

DeFactify

PROJECT PROPOSAL

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Ivet Kalcheva

Version 1.0

(Final)

Contents

Introduction.....	3
What?	3
Why?	3
Who?	3
When?	3
How?	4
Domain Understanding	4
Research Question	4
Exploratory Research.....	4
Research Methods	4
Analytic Approach	5
Target Variable	5
Type of Problem.....	5
Potential Machine Learning Models	5
Defining success	5
Data Requirements.....	6
Define Objectives.....	6
Data Characteristics	6
Data Sources	6
Data Legality and Ethics	6
Data Diversity	6
Version Control	6
Iterative Process	6
Conclusion	7

Introduction

What?

The goal of this project is to develop a machine-learning model that detects fake news by analysing the sources and recognising linguistic patterns in news articles based on the article's title and content. The artificial intelligence must accurately identify real articles and differentiate them from fake ones. This will help users identify unreliable sources of information while surfing online.

Why?

Fake news has become an increasing concern, especially in recent years due to the growing influence of artificial intelligence and social media. In the past, there were many regulations governing journalism. However, in today's digital age, the internet allows anyone to publish, share and consume information and news with little oversight or professional standards. This trend has led to much misinformation, social disruption and, at times, the use of fake news as a tool for spreading propaganda. This issue is particularly alarming for many older adults, who often blindly trust the information they read on social media. Thus, a tool that alerts users to the dangers of fake news is very crucial.

Who?

- ✦ **Stakeholder:** Yulian Kalchev – a father and victim of fake news on social media.
- ✦ **General Public** would benefit from this assistance, during their online presence.

When?

End Date	Week 5	Week 8	Week 9	Week 10	Week 11
Iteration 0					
Iteration 1					
Iteration 2					
Iteration 3					
Iteration 4					

- ✦ **Iteration 0:** Choose an appropriate idea, draft the first version of the project proposal, data collection of example news, environment setup and implementation.
- ✦ **Iteration 1:** Implement feedback from iteration 0 and improve the implementation.
- ✦ **Iteration 2:** Implement feedback from iteration 1 and improve the implementation.
- ✦ **Iteration 3:** Implement feedback from iteration 2 and complete optimisation.
- ✦ **Masterpiece:** Last iteration with final touch-ups, putting a focus on the demo (website).

How?

The final product will be a web application, where users can paste article's title and content to receive a classification ("True" or "Fake"). The model will be updated periodically to incorporate new trends in fake news, so it stays accurate.

Domain Understanding

Research Question

What linguistic and structural features distinguish fake news from real news?

Exploratory Research

To ensure high prediction accuracy, the research will focus on:

- ✦ Identifying fully truthful sources of news.
- ✦ Recognising linguistic differences between fake and real news.
- ✦ Analysing headline patterns and their influence on perceived authenticity (e.g., clickbait¹).
- ✦ Taking in consideration their category (e.g., Sports, Politics, Economy, etc.)
- ✦ Investigating metadata² (e.g., publication date, journalist(s) reputation).

Research Methods

- ✦ **Literature study:** Review prior studies on fake news detection.
- ✦ **Document Analysis:** Identify differences, analyse fake/real news articles and collect the data.
- ✦ **Model Evaluation:** Implement and evaluate models on accuracy and dataset.

Clickbait¹ - Clickbait stories use sensationalist headlines to grab attention and drive attention to the publisher's website usually at the expense of truth or accuracy.

Metadata² - Website metadata, such as page titles, descriptions, and keywords, helps search engines rank web pages. Search engines use this information to assess relevance to user search queries.

Analytic Approach

Target Variable

The project's target variable can be classified as binary: "Fake" (0) or "Truthful" (1). The model aims to predict this based on the articles' source, linguistic features, headline patterns, and metadata.

Type of Problem

Classification problem, using supervised learning.

Potential Machine Learning Models

- ✦ **K-Nearest Neighbours (KNN):** A simple and understandable model, suitable for initial testing with well-defined features.
- ✦ **Decision Trees:** Excellent for capturing non-linear relationships and understanding feature importance. to test structural or linguistic cues. Can be integrated author-based credibility as a feature – articles with named authors may be more reputable than anonymous ones.
- ✦ **Naïve Bayes:** It assumes feature independence, which, while a simplification, works surprisingly well with high-dimensional text data. Its strength lies in detecting patterns in word usage that are indicative of fake or truthful reporting, making it a solid candidate for natural language processing pipelines.
- ✦ **Support Vector Machines (SVM):** A powerful model for classification tasks, SVM is effective in high-dimensional spaces and works well with text data. It can separate data with a clear margin of separation, making it useful for distinguishing between fake and real news articles, based on linguistic and structural features.

Defining success

Success will be defined by:

- ✦ **Prediction Accuracy:** High classification accuracy on the test dataset.
- ✦ **Robustness:** Generalisation across diverse datasets.
- ✦ **Stakeholder Satisfaction:** Positive feedback on usability and effectiveness.

Data Requirements

Define Objectives

To classify news articles as fake or real and provide explanations for classifications.

Data Characteristics

- ✦ Text data from news articles (title, content/text).
- ✦ Metadata such as publication date, journalist(s), category and source credibility.
- ✦ Label, identifying if it either "Fake" (0) or "Real" (1).

Data Sources

Scraping news articles from 7 websites (3 real and 4 fake ones).

- ✦ **Real:** BBC, AP News and TechCrunch
- ✦ **Fake:** The Onion, The People's Voice, The Intel Drop and SpaceXMania

Unfortunately, some of the articles are behind a paywall, such as The New York Times, The Washington Post and Bloomberg. Consequently, I had to discard some of them, while others (Reuters) denied me access due to restrictions.

Data Legality and Ethics

- ✦ Ensure compliance with data privacy regulations (e.g., GDPR).
- ✦ Avoid misuse of data or spreading misinformation through the analysis.

Data Diversity

Include articles from various domains and sources, including diverse topics (e.g., politics, science, entertainment, environment) to improve generalisation.

Version Control

Using GitHub for code and dataset versioning: **["DeFactify"]**

Iterative Process

It is important to evaluate model performance, refine preprocessing steps, update the dataset and continuously incorporate feedback.

Conclusion

Overall, “*DeFactify*” targets the growing issue of misinformation by developing a machine learning algorithm for fake news detection. By analysing linguistic patterns and source credibility, the tool will help individuals identify unreliable information and promote critical thinking. The final product will be a user-friendly application, designed to fight against propaganda effectively.