagging, and other text analysis- based research because it shows promising results . Some examples of pre-trained word embedding are often used, namely Word2Vec, GloVe, and fastText.

Training Phase: This research consists of two main phases. The first phase is the training phase, begins by retrieving training data stored in the database. The training data then goes through a data cleansing process to clean up poor-quality data. The data augmentation process is then applied to the cleaned data to balance the data between the classes. The augmented data is then pre- processed and transformed into word vectors using pre-trained word embedding.

Testing Phase: The second phase is the testing process to evaluate the trained model, it is carried out by first taking the test data from the database. The test data goes straight to the same pre-processing stage as the training phase without going through the data cleansing and augmentation stages. The previously trained model is then taken from the database and used to predict the pre-processed test data. Finally, the prediction results will be displayed and used to evaluate

IV Results

The Result in this study were carried out using four different datasets, which were also used in previous studies, namely ISOT Fake News Dataset, Fake News Dataset, Fake or Real News Dataset, and Fake News Detection Dataset.

V. DICUSSION / LIMITATIONS

The characteristics of each dataset descindicate that the four datasets have different amounts of
data. Unfortunately, each dataset has not gone through the stages of data cleansing, data augmentation, and data pre-processing because there are still empty data rows, data imbalances, remaining stop words, and affixed words. Therefore, the process of data cleaning, data augmentation, and data pre-processing is necessary so that the data is ready for further analysis. Datasets that has been cleaned,

augmented and pre-processed are also publicly accessible.The second dataset used in the final test was the Fake News Dataset where the results and the comparison .The training process using Fake News Dataset takes 190 s to 387 s, where CNN is the fastest.

VI CONCLUSION

This study applies a data augmentation process to each dataset using the back-translation method to reduce the class imbalance. Tests are conducted to determine the impact of data augmentation on the performance of the resulting model. The test results show that data augmentation has a positive effect, especially in improving model performance consistency. Several deep learning methods such as CNN, We evaluate the combination of deep learning methods with popular word embedding in depth using several datasets. The datasets have gone through a cleansing, augmentation, and pre-processing process and is publicly accessible. In the future, we would like to implement our method to detect fake news in Indonesia because there is still much room for improvement in the current Indonesian fake news detection system. Further data collection and adjustments to Indonesian text processing methods are needed to address these challenges

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