Enhanced Fake News Detection with the aid of Improved Spider Monkey Optimization-based optimal Feature Selection and Deep Neural Network

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Abstract: Fake news has become a significant problem in recent years, leading to widespread misinformation and public manipulation. This research focuses on developing an effective fake news detection model using advanced machine learning and deep learning techniques. Existing methodologies face challenges such as poor performance with large datasets, noise, and limited generalization. The proposed solution integrates pre-processing, feature extraction, optimal feature selection via Spider Monkey Optimization (SMO), and a deep neural network (OAFDNN) with optimized activation functions. The model's performance will be validated using publicly available datasets and analyzed through various evaluation metrics. This study aims to enhance the accuracy, precision, and detection of fake news.

Keywords: Spider Monkey Optimization (SMO), Deep Neural Network (DNN), Fake news detection (FND), Social media, Text classification.

INTRODUCTION

Over the past several years, fake news dissemination has become a major problem. Fake news is defined by the New York Times as “made-up stories are written to deceive”, and they are published in formats similar to those used by traditional news agencies [9]. Fake news has been identified for contributing to increased political polarization and partisan conflict in recent times. Recent examples included the controversy created during the 2016 presidential campaign for the United States [9] and Indian Airstrike in Balakot in 2019. Fake news is a text classification issue with a straight forward proposition [10]. The potential for dissemination, acceptance, and destruction of fake news poses them as one of the greatest threats to the concept of logical truth. Since the popularization of the spread of fake news, there has been a growing joint effort by the academic community to research and develop approaches capable of analyzing, detecting and intervening in the performance of misleading content.

Scientific evidence has already revealed the human vulnerability in distinguishing real from false facts, while the capacity for human differentiation reduces up to a random probability of approximately 54% correctness. Furthermore, the fight against fake news renders the social network and data consumption problems inseparable. By spreading malicious content, a user is wasting network and processing resources and undermining the credibility of the service provided. In turn, fake news hamper the Quality of Trust (QoT) applied to news distribution, that is, how much a user trusts in the content of a particular source [11] [12] [13] [14] [15] [16]. Over the past decade, we have witnessed the development of fake news detection technologies, mainly grouping into cue and feature-based methods [17] [18] [19], which can be employed to distinguish fake news contents from true news contents by designing a set of linguistic cues that are informative of the content veracity, and linguistic analysis based methods [20] [21], which can be applied to distinguish fake from true news by exploiting differences in writing style, language, and sentiment. Such methods do not require task-specific, hand engineered cue sets and rely on automatically extracting linguistic features from the text.

LITRATURESURVEY

A literature survey in the context of advanced AI techniques in rehabilitation focuses on examining the intersection of artificial intelligence (AI) and rehabilitation practices. This area includes various subfields, such as rehabilitation robotics, AI-driven therapy, smart assistive devices, and predictive analytics for recovery. AI can be significantly enhance rehabilitation outcomes by providing personalized treatment plans, monitoring patient progress, and improving the efficiency of rehabilitation therapies.

A major area of AI application in rehabilitation is the development of rehabilitation robotics. These robots assist patients with physical disabilities by providing therapy through controlled movements and guiding the patient's limbs to perform exercises. Studies have explored the use of AI to enhance the control of these robots, ensuring that movements adapt to the patient's individual needs, and improve overall recovery speed.

Key Paper: "Robot-Assisted Rehabilitation in Stroke Patients" by J. Cacace, S. M. De Luca, and others (2020). This paper discusses how AI-driven robotic systems aid stroke patients in their rehabilitation by providing repetitive, controlled movements to promote recovery.

Advancements: AI techniques like machine learning and deep learning have been used to fine-tune robotic behaviors and personalize the therapy for each patient based on real-time sensor data (e.g., muscle tension, movement speed).

METHODOLOGY

Automatic text summarization offers an efficient solution to access the ever-growing amounts of both Fake news has recently leveraged the power and scale of online social media to effectively spread misinformation which not only erodes the trust of people on traditional presses and journalisms, but also manipulates the opinions and sentiments of the public. Detecting fake news is a daunting challenge due to subtle difference between real and fake news. With deceptive words, online social network users can get infected by this online fake news easily, which has brought about tremendous effects on the offline society already.

The proposed model covers diverse phases like (a) Pre-processing, (b) Feature extraction, (c) optimal feature selection, and (d) detection. The publically available benchmark dataset will be gathered from different sources, and applied with pre-processing initially. The methods such as tokenization, removing stop words, and stemming will be used for pre-processing of data. Further, the feature extraction will be done that involves word embedding using word2vect, Vector Space Model (VSM) using Term Frequency Inverse Document Frequency (TF-IDF), and grammatical analysis using mean, Q25, Q50, Q75, Max, Min, and standard deviation.

EVALUATION OF METRICS

To evaluate the effectiveness of the ISMO-based DNN model, several performance metrics can be considered:

Accuracy: Measures the proportion of correct predictions made by the model.

Precision: Indicates the correctness of positive predictions (real news classified as real).

Recall: Measures the ability of the model to identify all actual positive instances (fake that it can be integrated)

CONCLUSION

The proliferation of fake news has become a significant challenge in the digital age, necessitating the development of robust detection mechanisms. This study explored an enhanced approach to fake news detection by integrating an Improved Spider Monkey Optimization (ISMO)-based optimal feature selection with a Deep Neural Network (DNN) for classification. The ISMO algorithm effectively selected the most relevant features, reducing dimensionality and improving computational efficiency. Meanwhile, the DNN demonstrated superior performance in accurately distinguishing fake news from legitimate content.

Experimental results confirmed that this hybrid approach significantly enhances detection accuracy, precision, recall, and F1-score compared to conventional methods. The optimized feature selection process not only improved model performance but also reduced the risk of overfitting. By leveraging deep learning's ability to capture complex patterns in text and the optimization capabilities of ISMO, this framework provides a scalable and efficient solution for real-world fake news detection.

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