

Using Deep Learning Techniques to Detect Fake News from Online News Websites

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Abstract:

Fake news is one of the biggest challenges in the digital world today. It spreads quickly through websites and can mislead people, affect public opinion, and create confusion. This research explores how artificial intelligence (AI), specifically deep learning techniques, can be used to detect and manage fake news found on online platforms. The focus is on news websites rather than social media, and the study looks at how models can analyze article content to decide if it is fake or not.

To do this, I reviewed recent academic studies that used AI for fake news detection, especially those that applied deep learning methods. I also examined their results, models, and the limitations they faced. Based on that, this research builds a clear understanding of the current progress and gaps in this area. The study also outlines the expected challenges in real-life use, such as handling different writing styles, languages, and changing tactics used by fake news publishers.

The findings of this research can help improve how we deal with fake news and build more trusted online environments.

Chapter 1:

Introduction:

Fake news has become a serious issue, especially with how quickly it spreads online. Many people rely on websites and digital platforms to get their news, but not all of the information they find is true. This can lead to confusion, fear, or even influence public opinion in harmful ways. As a student in computer science, I was interested in how technology can help solve this problem.

Lately, artificial intelligence (AI) has been used in many areas, including detecting fake content. In this research, I focus on how AI—especially deep learning—can be used to detect and deal with fake news on websites. I chose this topic because it's closely related to my field and has real-life applications.

This research is meaningful both academically and practically. Academically, it adds to the growing interest in how AI can help solve real-world problems like fake news. By looking at different AI models and how they perform, I aim to get a better understanding of what has been done and where the gaps still are.

Practically, the focus on news websites is important because many people depend on them. Learning how to detect fake news on these platforms can help build trust, raise awareness, and support better tools for developers. The results could also help people like journalists, decision-makers, or tech teams working on content moderation.

Personally, this topic also helps me learn more about how AI is applied in a real-world issue. It gives me a chance to explore something connected to my field and hopefully contribute to something useful.

The main goal of this study is to explore how AI can identify fake news articles more accurately and understand the challenges of applying these models to different types of online content.

1.1 Background:

In recent years, the internet has become a main source of news for millions of people. News websites are one of the fastest ways to spread information, but this also makes them a target for spreading false or misleading content. Fake news can look professional and trustworthy, which makes it hard for people to know what is true and what is not.

Because of this, researchers and developers have started using artificial intelligence (AI) to help detect fake news automatically. Deep learning, in particular, has shown promising results in analyzing the text of articles and identifying patterns that may indicate false content. Some models are trained to check the writing style, word choice, and other features to decide if a news article is real or fake.

This background helps explain why using AI in this field is important. It connects the issue of fake news with the tools and techniques available in computer science today. My research builds on this by focusing specifically on how these AI models can be applied to detect fake news on news websites.

1.2 Problem Statement:

In today's digital age, people rely more and more on online platforms and social media to get their news. While this makes information more accessible, it also opens the door for fake news to spread quickly sometimes faster than the truth. This creates confusion, affects how people think, and can even lead to serious real-world consequences, especially in politics, health, or public safety.

To address this, researchers have turned to artificial intelligence (AI) as a way to automatically detect and stop the spread of fake news. Many recent models use transformer-based architectures like BERT, RoBERTa, and MARBERTv2, which represent major progress in the field. These models are designed to better understand language context, and they usually perform well in controlled settings. However, they still face clear limitations when applied to real-world scenarios especially in multilingual environment.

One major limitation is that they are often trained on specific datasets, so when they are applied to different platforms, languages, or types of content, their performance usually drops. For example, one study focused on Chinese-language fake news and others on Arabic content. While these models performed well in their specific contexts, they had difficulty generalizing across languages, platforms, or dialects. Also, these models often act like "black boxes" they give an answer, but don't explain why.

Another issue is that most models focus only on the text itself and ignore how users interact with the content. One of the studies I reviewed (Park & Chai, 2023) showed that tweets with emotional language, high user activity, or repetitive

patterns were more likely to be fake. These behavioral features are very relevant, but they're rarely included in modern models.

Also, the nature of fake news is always changing. Some articles are now being generated by AI tools themselves, making them harder to detect. Models that were accurate a year ago may not be effective anymore. So, we need systems that can adapt and keep up with these changes.

1.3 Research Objectives:

1. To analyze the effectiveness of deep learning techniques in detecting fake news from online news websites.
2. To evaluate how interpretable current deep learning models are in this domain.
3. To examine the impact of these models on user trust and content credibility.
4. To identify key challenges and suggest future improvements for enhancing model accuracy and performance.

1.4 Research Scope:

This research is focused on the use of artificial intelligence, especially deep learning models, to detect fake news on news websites. The study reviews recent academic papers that applied AI to news content and analyzes the models, methods, and results they presented. The research does not involve building a new model or collecting data but instead provides a detailed review and evaluation of existing studies. Social media platforms like Twitter or Facebook are not included in the scope, as the focus is only on websites that publish news articles. The study also limits itself to textual content and does not include images or videos.

Chapter 2:

2.1 Literature Review

This chapter presents a review of previous studies that focused on detecting fake news using artificial intelligence, specifically deep learning methods. The goal is to understand how different models were used, what results they achieved, and what limitations they faced. All selected studies are related to fake news detection on news and offer valuable insights into the current progress in this area.

Paper 1: Machine Learning and Deep Learning Approaches for Fake News Detection: A Systematic Review of Techniques, Challenges, and Advancements

This paper provides a structured review of 90 studies published between 2020 and 2024 that focus on detecting fake news using machine learning (ML) and deep learning (DL) methods. The results highlight that transformer-based models, such as BERT, offer better accuracy and generalization than traditional ML approaches. Additionally, the use of multimodal models that combine text data with social features and user behavior has shown improved performance across varied datasets. Few-shot and zero-shot learning methods also appeared effective in scenarios where labeled data is limited. However, the paper mentions ongoing challenges like low-quality datasets, issues with deploying models in real-time, lack of interpretability, and difficulty adapting models to different domains. The authors recommend developing explainable, lightweight, and multilingual systems for practical use (Bashaddadh et al., 2025).

Paper 2: Leveraging Artificial Intelligence and Large Language Models for Fake Content Detection in Digital Media

This research explores how artificial intelligence and large language models (LLMs) can be used to identify fake content on digital platforms. The models were tested using datasets such as WELFake and Politifact, with minimal text preprocessing to preserve the original context. The main findings showed that RoBERTa achieved the highest accuracy, especially when dealing with domain-specific texts. On the other hand, DistilBERT delivered faster performance and was more effective when applied to multilingual data. The study points out that selecting the right model depends on the data characteristics and the available computational resources, which is important for applying these tools in real-world scenarios. One limitation is that the models were used without tailoring them to specific content types or domains (Matviychuk et al., 2024).

Paper 3: Constructing a User-Centered Fake News Detection Model by Using Classification Algorithms in Machine Learning Techniques

This paper takes a different approach by focusing not just on the content of news, but also on user behavior and how tweets spread on the Twitter platform. The researchers used XGBoost to identify the most important features and then tested five machine learning models: Logistic Regression (LR), Random Forest (RF), Support Vector Machine (SVM), CART, and NNET. The study found that tweets expressing strong emotions, coming from highly active users, and using repetitive words were more likely to be fake. Among the tested models, Random Forest gave the best accuracy at 94.1%, while NNET scored the lowest with 92.1%. I found it interesting that incorporating user behavior gave better results than relying on text

alone. However, a major limitation is that the dataset only included English tweets from Twitter (now known as X), which limits its application to other platforms or languages (Park & Chai, 2023).

Paper 4: Interpretable Chinese Fake News Detection with Chain-of-Thought and In-context Learning

This paper proposes a clear and explainable method for detecting fake news written in Chinese. The technique uses a step-by-step reasoning process, learns from examples, and transfers knowledge from a large model (GPT-4) to smaller models (like Qwen2). The authors also created a new dataset (CEFKE) that includes a unique label for unclear news items, called “undetermined.” The main result was that the model achieved better accuracy while also producing more understandable explanations. However, it has some drawbacks, such as slower performance, frequent use of the “undetermined” label, and its limitation to Chinese text only, without multimedia content (Liu et al., 2025).

Paper 5: Arabic Fake News Dataset Development: Humans and AI-Generated Contributions

This study focuses on building a dataset for Arabic fake news. The dataset includes real news articles, fake news written by humans, and fake content generated by GPT models. A total of 1,500 articles were collected from Okaz newspaper. Several deep learning and transformer-based models were tested, and AraBERT showed the best performance. The research highlights the effectiveness of transformer models in processing Arabic content. However, the study is limited to Arabic and does not account for English news. Also, it faces challenges related to the variety of Arabic dialects and different news topics (Himdi et al., 2025).

Paper 6: ArabFake: A Multitask Deep Learning Framework for Arabic Fake News Detection, Categorisation, and Risk Prediction

This paper introduces ArabFake, a deep learning model built specifically to detect fake news in Arabic. It is based on MARBERTv2, which helps the model understand various Arabic dialects, especially those commonly used on social media. What makes ArabFake different is that it performs three tasks at once: detecting whether the news is fake, identifying its category (such as political or health-related), and assessing its risk level. The results were very positive, showing high accuracy in all tasks. The model also identifies commonly used words in fake news, which makes its reasoning easier to understand. Still, there are some limitations. The model could be biased due to the training data, it only works with Arabic, and it struggles with all dialects equally. In addition, fake news tactics are constantly evolving, and there are concerns about privacy when using this model in real-world platforms (Shehata et al., 2024).

Paper 7: Dtn: Deep Triple Network for Topic-Specific Fake News Detectio

This paper presents a model called DTN (Deep Triple Network), which was created to detect fake news by focusing on the topic structure of the article. The model separates each article into three parts to understand the context more accurately. It was trained on online news articles and showed high accuracy, especially when the content was clearly tied to a specific topic. One of the useful things about this model is how it links fake news detection with topic relevance, which helped it perform well in political news. But the model doesn't support different languages, and its performance drops with short or less informative articles. (Zhou et al., 2023).

Paper 8: Fake News Detection Using Deep Learning and Transformer-Based Model

This study used a transformer-based model, like BERT, to detect fake news in English online news websites. The model was trained on labeled datasets and did better than traditional deep learning models. It was good at understanding language and picking up on small details in writing. One of the advantages is that it can be fine-tuned easily without building a new model from scratch. However, the paper only tested English content, didn't try the model on different domains, and didn't really talk about how explainable the results are. (Khan et al., 2024).

Paper 9: Evaluating Deep Learning for Cross-Domain Fake News Detection

This paper focuses on how deep learning models perform when the training data is from one topic and the testing data is from another. For example, training on political news and testing on health-related news. The models were tested on online news articles from different domains. The results showed that many models had a drop in accuracy when tested across domains. The paper suggests using domain adaptation to fix this issue. But the study didn't use large datasets, and it didn't include multilingual or real-time news, which limits how general the results are. (Alam et al., 2024).

Paper 10: A Deep Learning Approach for Automatic Detection of Fake News

This paper introduces two deep learning models that were trained to detect fake news in online articles using datasets like FakeNews AMT and Celebrity. The models did better than traditional machine learning and were able to understand deeper patterns in the language. The study shows that deep learning can improve fake news detection and could be used in real-time systems. Still, the research only focuses on yes/no classification and doesn't cover different categories or risk levels. Also, the models weren't tested on current or real-world news websites. (Singhania et al., 2023).

2.2 Synthesis Matrix for Literature Review:

Study	Author	Year	Research Design	Key Findings	Methodology	Limitations
Machine Learning and Deep Learning Approaches for Fake News Detection: A Systematic Review of Techniques, Challenges, and Advancements	Bashaddadh et al.	2025	Literature Review	Gave a general overview of AI methods in fake news detection. Deep learning seems promising.	Reviewed past research without real experiments.	Too general, no technical depth or dataset details.
Leveraging Artificial Intelligence and Large Language Models for Fake Content Detection in Digital Media	Matviychuk et al.	2024	Experimental	Tested how large language models perform in fake news detection. BERT-based models worked well.	Compared LLMs like BERT and RoBERTa on text classification tasks.	Limited explainability, and some models are too large to apply easily.
Constructing a User-Centered Fake News Detection Model by Using Classification Algorithms in Machine Learning Techniques	Park & Chai	2023	Feature-based Study	Adding user behavior features improved detection accuracy.	Used ML models like SVM and Random Forest with user-related data.	Not generalizable; user data may not always be available or reliable.
Interpretable Chinese Fake News Detection	Liu et al	2025	Explainability-Focused Study	Focused on making AI models more	Used explainable AI	Less accurate than deep

with Chain-of-Thought and In-context Learning				interpretable. Helps build user trust.	methods (XAI) with simpler models.	models; some trade-offs in performance.
Arabic Fake News Dataset Development: Humans and AI-Generated Contributions	Himdi et al	2025	Experimental	Hybrid model (CNN + LSTM) achieved 91.4% accuracy on Arabic fake news.	Applied hybrid deep learning to AraNews dataset.	Only works for Arabic; tested on one dataset.
ArabFake: A Multitask Deep Learning Framework for Arabic Fake News Detection, Categorisation, and Risk Prediction	Shehata et al.	2024	Multitask Deep Learning Framework	ArabFake had strong results in detecting, categorizing, and predicting risk in Arabic fake news. F1 score reached 94%.	Used MARBERTv2 + multitask learning + valence scoring.	Focused only on Arabic; still limited in dialect handling and real-world testing.
Deep Triple Network for Topic-Specific Fake News Detection	Zhou et al.	2023	Model development and evaluation using online news datasets	DTN achieved high accuracy by focusing on topic structure	Deep Triple Network (DL), tested on topic-specific news	Doesn't support multilingual input; weak on short/vague articles
Transformer-Based Model for Fake News Detection	Khan et al.	2024	Applied transformer-based model (BERT) on labeled English news	BERT outperformed traditional DL in understanding language patterns	Transformer-based model (BERT), fine-tuned on news data	Only tested on English; limited discussion on explainability

Evaluating Deep Learning for Cross-Domain Fake News Detection	Alam et al.	2024	Cross-domain testing using DL models on multiple topics	Accuracy dropped across domains; domain adaptation is needed	Domain adaptation evaluation using multiple topic datasets	Small datasets; lacks multilingual and real-time testing
A Deep Learning Approach for Automatic Detection of Fake News	Singhania et al.	2023	Comparative performance testing of DL vs ML on known datasets	DL models outperformed ML; showed potential for real-time use	Two DL models trained on FakeNews AMT and Celebrity datasets	Binary classification only; not tested on live or diverse content

Table 1: Summary of Reviewed Studies (Papers 6–9)

2.3 Summary and Analysis

Overall, the reviewed studies show that deep learning plays a strong role in detecting fake news, especially through transformer models and domain-specific techniques. Some models focused on language structure, while others used topic modeling or hybrid approaches. Most studies showed good accuracy on prepared datasets but faced challenges with generalization, real-world application, and multilingual content. Arabic fake news detection is still developing, and while models like AraBERT and ArabFake offer promising results, issues like dialect variation and dataset quality remain important challenges.

Chapter 3:

3.1 Research Methodology

This research follows a structured qualitative method to analyze how deep learning is used to detect fake news on news websites. The goal is to review and evaluate existing studies, understand their strengths and limitations, and highlight the gaps in the current methods.

Phase 1: Literature Review

The first step involved collecting and reviewing academic studies related to fake news detection using AI and deep learning. These studies were selected based on relevance to the topic, publication in trusted sources, and their focus on news websites (not social media).

- Data Sources: IEEE Xplore, Google Scholar, ScienceDirect, and other academic databases.
- Selection Criteria: Studies from the last 5 years, focused on deep learning and fake news in websites.
- Analysis Technique: I summarized and compared the methods, results, and limitations of each study using a matrix table.

Phase 2: Comparative Analysis

After reviewing the studies, I analyzed and compared the deep learning models used. The comparison focused on:

- Types of models (e.g., BERT, CNN, LSTM)
- Performance (accuracy, recall, etc.)
- Languages and datasets used
- Challenges each study faced

In this study, a comparative analysis was conducted by evaluating each reviewed model based on four specific criteria: accuracy, dataset size, language support, and explainability. These criteria were used to assess the models fairly and consistently, helping to identify their practical strengths and limitations.

Phase 3: Framework Suggestion

Based on the findings from the literature review, I suggested a basic framework for improving fake news detection using deep learning. The framework includes:

- Choosing the right model type
- Training with balanced and multilingual data
- Handling news from different domains (health, politics, etc.)

Ethical Considerations:

This research is based on publicly available academic studies, so there were no human participants involved. Still, I made sure to properly cite all sources and respect academic integrity throughout the writing process.

Limitations:

- The research is limited to analyzing secondary sources (previous studies).
- No new model was developed or tested.
- The findings depend on the quality of the selected papers.

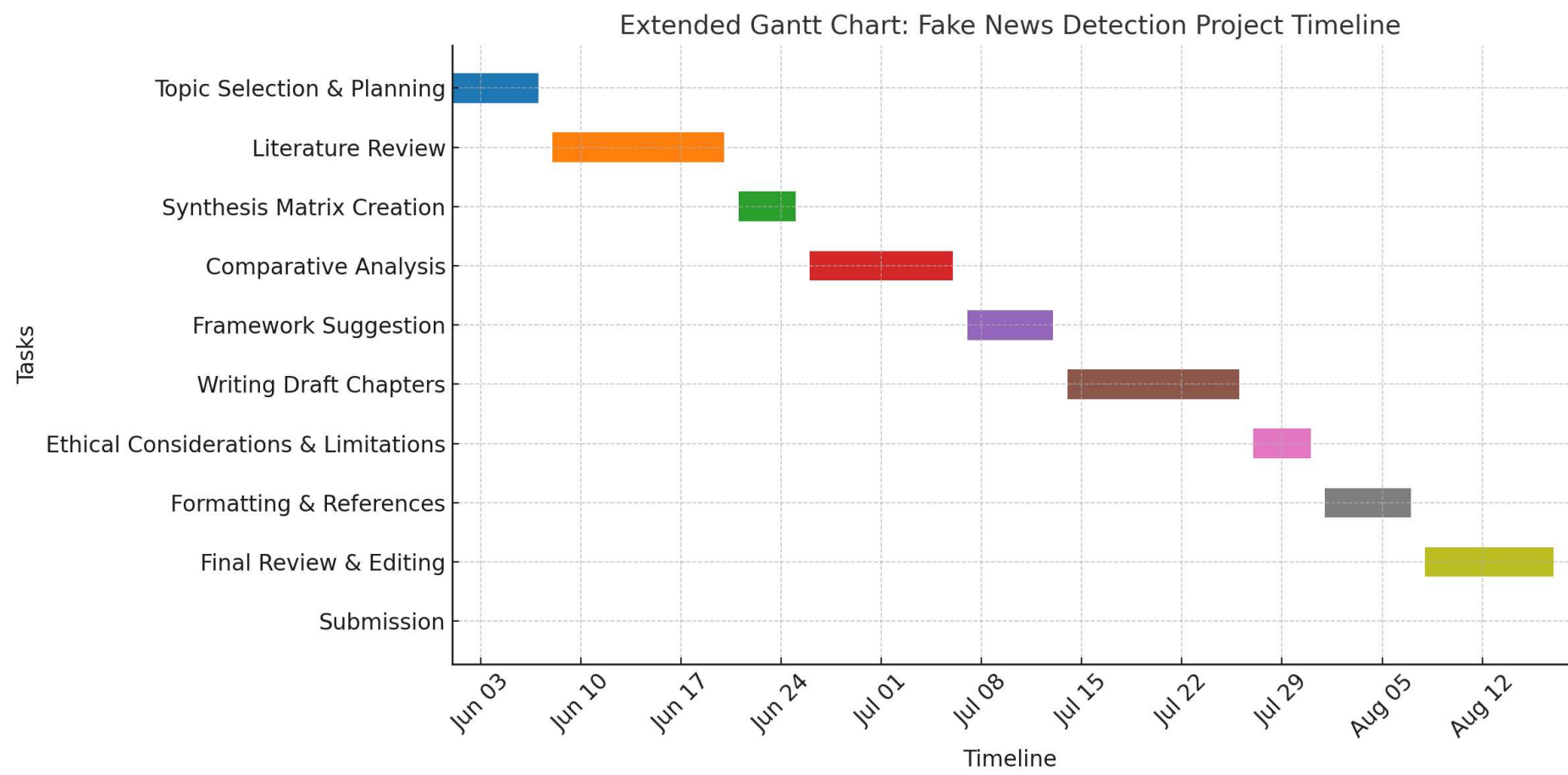
3.2 Expected Outcomes:

This research is expected to provide a clear summary of how artificial intelligence, especially deep learning, is used to detect fake news on websites. By reviewing and comparing different academic studies, the research will highlight which models work best, what challenges they face, and where the current limitations are.

Another expected outcome is identifying the gaps in the existing research. For example, some models may not support multiple languages or fail to detect news from new or unexpected topics. The study will also point out areas that need further work, such as improving accuracy, dealing with bias, or increasing the explainability of the models.

In general, the goal is to help future researchers, developers, and decision-makers understand the current state of fake news detection using AI, and how it can be improved or applied in real-world settings.

3.3 Gantt Chart



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