CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Fake news is fictitious information in the form of articles, stories or hoaxes that are deliberately false and are created to deliberately misinform or deceive (Monther and Ali 2018). Fake news has taken many different forms across history, ranging from word of mouth, printed form, to the internet we have today. Before the internet, most people got their information from a few trusted sources, such as newspapers or television networks, so it was in the best interest of these sources to avoid distributing fake news to maintain credibility. Ever since the internet, we have been bombarded with so much information form so many sources, the internet has made it so much easier to spread fake news. Studies show that 75% of people who see fake news think its real news (Craig and Singer-Vine 2016).

Having misinformation online can have a huge impact on our society and our democracy (Colomina 2021). Smith, J. (2022) in his research paper highlighted a few studies that have found a link between misinformation and political division. Moreover, the author goes further to give examples from history, of how misinformation has been used as a form of social control, rumors have also been used in the past to taint the reputation of political figures (Smith, J. 2022). A popular concern about misinformation is that it ca lead voters to support policies that may oppose their own interests. This goes to show that misinformation has the potential to manipulate democratic processes. Misinformation in the way health topics are communicated affects public understanding of health topics. For example, Smith, J. (2022) highlighted in his research paper that misinformation about covid-19 has been linked to chloroquine overdoses, hoarding, panic buying, negative health behaviors like vaccine hesitancy and other negative outcomes. “Acting as a critical consumer of information is the first defense against problematic news sources and misleading content.” Christina. n.d. (2023) said in her article on how to fight fake news. Fact-checking organizations like the NewsGuard, Hoaxy, etc. have been built for verifying the accuracy of news articles. As the problem of fake news continues to grow, effective detection methods are needed, so more and more tools are being developed to identify it prevent it from spreading.

For fake news detection, Deep learning models generally perform better than machine learning models due to the increasing data samples (Althaibiti et al. 2021). Deep learning models have shown great potential for fake news detection. Note that no single method is perfect, and there is still room for improvement. There are specific challenges involved with using deep learning models for this task: Deep learning models require large datasets containing fake and legitimate news to train. Since fake news is often difficult to identify and collect, this can be a challenge. Due to the evolving nature of fake news, it can be difficult for deep learning models to keep up with the latest trends in fake news, so they need to be regularly retrained with new data in order to keep up.

A pretrained deep learning model is a model that has prior knowledge of a specific task. It has been trained on a large dataset of data, typically in a supervised learning setting. They can be used to save time and effort when developing new machine learning applications. Instead of having to train a model from scratch, we can simply fine-tune a pretrained deep model that already has a wholistic view of the task it was intended to perform. This can be very useful when the training dataset available is not large.

The table below summarizes the advantages and drawbacks of using pretrained deep learning models for fake news detection:

|  |  |
| --- | --- |
| **Pros** | **Cons** |
| Faster to train on top of or finetune. | If the dataset is large, it may be less accurate than a deep learning model trained from scratch. |
| More accurate than deep learning models trained from scratch. | Less accurate for a task outside of the domain of the data it was trained on. |

***Table 1.1****: Pros and Cons of using pretrained deep learning models.*

There are feature extraction techniques used in fake news detection which include using lexical features which are based on the words and phrases used, syntactic features which are based on the structure and semantic features which are based on the meaning of the text. For this research, we will use the transformers library to achieve this. The transformers library uses lexical features as its feature extraction technique. After the features have been extracted, it uses a vector representation to capture each word. This vector representation captures the meaning of each word. The importance of feature extraction and representation techniques, model architecture selection, and optimization strategies to achieve high accuracy in detecting fake news cannot be overstated Wu, J., & Liu, P. (2021).

The research goal of this study is to develop an interactive web application for fake news detection by finetuning pretrained machine learning models. Misinformation techniques are constantly evolving, so in order to keep up, we need to be able to quickly adapt our fake news detection tools. To this effect, this research will be biased on computation speed. Taking time into consideration, we will use data that is most recent to provide the public with a tool that is relevant for detecting fake news as of the period of this research

1.2 PROBLEM STATEMENT

Fake news is false or misleading information presented as news. It can negatively impact society, politics, businesses, and people’s behavior (PwC. 2022). In an article, Han et al. (2022) pointed out that there are different existing methods for fake news detection, but there is no perfect method. Han’sarticle reported that deep learning methods have shown promise in this area but can be difficult to train and deploy for public use, there are several challenges that need to be addressed before they can be widely used (Han et al. 2022). Since it takes a long time to train these models, it is difficult for this method to keep up with the evolution of techniques used by creators of fake news. This study proposes using pretrained models as a means of speeding up the training process, as well as other methods to increase computational speed. This research study also proposes using python frameworks like streamlit and gradio since they can be used to deploy machine learning models quickly and easily. This approach of model deployment could be beneficial for future scalability to handle more users and requests. With more research, there is a good chance that deep learning will play a major role in combating the spread of fake news.

1.3 CONTENT OF THE FOLLOWING CHAPTERS

Below is the structure of the content in the remaining chapters.

Chapter two - Literature review: a deep dive into previous research on fake news detection using deep learning models. We will discuss different methods proposed, the datasets selected, the chosen metrics for evaluation of results and the limitations observed. The existing gaps in previous research and how the proposed research intends to address these gaps.

Chapter three - Project specifications: tools and methodologies to be used for this research. As well as justification for the tools and methods. The dataset selected for this research, the optimization strategy, the feature extraction and representation techniques that will be used, and the model architecture. We will also discuss the metrics that will be used to evaluate performance, and the computational resources required for the research. Finally, we will discuss the means of deployment, scalability, and limitations of this method.

Chapter four – Implementation and Results: a detailed description of how the research is to be conducted. The hardware and software used, the steps involved in implementation, and the challenges encountered. We will document the speed of the process, as well as the evaluation loss.

Chapter five – Evaluation: Critical analyses of research outcomes, comparison of achievement with existing solutions, comparison of achievement with project objectives, and evaluation of functional requirements.

Chapter six - Conclusion: Limitations, factors that could affect performance, potential benefits of the research, and recommendations for future research.

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