

**MINISTRY OF EDUCATION AND RESEARCH OF THE REPUBLIC OF MOLDOVA**

**Technical University of Moldova**

**Faculty of Computers, Informatics, and Microelectronics**

**Department of Software Engineering and Automation**

**Approved for defense**

**Department head:**

**Ion FIODOROV, phd, associate professor**

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**RESEARCH ON METHODS FOR DETECTING FAKE NEWS USING  
NATURAL LANGUAGE PROCESSING AND MACHINE LEARNING**

**Master's project**

**Student:** \_\_\_\_\_ **Piciriga Bogdan, IS-231M**

**Coordinator:** \_\_\_\_\_ **Catruc Mariana, university lecturer**

**Consultant:** \_\_\_\_\_ **Cojocaru Svetlana, university assistant**

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## **ABSTRACT**

The spread of fake news has become a significant global challenge, particularly in the age of digital communication and social media. This research explores the application of Artificial Intelligence and Natural Language Processing techniques to develop scalable and efficient systems for detecting fake news. By leveraging advanced machine learning models such as BERT and frameworks like TensorFlow and PyTorch, these systems analyze and classify textual data to identify patterns indicative of misinformation. The study examines critical aspects of fake news detection, including feature extraction, sentiment analysis, and integration with fact-checking databases, while addressing challenges such as data imbalance, evolving misinformation tactics, and ethical considerations. The research adopts a quantitative approach, analyzing the technical, economic, and ethical dimensions of implementing such systems, with a focus on scalability and real-time processing capabilities. Additionally, it evaluates the potential societal impact, including restoring public trust, safeguarding democratic processes, and mitigating the harmful effects of misinformation. While the project presents significant costs, especially in the context of the Republic of Moldova, it also highlights the long-term benefits of such an investment. Through continuous model improvement and strategic implementation, this research demonstrates that advanced AI and NLP tools can play a pivotal role in combating fake news, ensuring a more informed and resilient society.

## REZUMAT

Răspândirea știrilor false a devenit o provocare globală semnificativă, în special în era comunicării digitale și a rețelelor sociale. Această cercetare explorează aplicarea tehnicilor de inteligență artificială și procesare a limbajului natural pentru a dezvolta sisteme scalabile și eficiente pentru detectarea știrilor false. Utilizând modele avansate de învățare automată, cum ar fi BERT și cadre precum TensorFlow și PyTorch, aceste sisteme analizează și clasifică datele textuale pentru a identifica modele care indică dezinformarea. Studiul examinează aspectele critice ale detectării știrilor false, inclusiv extragerea caracteristicilor, analiza sentimentelor și integrarea cu baze de date de verificare a faptelor, abordând în același timp provocări precum dezechilibrul datelor, evoluția tacticilor de dezinformare și considerații etice. Cercetarea adoptă o abordare cantitativă, analizând dimensiunile tehnice, economice și etice ale implementării unor astfel de sisteme, cu accent pe scalabilitate și capabilități de procesare în timp real. În plus, evaluează impactul potențial al societății, inclusiv restabilirea încrederii publicului, protejarea proceselor democratice și atenuarea efectelor dăunătoare ale dezinformării. Deși proiectul prezintă costuri semnificative, mai ales în contextul Republicii Moldova, el subliniază și beneficiile pe termen lung ale unei astfel de investiții. Prin îmbunătățirea continuă a modelului și implementarea strategică, această cercetare demonstrează că instrumentele avansate AI și NLP pot juca un rol esențial în combaterea știrilor false, asigurând o societate mai informată și mai rezistentă.

# CONTENTS

INTRODUCTION	7
1 ANALYSIS OF THE FIELD OF STUDY	8
1.1 Problem definition	8
1.2 Description of the domain	10
1.3 Existing solutions	13
1.4 The goals/objectives, mission of the system	13
1.5 The choice of technologies to implement the task	16
2 RESEARCH STRATEGY	18
2.1 Overview of the strategy	18
2.2 Research approach	19
2.3 Data collection techniques	21
2.4 Data analysis techniques	23
2.5 Tools, Frameworks, and Technologies	25
2.6 Validation and Reliability	27
2.7 Ethical Considerations	28
2.8 Challenges and Limitations	31
3 ECONOMIC RESEARCH	33
3.1 Business Problem	33
3.2 Business Case	34
3.3 Target Audience/Market Segment	35
3.4 SWOT Analysis	37
3.5 Market Analysis	38
3.6 Costs and Profit Estimation	41
3.7 Task Prioritization	45
CONCLUSIONS	46
BIBLIOGRAPHY	48

## INTRODUCTION

In today's digital age, the spread of misinformation, particularly fake news, poses a significant challenge to society. Fake news, often defined as intentionally fabricated information designed to deceive and manipulate public opinion, has been exacerbated by the widespread use of social media platforms. These platforms, with their vast and rapid dissemination capabilities, allow fake news to spread far and wide in a matter of minutes, often outpacing the spread of factually accurate information. As a result, fake news can influence political elections, create social unrest, and undermine public trust in institutions. Combating this phenomenon requires advanced technological solutions, and one of the most promising approaches lies in the field of Natural Language Processing (NLP).

Natural Language Processing, a branch of artificial intelligence, focuses on the interaction between computers and human language. It enables machines to process, understand, and generate human language in a way that is both meaningful and useful. In the context of fake news detection, NLP techniques allow for the analysis of textual content to identify patterns, linguistic features, and stylistic markers that differentiate authentic news from fabricated or misleading information. By leveraging these linguistic cues, NLP models can flag suspicious content, classify articles based on credibility, and even trace the origin of misinformation.

The task of detecting fake news using NLP involves various challenges. For one, fake news articles often mimic the style of legitimate news, making them difficult to distinguish based on superficial characteristics alone. Additionally, fake news can come in many forms, including sensationalized headlines, clickbait articles, and deliberately misleading information that may be mixed with partial truths. Furthermore, the language used in fake news may evolve over time, requiring NLP models to continuously adapt to new tactics used by malicious actors.

Despite these challenges, recent advancements in machine learning, deep learning, and NLP algorithms have significantly improved the accuracy of fake news detection systems. Techniques such as sentiment analysis, text classification, and fact-checking automation are increasingly being used to combat misinformation. Moreover, pre-trained models like BERT and GPT, which can be fine-tuned for specific tasks, have shown promise in detecting subtle nuances in text that signal deception.

This paper explores the application of NLP in detecting fake news, providing an overview of the current state of research, the challenges involved, and the potential for future developments in this field. Through a combination of linguistic analysis and machine learning, NLP offers a powerful tool for identifying and mitigating the spread of fake news in the digital era.

## BIBLIOGRAPHY

1. European Data Protection Supervisor. *Fake News Detection*. Accessed September 7, 2024. [https://www.edps.europa.eu/press-publications/publications/techsonar/fake-news-detection\\_en](https://www.edps.europa.eu/press-publications/publications/techsonar/fake-news-detection_en).
2. European Parliamentary Research Service. *Automated Tackling of Disinformation*. Accessed September 7, 2024. [https://www.europarl.europa.eu/RegData/etudes/STUD/2019/624278/EPRS\\_STU\(2019\)624278\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2019/624278/EPRS_STU(2019)624278_EN.pdf).
3. OpenFox. *Deepfakes and Their Impact on Society*. Accessed September 8, 2024. <https://www.openfox.com/deepfakes-and-their-impact-on-society/>.
4. ScienceDirect. "Detecting Fake News for Reducing Misinformation Risks Using Analytics Approaches." Accessed September 8, 2024. <https://www.sciencedirect.com/science/article/abs/pii/S0377221719304977>.
5. ClaimBuster. "Who Uses It?" Accessed September 8, 2024. <https://idir.uta.edu/claimbuster/>.
6. Sakha Global. *Detecting Fake News Through NLP*. Accessed September 17, 2024. <https://www.slideshare.net/slideshow/detecting-fake-news-through-nlp/117081107>.
7. Medium. "TF-IDF in NLP." Accessed November 3, 2024. <https://medium.com/@abhishekjainindore24/tf-idf-in-nlp-term-frequency-inverse-document-frequency-e05b65932f1d>.
8. TensorFlow. *Word2vec*. Accessed November 3, 2024. <https://www.tensorflow.org/text/tutorials/word2vec>.
9. Springer. "Detecting Fake News and Disinformation Using Artificial Intelligence and Machine Learning to Avoid Supply Chain Disruptions." Accessed September 21, 2024. <https://link.springer.com/article/10.1007/s10479-022-05015-5>.
10. Uxbooth. "Getting Started with Quantitative Data Analysis." Accessed November 2, 2024. <https://uxbooth.com/articles/getting-started-with-quantitative-data-analysis/>.
11. TheContentFarm. "Stacking Models: How to Create a Powerful Ensemble Predictions." Accessed September 25, 2024. <https://thecontentfarm.net/stacking-models-how-to-create-powerful-ensemble-predictions/>.
12. Investopedia. "A Simple Overview of Quantitative Analysis." Accessed November 1, 2024. <https://www.investopedia.com/articles/investing/041114/simple-overview-quantitative-analysis.asp>.
13. Machine Learning Mastery. "A Gentle Introduction to the Bag-Of-Words Model." Accessed November 3, 2024. <https://machinelearningmastery.com/gentle-introduction-bag-words-model/>.
14. The Stanford Natural Language Processing Group. "GloVe: Global Vectors for Word Representation." Accessed November 3, 2024. <https://nlp.stanford.edu/projects/glove/>.
15. HuggingFace. *BERT*. Accessed November 3, 2024. [https://huggingface.co/docs/transformers/model\\_doc/bert](https://huggingface.co/docs/transformers/model_doc/bert).
16. Nakamura, Kai, Sharon Levy, and William Yang Wang. "r/Fakeddit: A New Multimodal Benchmark Dataset for Fine-Grained Fake News Detection." 2020. pp. 3.
17. TopHost. "Web Hosting." Accessed November 1, 2024. <https://tophost.md/>.