Fake News Detection using Machine Learning

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***Abstract*—**Social media for news consumption is a mixed blessing. On the one hand, its low cost, easy access, and rapid dissemination of information over the social media.On the other hand, it enables the wide spread of "fake news" , i.e., information written intentionally to mislead the reader. The extensive spread of fake news has the potential for extremely negative impacts on individuals and society.Generally fake news detection methods classified into two categories.

1) News content models.
2) Social context models.

Many people rely on social media sites and networks for daily news stories and often it is difficult to tell whether a news is credible or not.Fake news articles could be in the form of clickbait(These are stories that are deliberately fabricated to gain more website visitors and increase advertising revenue for websites.),propaganda(Stories that are created to deliberately mislead audiences, promote a biased point of view or particular political cause or agenda.),etc.

Machine learning, an application of Artificial Intelligence that provides systems the ability to automatically learn and improve from experience without being explicitly programmed can be used to tackle these problems head on.Ours is an effort to use this technology to help reduce the problem of fake news in social platform such as Facebook, twitter, etc.

In this approach, we propose a standalone Machine Learning Fake News Detection model which combines the news contents and social context features and classify the news content.

1. INTRODUCTION

The traditional algorithms rely on human developers to provide explicit instructions, machine learning allows data to guide the process. Using a training set comprised of representative data, the computer develops a model that can be compared against an expected output. The more data the computer takes into account, the more accurate and sophisticated its model becomes without developers having to write additional lines of code.The same advancements in storage and processing that have facilitated the rise of big data have also allowed machine learning to advance by leaps and bounds. The same advancements in storage and processing that have facilitated the rise of big data have also allowed machine learning to advance by leaps and bounds. Storage and processing frameworks like Hadoop and robust libraries for programming languages like R, Python, and Java have made it feasible for the first time to feed machine learning algorithms tremendous amounts of unstructured data. For data scientists, the ability to create algorithms that are guided by actual data is a huge advantage.For data scientists, the ability to create algorithms that are guided by actual data is a huge advantage.

These days fake news are growing problems with huge ramifications in our society.The term 'fake news' became common parlance for the issue, particularly to describe factually incorrect and misleading articles published mostly for the purpose of making money through page views. NLP is a field in machine learning with the ability of a computer to understand, analyze, manipulate, and potentially generate human language. In this project, we are demonstrating the application on NLP for detecting 'fake news' i.e. the misleading news stories that comes from non-reputable sources. However, in order to solve this problem, it is important to understand what fake news is. Later, it is needed to look into how the techniques in the fields of machine learning, natural language processing help us to detect fake news.

A. Objectives

a) To build a model that can differentiate between 'real' and 'fake' news. b) To design and implement a system that overcomes the drawbacks of the existing systems. c) To design a system that is Cost effective, reliable and consumes less power.

B. Scope

Machine Learning is currently one of the hottest topics in IT. Technologies such as digital, big data, Artificial Intelligence, automation and machine learning are increasingly shaping future of work and jobs. is a specific set of techniques that enable machines to learn from data, and make predictions. When the biases of our past and present fuel the predictions of the future, it's a tall order to expect AI to operate independently of human flaws. The goal of our project is to create a model which can be used in social platform to detect any fake news which user shared.

2. SYSTEM ARCHITECTURE

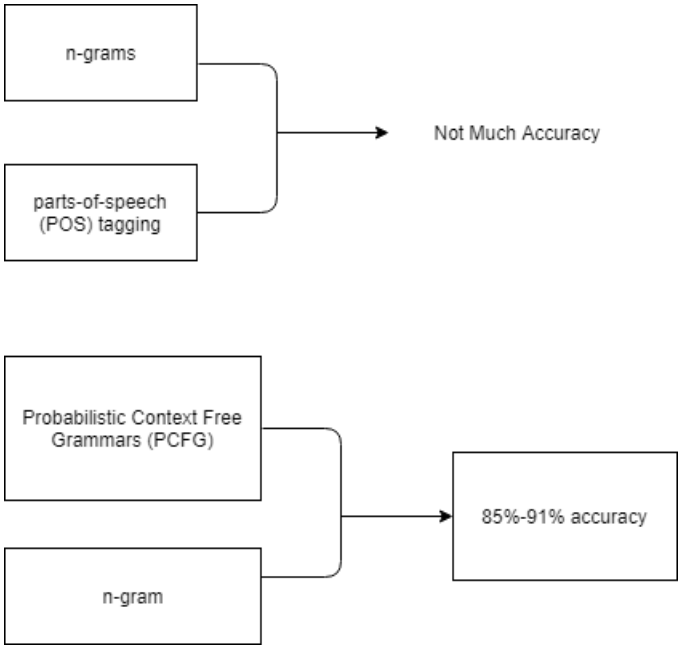
A. Existing System

There exists a large body of research on the topic of machine learning methods for deception detection, most of it has been focusing on classifying online reviews and publicly available social media posts.

Conroy, Rubin, and Chen [1] outlines several approaches that seem promising towards the aim of perfectly classify the misleading articles. They note that simple content-related n-grams and shallow parts-of-speech (POS) tagging have proven insufficient for the classification task, often failing to account for important context information. Deep Syntax analysis using Probabilistic Context Free Grammars (PCFG) have been shown to be particularly valuable in combination with n-gram methods. Feng, Banerjee, and Choi [2] are able to achieve 85%-91% accuracy in deception related classification tasks using online review corpora.

Feng and Hirst implemented a semantic analysis looking at 'object: descriptor' pairs for contradictions with the text on top of Feng's initial deep syntax model for additional improvement. Rubin, Lukoianova and Tatiana analyze rhetorical structure using a vector space model with similar success. Ciampaglia et al. employ language pattern similarity networks requiring a pre-existing knowledge base.

Existing system block diagram



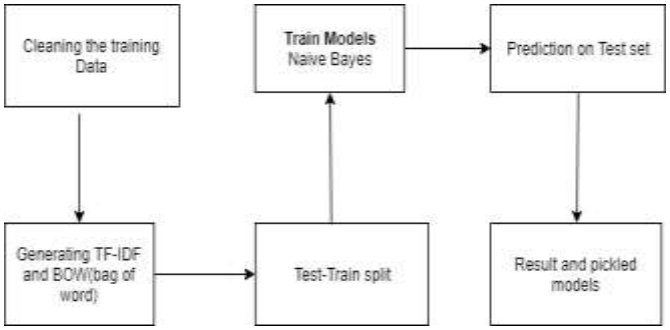
B. Proposed System

In this approach a model is built based on the count vectorizer or a tfidf matrix (i.e) word tallies relatives to how often they are used in other artices in your dataset) can help . Since this problem is a kind of text classification, Implementing a Naive Bayes classifier will be best as this is standard for text-based processing. The actual goal is in developing a model which was the text transformation (count vectorizer vs tfidf vectorizer) and choosing which type of text to use (headlines vs full text). Now the next step is to extract the most optimal features for countvectorizer or tfidf-vectorizer, this is done by using a n-number of the most used words, and/or phrases, lower casing or not, mainly removing the stop words which are common words such as “the”, “when”, and “there” and only using those words that appear at least a given number of times in a given text dataset.

C. Sequence of steps involved

- Exploratory Data Analysis.
- Generate TFIDF and BOW vectors.
- Feature engineering.
- Test-Train split.
- Training the models.
- Prediction on test data.
- Evaluating the model based on different evaluation metrics(f1 score,confusion matrix,etc)

D. System Block Diagram



Cleaning the training Data

Cleaning of the data will be done to remove all the noisy data from the dataset to bring the data in the form suitable to feed to machine learning algorithms. It involves, removing all the html tags, punctuations, applying stemmers, stop words and so on.

Generating Vectors for the text data

Machine learning models cannot be operated on text data. Hence, we need to convert our text data into numerical form before feeding it to machine learning models. Our text data will be converted into vectors using TFIDF and Bag Of Words (BOW) algorithms.

Test Train splits

After cleaning the data and getting the vectors for the same, we will split the data generally in a ratio of 80:20. So, the 80% of the data will be used for training the model and the remaining 20% will be used for validation of the model and eventually getting its accuracy.

Training the model

Now, we will be training our model with the training data which we have prepared. Since this problem is a text classification problem, we will be using the naive bayes algorithm as it works best for text classification problems.

Prediction on test set

After the model is trained, we will predict the target variable for the test set and compare it with the actual data to evaluate the model and find its accuracy.

Results and pickled model

Since everything is done properly, we will now save our model in a pickle file so that we can readily use it without building it again.

Naive Bayes Algorithm

Naive Bayes is a simple technique for constructing classifiers: models that assign class labels to problem instances, represented as vectors of feature values, where the class labels are drawn from some finite set[14].Abstractly Naive Bayes is a conditional probabilistic model: given a problem instance to be classified, represented by a vector x=(x1,x2,....xn) representing some *n* features (independent variables), it assigns to thisinstance probabilities.

$$p(C_k \mid x_1, \ldots, x_n)$$

In plain English, using Bayesian probability terminology, the above equation can be written as

$$\text{posterior} = \frac{\text{prior} \times \text{likelihood}}{\text{evidence}}$$

In practice, there is interest only in the numerator of that fraction, because the denominator does not depend on *C* and the values of the features xi are given, so that the denominator is effectively constant. The numerator is equivalent to the joint probability model.

$$p(C_k, x_1, \ldots, x_n)$$

which can be rewritten as follows, using the chain rule for repeated applications of the definition of conditional probability:

$$\begin{aligned} p(C_k, x_1, \ldots, x_n) &= p(x_1, \ldots, x_n, C_k) \\ &= p(x_1 \mid x_2, \ldots, x_n, C_k)\, p(x_2, \ldots, x_n, C_k) \\ &= p(x_1 \mid x_2, \ldots, x_n, C_k)\, p(x_2 \mid x_3, \ldots, x_n, C_k)\, p(x_3, \ldots, x_n, C_k) \\ &= \ldots \\ &= p(x_1 \mid x_2, \ldots, x_n, C_k)\, p(x_2 \mid x_3, \ldots, x_n, C_k) \ldots p(x_{n-1} \mid x_n, C_k)\, p(x_n \mid C_k)\, p(C_k) \end{aligned}$$

Now, assume that each feature xi is conditionally independent of every other feature xj.This leads to approximation that

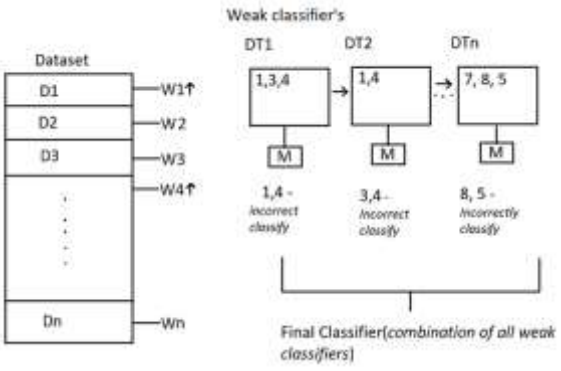
$$p(x_i \mid x_{i+1}, \ldots, x_n, C_k) \approx p(x_i \mid C_k)$$

Thus, the joint model can be expressed as

$$\begin{aligned} p(C_k \mid x_1, \ldots, x_n) &\propto p(C_k, x_1, \ldots, x_n) \\ &\approx p(C_k)\, p(x_1 \mid C_k)\, p(x_2 \mid C_k)\, p(x_3 \mid C_k) \cdots \\ &= p(C_k) \prod_{i=1}^{n} p(x_i \mid C_k), \end{aligned}$$

Xgboost algorithm

It is collection of decision trees. Initially the dataset assign same weights. Each decision tree contain model which will do predictions. It is possible that model do misclassifications(weak classifiers). Update(increase) weights. Then next DT will take max weights and do prediction. Again - misclassifications(weak classifiers). Update(increase) weights. And finally it take majority.



3. HARDWARE SPECIFICATION

Processor	Intel(R) Core(TM) i7-8550U CPU @ 1.80GHz, 1992 Mhz, 4 Core(s), 8 Logical Processor(s)
OS Name	Microsoft Windows 10 Home Single Language
RAM	8 GB DDR4
Internal Memory	2TB
Total virtual memory	9.75GB
Available Virtual Memory	5.71GB
Ram speed	2400MHz
Bluetooth	Version 4.2
Wireless LAN	802.11 a/b/g/n/ac
Clockspeed	1.6GHz

4. SOFTWARE SPECIFICATION

Jupyter notebook
Angular 6
Sublime Text IDE
Ionic
NodeJS

5. PROJECT INPUTS AND OUTPUTS

E. Dashboard

Our website has a dashboard where user can get live feeds via google news api.

F. Input details.

User can enter any article that he/she come across on the internet or social media on the below textbox and our algorithm will predict whether the given news article is Fake or Real. User will also be able to view the related articles which our algorithm found across the web.

G. Output Details

Following is the sample output which will be displayed when user enters an article.

6. Applications

- **Validity Importance**

In various news networks where validity of information is of at most importance.

- **Organisations :-**

In various multinational or national organisations, to prevent misunderstandings and yet decreasing the morale of workers/employees.

- **Social Networks : -**

In social networking sites, where a message being received can be identified as authentic or fake, thus stopping a rumour from going viral.

- **Mobile Application :-**

It could also be used as a mobile application to verify the news a person might have heard during a verbal conversation.

7. SUMMARY

With the increasing popularity of social media, more and more people consume news from social media instead of traditional news media. However, social media has also been used to spread fake news, which has strong negative impacts on individual users and broader society.

In thisarticle, we explored the fake news problem by reviewing existing literature in two phases: characterization and detection. In the characterization phase, we introduced the basic concepts and principles of fake news in both traditional media and social media. In the detection phase, we reviewed existing fake news detection approaches from a data mining perspective, including feature extraction and model construction. We also further discussed the datasets, evaluation metrics, and promising future directions in fake news detection research and expand the field to other applications

REFERENCES

1. Marco L. Della Vedova,Eugenio Tacchini,Stefano Moret,Gabriele Ballarin,Massimo DiPierro,Luca de Alfaro. Automatic Online Fake News Detection Combining Content and Social Signals.

2. Mykhailo Granik, Volodymyr Mesyura. Fake News Detection Using Naive Bayes Classifier(2017)

3. Kai Shu,Amy Sliva, Suhang Wang, Jiliang Tang, and Huan Liu **(ACM digital library)June (2017).** Fake News Detection on Social Media: A Data Mining Perspective

4. LUÍS BORGES, BRUNO MARTINS,PÁVEL CALADO. Combining Similarity Features and Deep Representation Learning for Stance Detection in the Context of Checking Fake News

5. Sebastian Tschiatschek,Adish Singla,Manuel Gomez Rodriguez,Arpit Merchant,Andreas Krause. Fake News Detection in Social Networks via Crowd Signals

6. Georg Rehm, Julian,Moreno-Schneider, Peter Bourgonje. Automatic and Manual Web Annotations in an Infrastructure to handle Fake News and other Online Media Phenomena

7. Georg Rehm, Julian Moreno-Schneider, Peter Bourgonje (22 May 2018). Fake News Detection with Deep Diffusive Network Model

8. Kai Shu, Deepak Mahudeswaran, and Huan Liu. Fake News Tracker: A Tool for Fake News Collection, Detection, and Visualization

9. Veronica Perez-Rosas, Bennett Kleinberg, Alexandra Lefevre,Rada Mihalcea. Automatic Detection of Fake News

10. Aswini Thota,Priyanka Tilak,Simrat Ahluwalia,Nibrat Lohia. Fake News Detection: A Deep Learning Approach

11. Shubham Gupta , Dishant Grover , Anushka Gupta , Deepanshu Kapoor , and Narina Thakur. A Survey on Identification of Fake News

12. Fernando Cardoso Durier da Silva ,Rafael Vieira da Costa Alves,Ana Cristina Bicharra Garcia. Can Machines Learn to Detect Fake News? A Survey Focused on Social Media

13. http://news.mit.edu/2018/mit-csail-machine-learning-system-detects-fake-news-from-source-1004

14. https://en.wikipedia.org/wiki/Naive_Bayes_classifier

15. https://en.wikipedia.org/wiki/Support-vector_machine

16. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc.

London, vol. A247, pp. 529–551, April 1955. *(references)*

17. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.

18. I. S. Jacobs and C. P. Bean, "Fine particles, thin films and exchange anisotropy," in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.

19. K. Elissa, "Title of paper if known," unpublished.

20. R. Nicole, "Title of paper with only first word capitalized," J. Name Stand. Abbrev., in press.

21. Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, "Electron spectroscopy studies on magneto-optical media and plastic substrate interface," IEEE Transl. J. Magn. Japan, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].

22. M. Young, The Technical Writer's Handbook. Mill Valley, CA: University Science, 1989.