

NLP와 Siamese Neural Networks를 이용한 뉴스 사실 확인 인공지능 연구

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Fake News Checking Tool Based on Siamese Neural Networks and NLP

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Abstract

Over the past few years, fake news has become one of the most significant problems. Since it is impossible to prevent people from spreading misinformation, people should analyze the news themselves. However, this process takes some time and effort, so the routine part of this analysis should be automated. There are many different approaches to this problem, but they only analyze the text and messages, ignoring the images. The fake news problem should be solved using a complex analysis tool to reach better performance. In this paper, we propose the approach of training an Artificial Intelligence using an unsupervised learning algorithm, combined with online data parsing tools, providing independence from subjective data set. Therefore it will be more difficult to spread fake news since people could quickly check if the news or article is trustworthy.

1. Introduction

Recently fake news has become a significant problem. According to Wikipedia, fake news is usually spread on the internet or other media to influence political views, damage persons or entities' reputations, and make money through advertising revenue[1]. The approximate data for articles published per day is more than 6,089,875[2]. When numbers are this large, we need some algorithm to scan and compare them to make sure they are not fake. Thus, the main goal of this algorithm is to improve the existing approach to analyzing fake news by including an image analyzing algorithm with an automatic news parsing tool. The main difference of the approach we propose is that it analyzes news not only by keywords from a text but with images and overall context comparison.

The rest of this paper is organized as follows: Section 2 is a brief introduction to the

OCR, CLIP, Siamese Neural Networks, and BERT. In section 3, we explain our approach in detail. Section 4 is the expected outcome and conclusion.

2. Related Works

2.1 OCR (Optical Character Recognition)

OCR is a complex methodology for extracting valuable data from the image. In the case of extracting data from the news, we will be dealing with structured data, which is less challenging than unstructured data. To accomplish this task, we will be using CRNN(Convolutional Recurrent Neural Network), proposed by Shi et al.[3], a combination of CNN, RNN, and CTC. The workflow of this method is represented in figure 1.

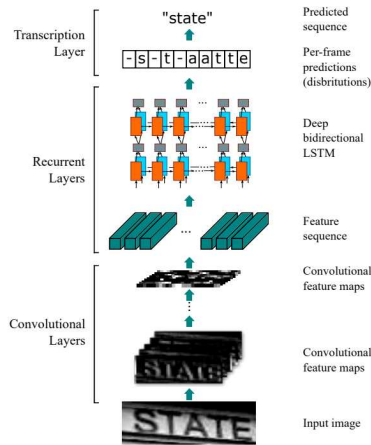


figure 1. The structure of OCR[3]

2.2 CLIP (Contrastive Language-Image Pre-training)

Standard image models train an image feature extractor and a linear classifier to predict some labels. Radford et al.[4] proposed the CLIP, which trains an image encoder and text encoder to predict the correct pairings of image and text. The visual representation of this approach is shown in figure 2. The performance of this approach can be competitive with task-specific supervised models.

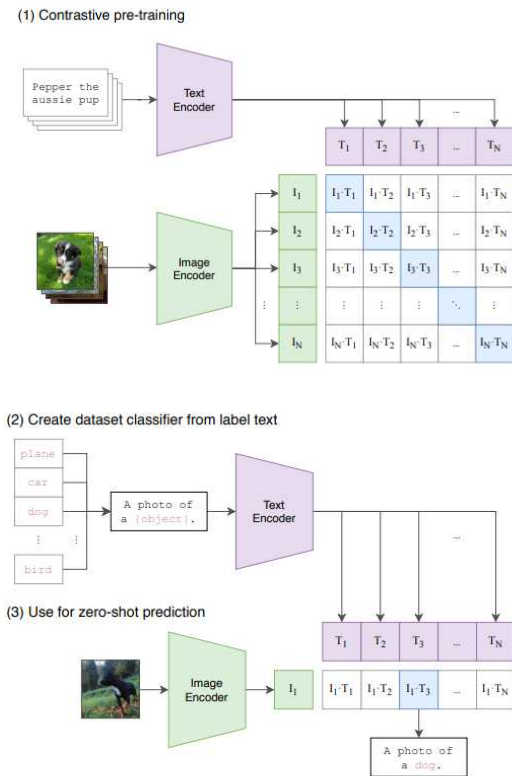


figure 2. CLIP approach summary[4]

2.3 Siamese Neural Networks for One-shot Image Recognition

The siamese neural network, proposed by Koch et al.[5], consists of symmetric networks that accept individual inputs joined by an energy function, ensuring it will compute the same metrics. As figure 3 shows, each network computes the same function because the weights between the twin networks are tied. Hence, if two similar images were given as an input to the network, they would not be mapped to different locations. This approach allows us to compare images to each other in a pairwise manner, and the highest score goes to the images with the highest probability of being the same.

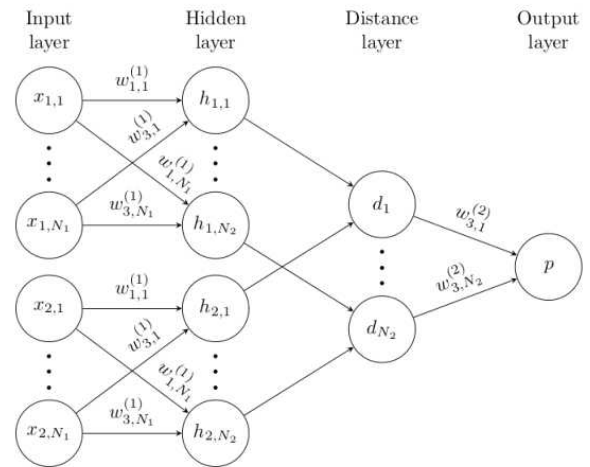


figure 3. Example of 2 hidden layers siamese network for binary classification[5]

2.4 NLP (Natural Language Processing)

NLP is the ability of Artificial Intelligence to understand and analyze text. Modern AI NLP can succeed in many complicated tasks, including sentiment analysis and text similarity analysis. To compare two chunks of text, we usually use cosine similarity.

$$similarity(A, B) = \frac{A \cdot B}{\|A\| \times \|B\|}$$

This method uses the cosine of the angle between two words or texts, and if they are pointing in the same direction, the angle between them will be equal to 0, which means that these two objects' cosine similarity will be equal to 1.

The range of cosine similarity is from -1 to 1, and the closer objects' cosine similarity is to 1, the more similar these objects are.

BERT (Bidirectional Encoder Representations from Transformers) is one of the modern approaches to text analysis proposed by Devlin et al.[6]. It is designed to pre-train deep bidirectional representations from an unlabeled text by jointly conditioning both left and right contexts in all layers. BERT perfectly suits various tasks where understanding text is necessary.

3. Methodology

The approach we propose in this paper consists of two steps. First, our AI should parse the data from the news and analyze it separately. The second step is to search for similar articles or news and compare them. A detailed explanation can be found in figures 4 and 5.

3.1 OCR for Data Parsing and Analyzing News Separately

Unlike machines, humans can quickly locate a title, date, image, and text on any news article. Since all web pages have a different layout and HTML structure, we have to provide our algorithm with the ability to extract the data we need. We can train an AI model to locate all this data from that web page's screenshot and then extract the text with an image, as described in the related works above. The overall workflow of the algorithm is shown in figure 4.

The goal is to get the title, text, image, backlinks, date, and some EXIF data from the image. Then we will have a pool of keywords for this specific news.

Moreover, we should search the internet for any similar articles. After we extract the needed data, it will be analyzed using the CLIP and NLP for text analysis approach, concluding if the picture is related to this article and the overall context. As a result, we will get the conclusion about the article itself, which is one part of the algorithm.

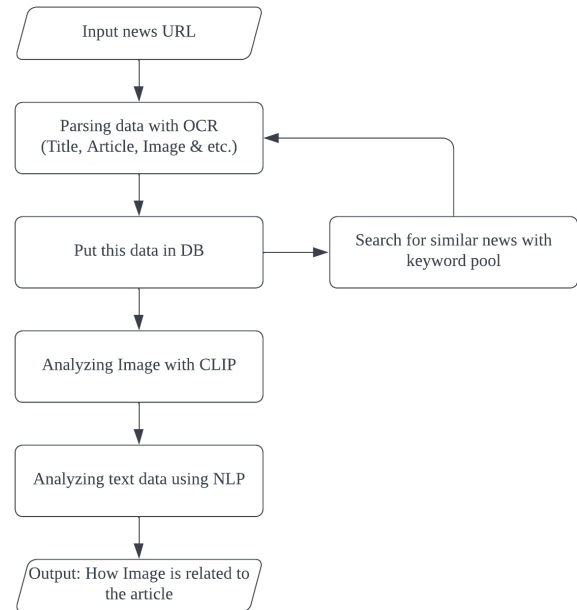


figure 4. Workflow of news parsing and analyzing

3.2 Comparing Extracted Data with AI Algorithms

After extracting the data and browsing the internet for similar articles, we can get the dataset we have to compare to each other, as represented in figure 5. Comparing titles and articles with NLP similarity checking algorithm is essential because articles may rephrase a text or title, but the message still would be the same. The main goal is to figure out the idea of this sentence. Comparing Images with Siamese Neural Network is essential because we want to make sure if these images are showing the same thing. If the articles are similar, we can assume they are not fake and trust this source.

3.3 Expectations

If the news was fake in the first place and it spread all over the internet, we can not solve this problem using this approach. However, because the method presented in this paper is not using the existing dataset and parses information every time to train Artificial Intelligence, it may become a powerful tool for complexly analyzing the news.

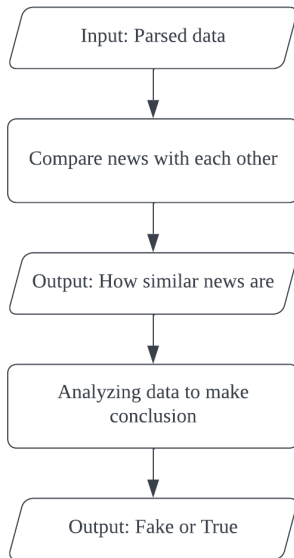


figure 5. Workflow of overall news comparing

4. Conclusion

We proposed to combine text analysis tools with image analysis tools for a more detailed scan of facts in news or articles. This model allows us to move forward from the supervised learning approach, which uses a subjective dataset. In addition, we can check the truthfulness of images included in news or article. Even though this approach provides several advantages, it still has to be tested with different algorithms and technics for future improvement.

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