



# Project Proposal

Project Title: Detecting Fake News Using a Machine Learning Model  
Based on Lexical Characteristics of Text

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## Project Description:

The overall aim of the project is to create an artificial intelligence that is able to detect fake news articles based on the lexical content of the article. This will be done using the assistance of Linguistic Inquiry and Word Count (LIWC), a program that includes dictionaries containing different categories of words that can indicate characteristics of the text. The end result will be a machine learning model that is able to classify a news article into two categories: real or fake.

## Background:

The research question for this project is how fake news can be classified by purely using the lexical quality of an article.

The hypothesis is that using Linguistic Inquiry and Word Count (LIWC), the vocabulary of various true and fake articles can be analyzed in various ways in order to train a machine learning model to accurately distinguish between the two.

### **Why Misinformation is an Issue**

For the past few years, the internet has become the world's news source. However, due to the internet's accessibility, it has become easier for people to proliferate false information in the form of news articles, more commonly known as "fake news". False information campaigns have targeted corporations, communities, and even governments. The spread of misinformation can have far reaching effects, like economic harm, destruction of a company's reputation, and public health concerns (Doshi et al., 2020).

### **Reasons for Misinformation and Types of Misinformation**

There are two main goals for the creation of fake news: monetization from ad revenue and propaganda to trick a certain audience. Propaganda in particular can be detrimental to society. Results can include refusal to receive the COVID-19 vaccine, which can have a detrimental effect on public health as a whole (Phelan, 2021). Misinformation also potentially has an effect on the political landscape, especially if people are basing their political beliefs on erroneous information.

There are also multiple types of fake news: satire, hoaxes, and propaganda. Though satire mimics the style of real news, it is not intended to be taken seriously and often has clear humorous intent. Hoaxes convince readers of a false narrative that is intended to instill fear. Propaganda warps the truths and falsehoods of a situation in order to convince the readers into a certain political or social agenda (Rashkin et al., 2017).

Sharing of misinformation on social media sites like Facebook and Twitter drastically increased during the lead up to the 2016 U.S. presidential election (Allcott et al. 2019) and the COVID-19 pandemic (Phelan 2021).

Additionally, as more time passes, computer generated fake news could become a threat, since it will cost less to generate and utilize in comparison to hiring human authors. There is evidence to suggest that computer written propaganda could be more convincing than human written propaganda. As language generation models improve, so too will the spread of misinformation (Zellers et al., 2020).

### **Current Potential Solutions**

There have been many different approaches to combat misinformation. Some include:

- Developing a computer model that has the ability to create fake news articles and can use that information to detect fake news articles (Zellers et al., 2020).
- Detecting specific vocabulary that tends to be used in certain types of fake news (Rashkin et al., 2017).
- Teaching the general public about techniques used in fake news so that they can combat fake news before they are directly exposed to it (Grant & Hsu, 2022).
- Warnings on social media platforms on controversial topics, especially during election season (Grant & Hsu, 2022).

A few of these solutions rely on warning the general public or the actions of the general public, something that can be difficult to achieve due to the differing political views and backgrounds of the population. This project will use a more automated approach and will not require efforts to change the mindsets of the general public. It will instead be mostly reliant on the creation of an AI that is able to predict if a news article is contributing to the spread of misinformation purely based on the content of the article itself.

### **Experimental Design/Research Plan Goals:**

According to (Amoruso et al., 2020), there are three major aspects of detecting misinformation:

- Recognizing misinformation
- Identifying sources of misinformation
- Limiting the spread of misinformation

This project will mainly focus on the first point: recognizing misinformation. If time provides for it, the second point could be observed as well.

In order to develop this project, a machine learning model using NLP will need to be developed. This model will be programmed in Python. There are two parts to this: the algorithm to be used for the model and the datasets needed to train and test this model. The dataset utilized should contain the full body text of a news article and be labeled as either true or false. If the datasets obtained are found to be insufficient, it will be required to use programs to create datasets, possibly by crawling news articles on the internet.

Then, a method must be found to process the data for each article so that a computer can be trained on its lexical qualities. LIWC was utilized to do this, since it contains various built-in dictionaries that are able to give indications about the writer's emotions, thinking style, and social concerns. When an article is run through LIWC, it finds what percent of the words in the article are from each of these dictionaries.

Once the machine learning model is created and trained, there must be a way to measure its result. This input for this model will be the textual content of a news article processed through LIWC. The output will be a prediction as to whether that article is true or false.

There are also many studied techniques pertaining to the detection of misinformation. If more than one technique is seen to be effective, those techniques can potentially be combined.

## Risk/Safety Concerns:

Producers of fake news may be able to exploit weaknesses in the model if they continuously test articles against it until one is detected incorrectly. A potential solution to this is retraining the model to account for these weaknesses, made easier if the inputted testing data is known (Zellers et al., 2019).

There is also the chance that this type of model could be less effective as news topics change over time (Castelo et al., 2019). A possible way to remedy this is to use a dataset that contains articles from a large timeframe.

## Data Analysis:

To determine how accurate the model will be, articles known to be truthful and articles known to be fake will be inputted into the model. If the model's prediction of the article's truthfulness corresponds to its actual truthfulness, this judgment will be considered correct. This process will occur multiple times until there is enough data to show the percentage accuracy of the model.

## Timeline:

Aug.		Sept.				Oct.				Nov.				Dec.				Jan.				Feb.	
3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2
Phase 1: Background research																							
										Phase 2: Development of knowledge and resources to use													
														Phase 3: Training and finalization of methodology									
																Phase 4: Analysis of data obtained							
																		Phase 5: STEM Fair Preparation					

### Phase 1: Background

- Brainstorm and narrow down research idea
- Background research and reading
- Finish project proposal

### Phase 2: Development

- Start to learn about machine learning and NLP
- Find / develop datasets for training data and testing
- Develop Python code for model
- Find what algorithms may be most effective for my model

### Phase 3: Training

- May need stronger computers to train
- Start obtaining results
- Find what can be improved based on those results
- Prepare December Fair poster
- Write Grant Proposal

### Phase 4: Analysis

- Analyze data and create visuals
- See if technique can be potentially improved
- Begin creating February STEM Fair poster
- Begin writing STEM Thesis

### Phase 5: STEM Fair

- Finalize data analysis and develop conclusions
- Finalize February STEM Fair poster
- Prepare for STEM fair
- Finish STEM Thesis

## References

- Amoruso, M., Anello, D., Auletta, V., Cerulli, R., Ferraioli, D., & Raiconi, A. (2020). Contrasting the Spread of Misinformation in Online Social Networks. *Journal of Artificial Intelligence Research*, 69, 847–879. <https://doi.org/10.1613/jair.1.11509>
- Castelo, S., Almeida, T., Elghafari, A., Santos, A., Pham, K., Nakamura, E., & Freire, J. (2019). A Topic-Agnostic Approach for Identifying Fake News Pages. *Companion Proceedings of The 2019 World Wide Web Conference*, 975–980. <https://doi.org/10.1145/3308560.3316739>
- Doshi, A. R., Raghavan, S., & Schmidt, W. (2020). Real-Time Prediction of Online False Information Purveyors and their Characteristics. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3725919>
- Grant, N., & Hsu, T. (2022, August 24). Google Finds ‘Inoculating’ People Against Misinformation Helps Blunt Its Power. *The New York Times*. <https://www.nytimes.com/2022/08/24/technology/google-search-misinformation.html>
- Phelan, H. (2021, April). MISINFORMATION and CONSPIRACY THEORIES about the COVID-19 VACCINES have spread across SOCIAL MEDIA, infiltrating the sunny world of WELLNESS INFLUENCERS at a time when the STAKES COULDN'T BE HIGHER. *Harper's Bazaar*, 3691, 130+. Gale OneFile: Pop Culture Studies.
- Rashkin, H., Choi, E., Jang, J. Y., Volkova, S., & Choi, Y. (2017). Truth of Varying Shades: Analyzing Language in Fake News and Political Fact-Checking. *Proceedings of the 2017 Conference on Empirical Methods in Natural Language Processing*, 2931–2937. <https://doi.org/10.18653/v1/D17-1317>
- Zellers, R., Holtzman, A., Rashkin, H., Bisk, Y., Farhadi, A., Roesner, F., & Choi, Y. (2019, June 18). *Counteracting neural disinformation with Grover*. Medium. <https://blog.allenai.org/counteracting-neural-disinformation-with-grover-6cf6690d463b>
- Zellers, R., Holtzman, A., Rashkin, H., Bisk, Y., Farhadi, A., Roesner, F., & Choi, Y. (2020). *Defending Against Neural Fake News* (arXiv:1905.12616). arXiv.

<https://doi.org/10.48550/arXiv.1905.12616>