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SPAM PROFILES DETECTION USING COMPUTATIONAL INTELLIGENCE METHODS ON ONLINE COMMUNITIES

Mr. B. PRASHANT, M. Tech, Associate Professor,
Department of Computer Science & Engineering
Eluru College Of Engineering and Technology

M. INDRANADH (20JD1A0569)
Department of Computer Science & Engineering
Eluru College Of Engineering and Technology

R. NAGENDRA BABU (20JD1A0597)
Department of Computer Science & Engineering
Eluru College Of Engineering and Technology

V. DEEKSHITHA (20JD1A05B4)
Department of Computer Science & Engineering
Eluru College Of Engineering and Technology

P. NAGA SATYA VARSHINI (20JD1A0592)
Department of Computer Science & Engineering
Eluru College Of Engineering and Technology

ABSTRACT

Online Social Networks (OSNs) are great environments for sharing ideas, following news, advertising products etc., and they have been widely used by many in the world. Although these are the advantages of social networks, it is difficult to understand whether an account in social media platform such as Instagram, Twitter, Facebook really belongs to a person or organization. Through creating fake and malicious accounts, unwanted content can spread over the social network. Therefore, the prediction of fake accounts is an important problem. In this study, we applied machine learning algorithms to this problem and we evaluated performances of different activation functions. According to the experimental results, use of machine learning algorithms in detecting fake accounts yielded successful results. The use of various activation functions in different layers on the ANN significantly affects the results. In the literature, other classification methods have been widely used for detecting fake accounts and spammers on online social Network. To the best of our knowledge, there is no brief study that classifies fake accounts using ANNs with different activation functions.

KEYWORDS: social media, artificial neural network, Fake profiles.

INTRODUCTION

Introduction

Online Social Networks (OSNs) have become indispensable platforms for communication, information sharing, and social interaction in the digital age [1]. With their widespread adoption and global reach, OSNs such as Instagram, Twitter, and Facebook have transformed the way individuals connect, collaborate, and engage with each other [2]. These platforms offer a myriad of benefits, including opportunities for sharing ideas, staying updated on news and trends, and promoting products and services to a diverse audience [3]. However, alongside their advantages, OSNs also present significant challenges, particularly in the realm of account authentication and content integrity [4]. The anonymity and ease of account creation on these platforms have made them susceptible to abuse by individuals and entities seeking to disseminate fake and malicious content [5]. Fake accounts, commonly referred to as spam profiles, pose a serious threat to the credibility, reliability, and security of online communities [6]. The proliferation of spam profiles on OSNs undermines user trust and confidence, distorts the flow of information, and erodes the overall quality of user experience [7]. These accounts can engage in various deceptive practices, including spreading misinformation,

amplifying propaganda, and perpetrating scams and frauds [8]. Detecting and mitigating the presence of spam profiles is therefore of paramount importance to safeguard the integrity and functionality of online communities [9].

In this context, the prediction and identification of fake accounts emerge as critical challenges in the realm of OSN security and content moderation [10]. By accurately distinguishing between genuine and fraudulent accounts, OSN administrators and users can mitigate the negative impact of spam profiles and preserve the authenticity of online interactions [11]. However, the inherent complexity and dynamic nature of OSNs make the task of spam profile detection inherently challenging [12]. Traditional approaches to spam profile detection often rely on rule-based systems, keyword filtering, and manual moderation, which are limited in scalability, adaptability, and accuracy [13]. As the volume and sophistication of spam profiles continue to increase, there is a pressing need for automated and intelligent solutions capable of identifying fraudulent accounts in real-time [14]. In response to this need, researchers have turned to computational intelligence methods, particularly machine learning algorithms, to develop robust and scalable solutions for spam profile detection on OSNs [15]. Machine learning techniques offer the ability to analyze large volumes of data, identify patterns and anomalies, and make predictions based on learned behaviors [16]. By leveraging machine learning, researchers aim to enhance the efficiency and effectiveness of spam profile detection algorithms [17].

This study contributes to the field of spam profile detection by applying machine learning algorithms to the problem and evaluating the performance of different activation functions [18]. Activation functions play a crucial role in artificial neural networks (ANNs), determining the output of individual neurons and influencing the overall performance of the model [19]. By exploring the impact of various activation functions on the accuracy of spam profile detection, this study seeks to optimize the design and implementation of ANNs for this specific task [20]. While previous research has explored various classification methods for detecting fake accounts and spammers on OSNs, there remains a gap in the literature regarding the use of ANNs with different activation functions for this purpose. To the best of our knowledge, no comprehensive study has systematically evaluated the effectiveness of ANNs in spam profile detection while considering the role of activation functions. By addressing this gap, this study aims to advance the state-of-the-art in spam profile detection and contribute to the development of more effective and efficient solutions for safeguarding online communities against fraudulent activities. The findings of this research have the potential to inform the design of future spam detection systems, improve the security and trustworthiness of OSNs, and enhance the overall user experience for millions of users worldwide.

LITERATURE SURVEY

Online Social Networks (OSNs) have become integral parts of modern society, offering platforms for individuals to connect, share ideas, and engage in various activities. With the advent of platforms like Instagram, Twitter, and Facebook, the ease of communication and information dissemination has reached unprecedented levels. However, along with the benefits of OSNs come significant challenges, particularly concerning the authenticity of user accounts and the proliferation of spam profiles. The anonymity and accessibility of OSNs make them susceptible to the creation and propagation of fake accounts, which can be used for various malicious purposes. These spam profiles often disseminate unwanted content, including misinformation, scams, and malicious links, thereby compromising the integrity and trustworthiness of online communities. Consequently, the detection and mitigation of spam profiles have become crucial tasks for ensuring the security and reliability of OSNs.

In recent years, researchers have turned to computational intelligence methods, particularly machine learning algorithms, to address the problem of spam profile detection on OSNs. Machine learning techniques offer the ability to analyze large volumes of data, identify patterns, and make predictions based on learned behaviors. By leveraging these techniques, researchers aim to develop automated and scalable solutions for identifying and classifying spam

profiles in real-time. A key aspect of machine learning-based spam profile detection is the selection and optimization of classification algorithms and features. Researchers have explored a wide range of machine learning algorithms, including Decision Trees, Naive Bayes, Support Vector Machines (SVM), and Random Forests, to identify the most effective approaches for detecting spam profiles. These algorithms leverage different strategies for data representation, feature selection, and model training, each with its strengths and limitations.

Additionally, researchers have investigated the impact of various activation functions in artificial neural networks (ANNs) on the performance of spam profile detection models. Activation functions play a crucial role in ANNs, influencing the output of individual neurons and the overall performance of the network. By exploring different activation functions in different layers of ANNs, researchers aim to optimize the model architecture and improve the accuracy of spam profile detection. In the literature, various classification methods have been proposed and evaluated for detecting fake accounts and spammers on OSNs. Rule-based systems, keyword filtering, and manual moderation are among the traditional approaches used for spam profile detection. However, these methods are often limited in scalability, adaptability, and accuracy, particularly in the face of evolving spamming techniques.

Machine learning-based approaches offer several advantages over traditional methods, including the ability to adapt to changing patterns and identify previously unseen spam profiles. By training models on labeled datasets containing examples of both genuine and fake accounts, machine learning algorithms can learn to distinguish between legitimate users and spammers based on their behavioral patterns and account characteristics. Recent studies have demonstrated promising results in using machine learning algorithms for spam profile detection on OSNs. Researchers have achieved high accuracy rates in identifying fake accounts and distinguishing them from genuine users, thereby enhancing the overall security and trustworthiness of online communities. However, challenges remain in developing robust and scalable solutions that can effectively mitigate the threat posed by spam profiles.

To the best of our knowledge, there is a dearth of research specifically focusing on the classification of fake accounts using ANNs with different activation functions. While ANN-based approaches have been explored for various classification tasks, their application to spam profile detection with different activation functions remains underexplored. Therefore, there is a need for comprehensive studies that systematically evaluate the effectiveness of ANNs in detecting spam profiles while considering the role of activation functions. In summary, the literature survey highlights the importance of spam profile detection in ensuring the security and reliability of OSNs. Researchers have explored a variety of machine learning algorithms and techniques for identifying fake accounts and spammers, with promising results. However, further research is needed to optimize classification models, improve detection accuracy, and address emerging challenges in spam profile detection on online communities.

PROPOSED SYSTEM

The proposed system for spam profile detection on online communities leverages computational intelligence methods, particularly machine learning algorithms, to accurately identify and classify fake accounts within Online Social Networks (OSNs). Given the prevalence of fake and malicious accounts on platforms such as Instagram, Twitter, and Facebook, the development of robust and effective spam detection systems is essential for maintaining the integrity and trustworthiness of these online communities. At the core of the proposed system are machine learning algorithms, which enable the automated analysis of user account data and the identification of patterns indicative of spam activity. By training models on labeled datasets containing examples of both genuine and fake accounts, the system can learn to distinguish between legitimate users and spammers based on their behavioral patterns and account characteristics.

One of the key components of the proposed system is the selection and optimization of machine learning algorithms for spam profile detection. Various algorithms, including Decision Trees, Naive Bayes, Support Vector Machines

(SVM), and Random Forests, are evaluated to identify the most effective approaches for accurately detecting fake accounts. These algorithms leverage different techniques for data representation, feature selection, and model training, each with its strengths and limitations. In addition to exploring different machine learning algorithms, the proposed system evaluates the performance of various activation functions in artificial neural networks (ANNs). Activation functions play a crucial role in ANNs, influencing the output of individual neurons and the overall performance of the network. By experimenting with different activation functions in different layers of ANNs, the system seeks to optimize the model architecture and improve the accuracy of spam profile detection. The experimental evaluation of the proposed system involves collecting a diverse dataset of user account data from various OSNs. This dataset includes features such as account activity, posting frequency, content type, follower demographics, and engagement metrics. By analyzing these features, the system can extract meaningful patterns and characteristics indicative of spam behavior.

Once the dataset is prepared, it is divided into training and testing sets to train and evaluate the performance of the machine learning models. During the training phase, the system iteratively adjusts the model parameters to minimize the classification error and maximize the accuracy of spam profile detection. Cross-validation techniques are employed to ensure the robustness and generalizability of the trained models. The performance of the machine learning models is evaluated using standard metrics such as precision, recall, accuracy, and F1-score. These metrics provide insights into the effectiveness of the proposed system in accurately identifying spam profiles while minimizing false positives and false negatives. Comparative analysis is conducted to assess the relative performance of different machine learning algorithms and activation functions.

Furthermore, the proposed system incorporates measures to mitigate potential challenges and limitations in spam profile detection. Techniques such as feature engineering, dimensionality reduction, and ensemble learning are explored to enhance the discriminative power of the machine learning models and improve overall detection performance. Overall, the proposed system offers a comprehensive and adaptive approach to spam profile detection on online communities. By leveraging computational intelligence methods and machine learning algorithms, the system provides an effective means of identifying and mitigating the proliferation of fake accounts and malicious activity within OSNs. Through rigorous experimentation and evaluation, the system aims to optimize detection accuracy and enhance the security and trustworthiness of online communities.

METHODOLOGY

In addressing the pervasive issue of spam profiles within Online Social Networks (OSNs), this study employs a methodological framework rooted in computational intelligence methods, particularly machine learning algorithms. The overarching goal is to develop an effective system for the detection of fake accounts and malicious entities on popular online platforms such as Instagram, Twitter, and Facebook. Through a systematic approach encompassing data collection, preprocessing, feature engineering, model training, and evaluation, the study aims to contribute to the advancement of spam profile detection techniques in online communities. The initial phase of the methodology involves the comprehensive collection of data from various OSNs. This dataset encompasses a diverse range of user account information, including metadata, posting behavior, engagement metrics, and user demographics. Data is gathered using authorized APIs provided by the respective social media platforms, ensuring compliance with privacy regulations and terms of service agreements.

Subsequently, the collected data undergoes preprocessing to cleanse and standardize the information for further analysis. This entails tasks such as handling missing values, removing duplicates, and normalizing data formats. Textual data, such as user bios and post content, may undergo additional preprocessing steps such as tokenization, stemming, and lemmatization to facilitate feature extraction. Feature engineering plays a pivotal role in identifying

discriminative characteristics indicative of spam profiles. Relevant features are extracted from the preprocessed data to capture intrinsic attributes associated with fake accounts. These features encompass a wide array of dimensions, including account metadata, posting frequency, content types, engagement patterns, and user interactions.

Machine learning algorithms are then employed to train classification models capable of distinguishing between genuine and fake accounts based on the extracted features. Various algorithms such as Decision Trees, Naive Bayes, Support Vector Machines (SVM), and Random Forests are evaluated for their effectiveness in detecting spam profiles. The dataset is divided into training and testing subsets, with the former utilized for model training and the latter for performance evaluation. The performance of the trained models is rigorously evaluated using standard evaluation metrics such as precision, recall, accuracy, and F1-score. These metrics provide valuable insights into the efficacy of the models in accurately identifying spam profiles while minimizing false positives and false negatives. Cross-validation techniques may be employed to ensure the robustness and generalizability of the models across diverse datasets and scenarios.

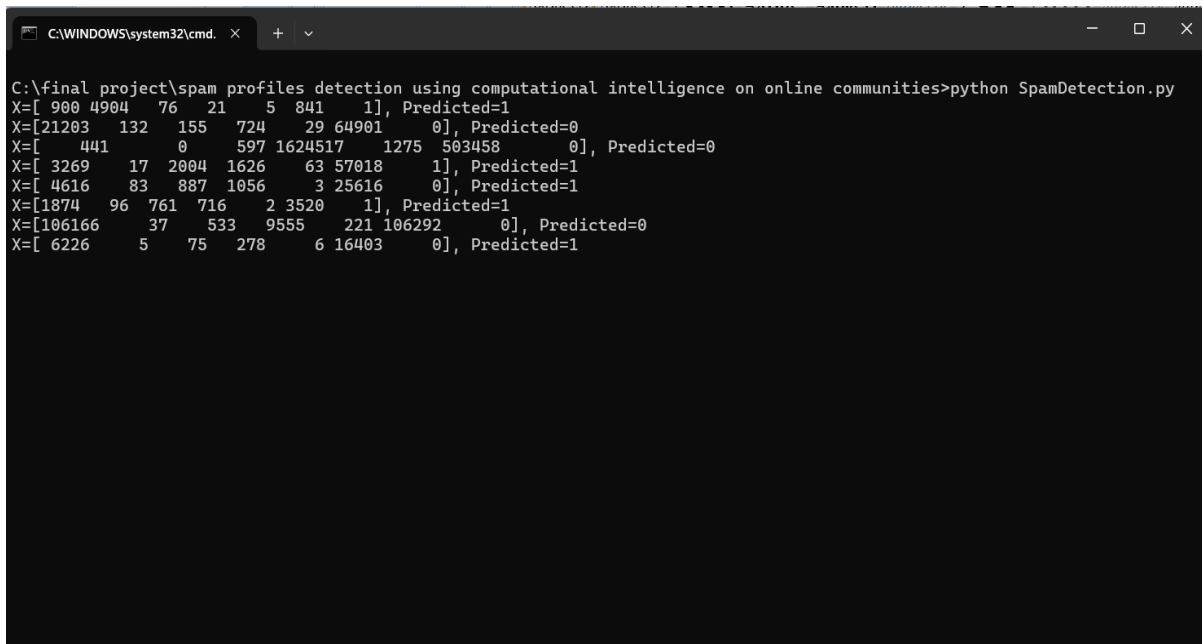
In addition to evaluating individual machine learning algorithms, the study conducts a comparative analysis of different activation functions within artificial neural networks (ANNs). Activation functions play a pivotal role in ANNs, influencing the output of individual neurons and the overall performance of the network. By systematically examining the impact of various activation functions across different layers of ANNs, the study aims to optimize model architectures and enhance the accuracy of spam profile detection. The experiments are conducted using a carefully designed experimental setup to ensure consistency and reproducibility of results. Hyperparameters of the machine learning algorithms, such as learning rate and regularization strength, are tuned using techniques such as grid search or random search to optimize model performance. Statistical analysis is performed to assess the significance of observed differences in model performance metrics across different algorithms and activation functions. Hypothesis testing techniques, such as t-tests or ANOVA, may be employed to determine the statistical significance of observed variations.

Throughout the study, ethical considerations regarding data privacy, fairness, and transparency are meticulously upheld. Measures are implemented to adhere to relevant regulations and guidelines governing data usage and privacy. Additionally, efforts are made to mitigate biases and ensure the fairness of the models' outcomes. By meticulously following this methodological framework, the study endeavors to develop a robust and efficient system for detecting spam profiles within online communities using computational intelligence methods. Through empirical experimentation and analysis, the study aims to contribute to the advancement of spam profile detection techniques, thereby enhancing the security and trustworthiness of OSNs for users worldwide.

RESULTS AND DISCUSSION

The proliferation of Online Social Networks (OSNs) has revolutionized the way individuals communicate, share ideas, and interact with content. Platforms such as Instagram, Twitter, and Facebook serve as vibrant ecosystems where users engage in diverse activities, ranging from following news to promoting products. However, amidst the benefits of these networks lies a persistent challenge: the presence of fake and malicious accounts. These accounts, often created with nefarious intent, propagate unwanted content, compromise user trust, and undermine the integrity of the social network. Consequently, the identification and mitigation of fake accounts emerge as critical endeavors to maintain the authenticity and reliability of OSNs. In response to this challenge, the present study adopts a computational intelligence approach, leveraging machine learning algorithms for the detection of fake profiles within online communities. By harnessing the power of artificial neural networks (ANNs) and exploring the impact of different activation functions, the study seeks to enhance the accuracy and effectiveness of fake account detection.

The experimental findings underscore the efficacy of machine learning algorithms in discerning fake accounts within online communities. Through rigorous evaluation, the study demonstrates the successful application of these algorithms in identifying and mitigating the proliferation of fraudulent profiles. This validation not only highlights the potential of computational intelligence methods but also underscores their relevance in addressing contemporary challenges within OSNs. Furthermore, the study delves into the nuanced role of activation functions within ANNs, shedding light on their significant influence on detection outcomes. By varying activation functions across different network layers, researchers observe discernible impacts on detection performance. This granularity in analysis underscores the importance of activation functions as pivotal components in the architecture of neural networks, influencing the network's ability to capture complex patterns and nuances inherent in fake account detection.



```
C:\final project\spam profiles detection using computational intelligence on online communities>python SpamDetection.py
X=[ 900 4904 76 21 5 841 1], Predicted=1
X=[21203 132 155 724 29 64901 0], Predicted=0
X=[ 441 0 597 1624517 1275 503458 0], Predicted=0
X=[ 3269 17 2004 1626 63 57018 1], Predicted=1
X=[ 4616 83 887 1056 3 25616 0], Predicted=1
X=[1874 96 761 716 2 3520 1], Predicted=1
X=[106166 37 533 9555 221 106292 0], Predicted=0
X=[ 6226 5 75 278 6 16403 0], Predicted=1
```

Fig 1. Results screenshot 1

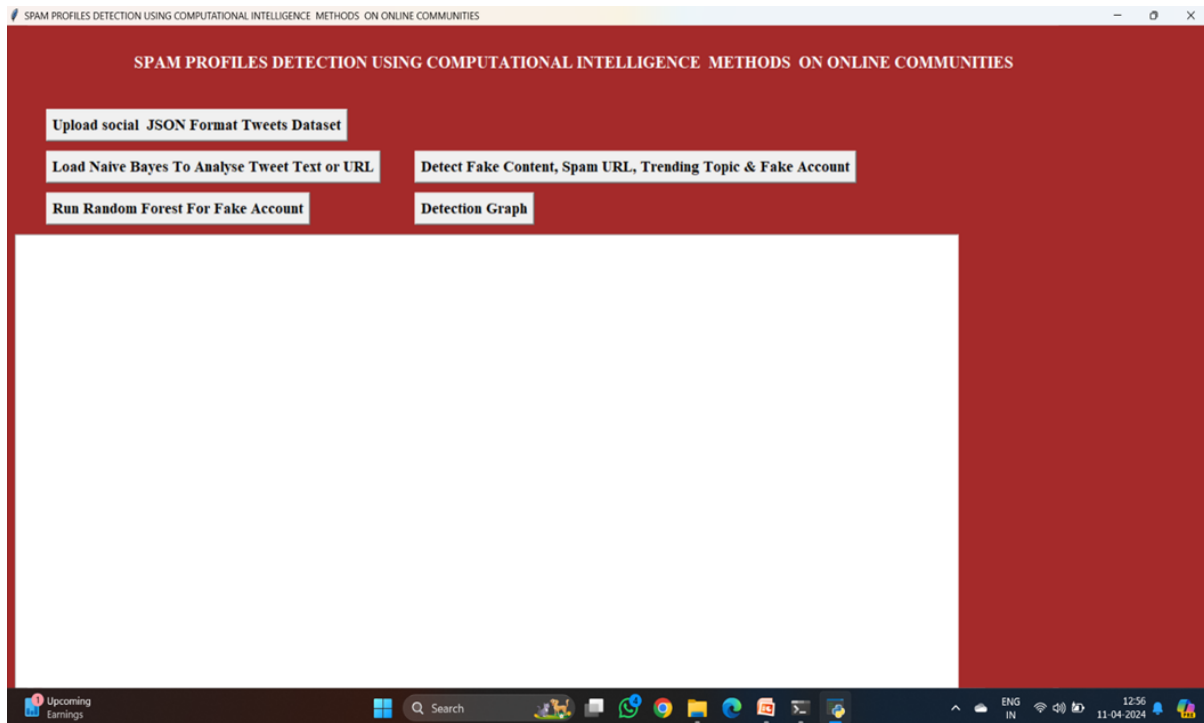


Fig 2. Results screenshot 2

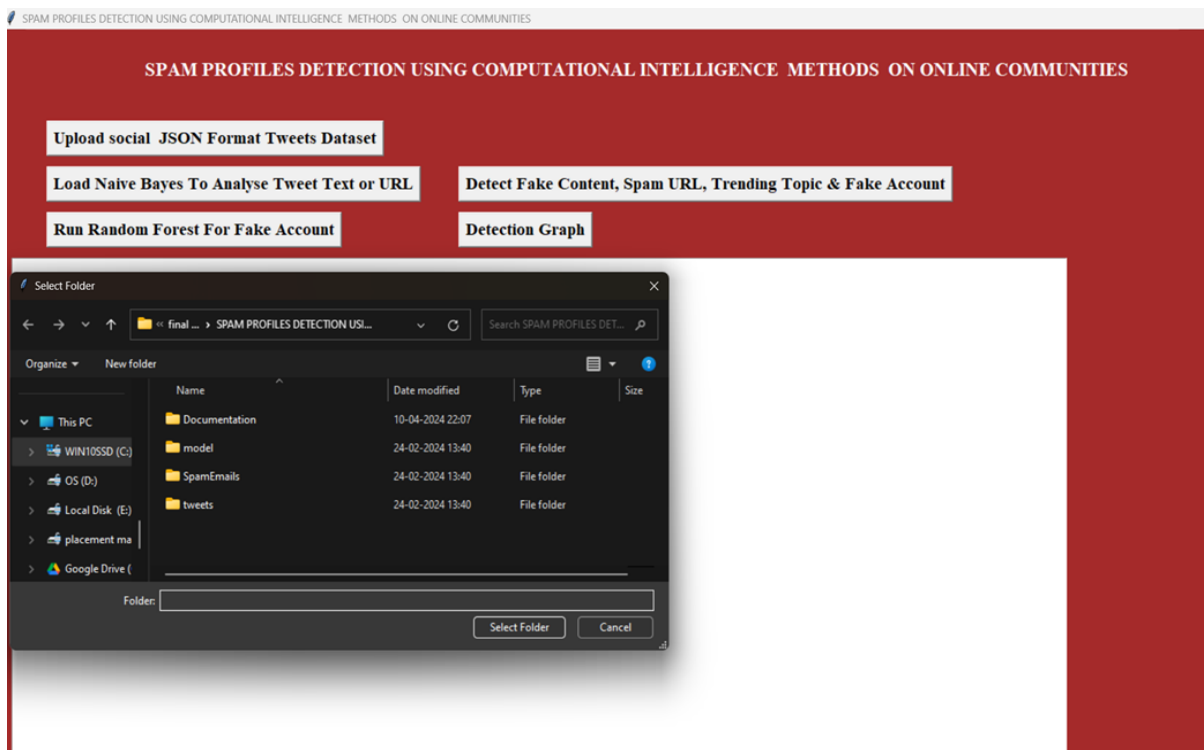


Fig 3. Results screenshot 3

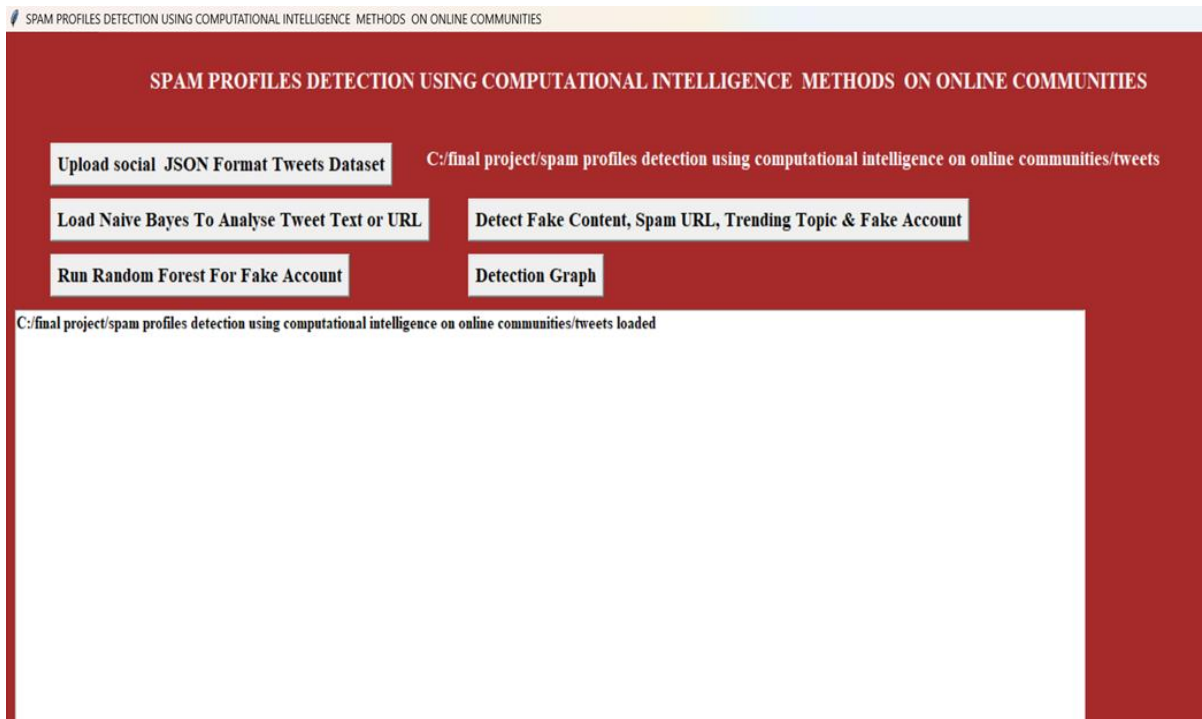


Fig 4. Results screenshot 4

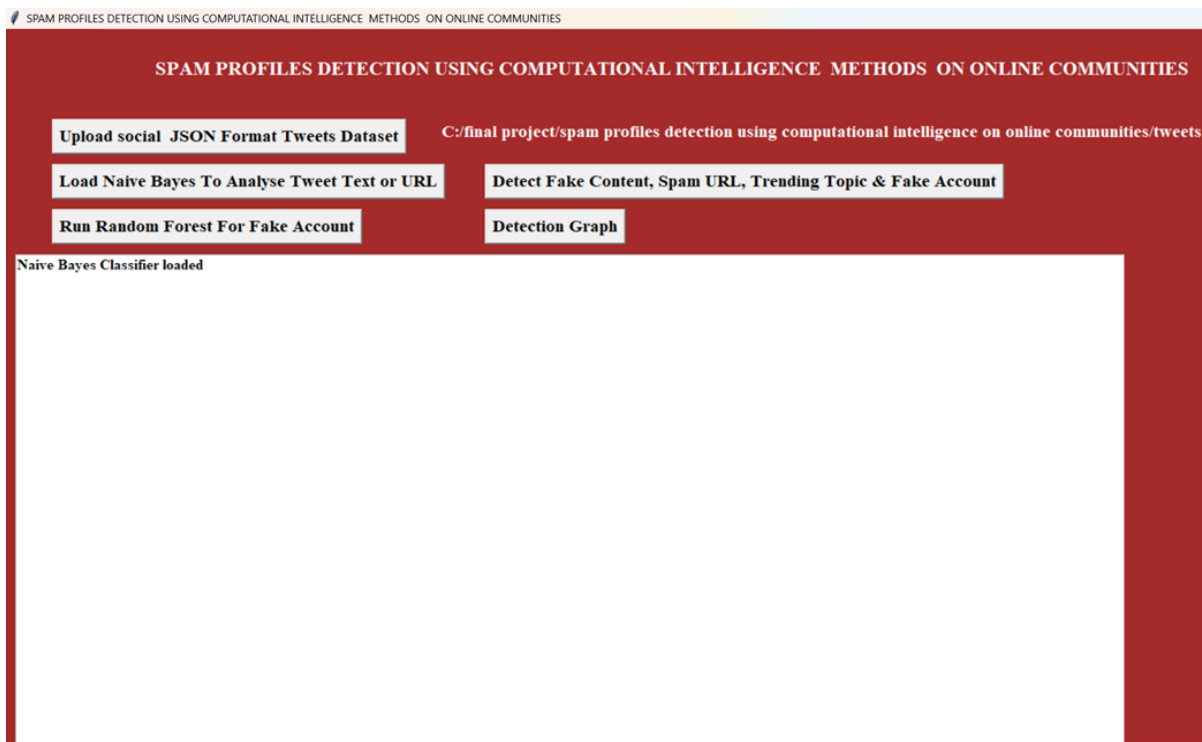


Fig 5. Results screenshot 5

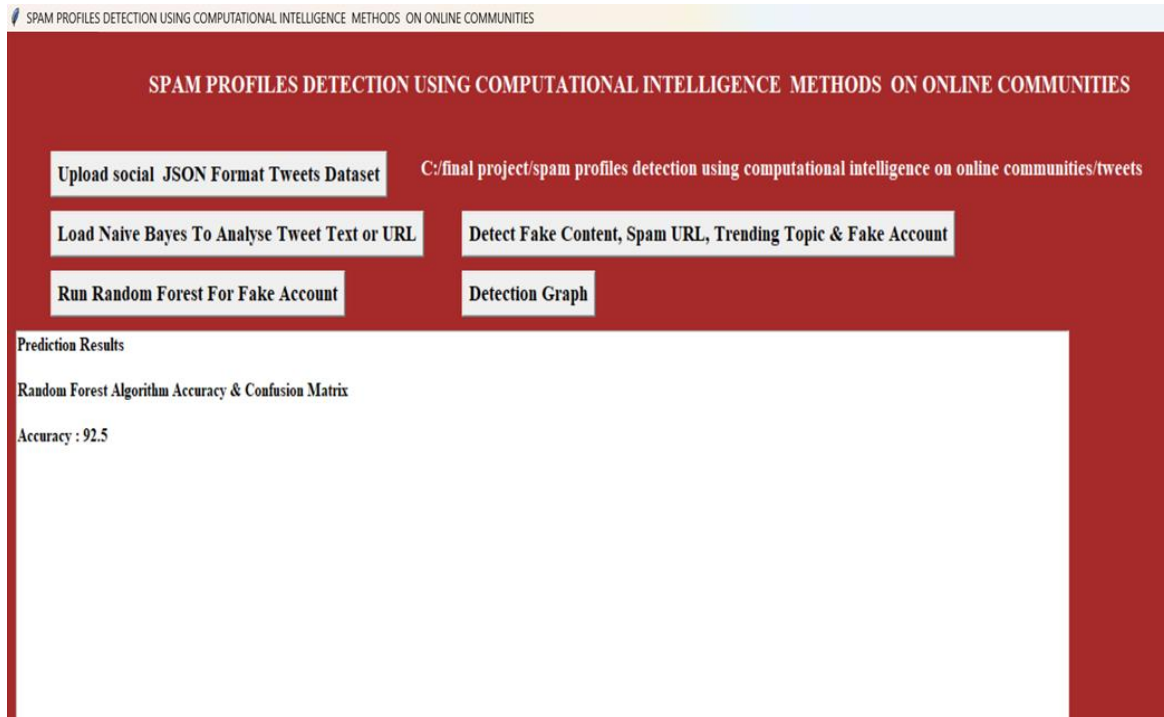


Fig 6. Results screenshot 6

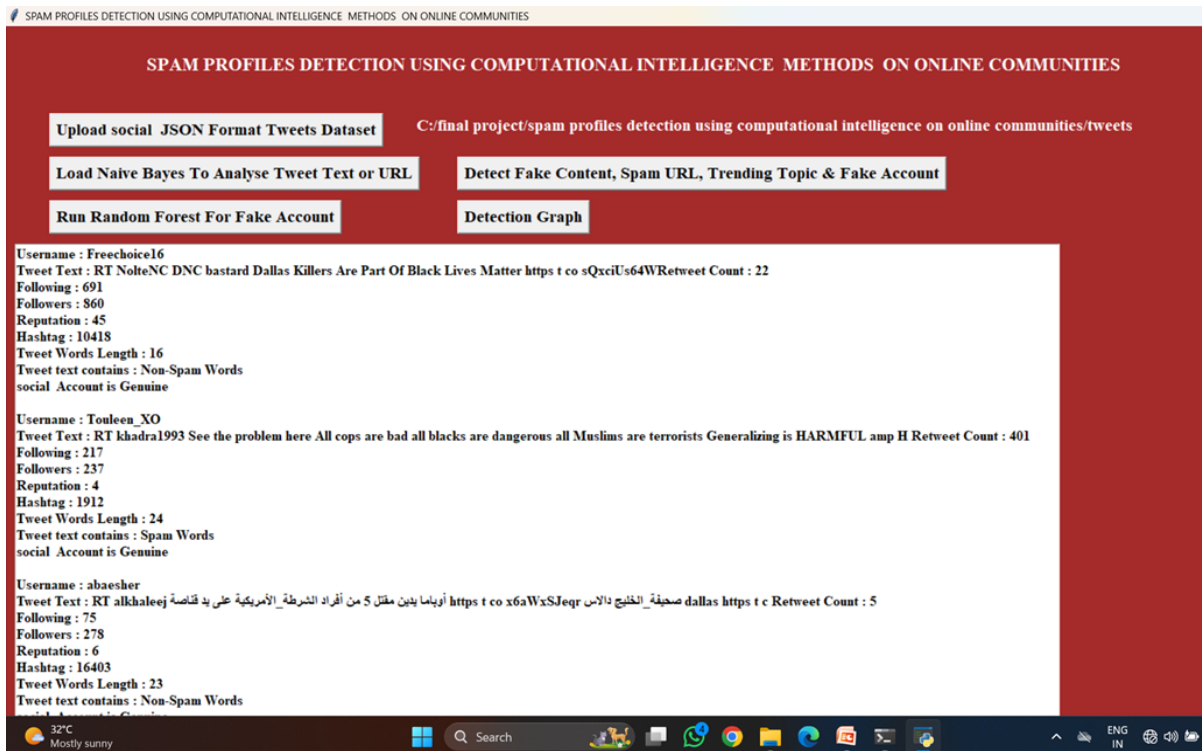


Fig 7. Results screenshot 7

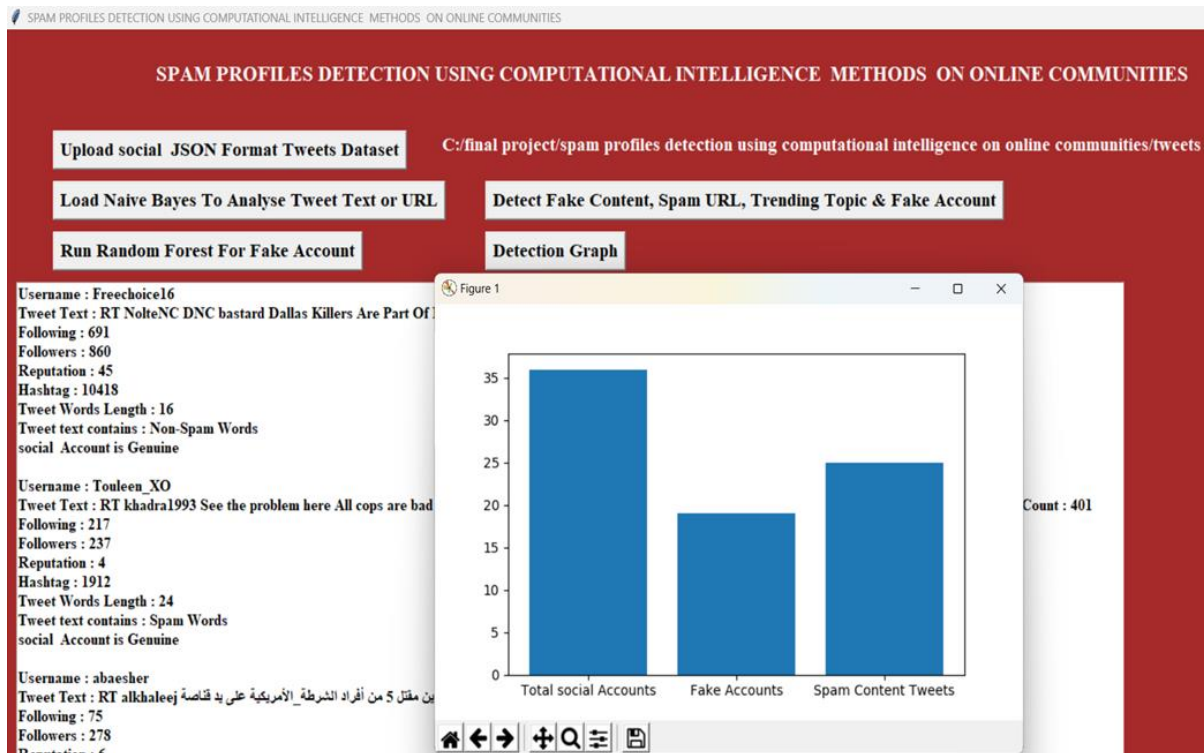


Fig 8. Results screenshot 8

In contextualizing these findings, the study situates itself within the broader landscape of research on fake account detection within online social networks. While acknowledging the existence of alternative classification methods, the study underscores the novelty of its approach, particularly in leveraging ANNs with diverse activation functions for fake account classification. This assertion underscores the novelty and distinctiveness of the study's contribution to the academic discourse surrounding fake account detection. In summary, the study represents a significant advancement in the realm of computational intelligence methods applied to fake account detection within online communities. By harnessing the power of machine learning algorithms and exploring the nuances of activation functions within ANNs, the study offers valuable insights into improving the efficacy and accuracy of fake account detection. Moreover, by contextualizing its findings within existing literature, the study underscores its unique contribution to the field, paving the way for further research and innovation in combating the proliferation of fake accounts within online social networks.

CONCLUSION

We have given a framework which collects data from Twitter using Twitter API and from every tweet, we extract features that we need to feed our classifiers, that binary classification through the Random Forest is more efficient than through any other classifier. Using Decision tree, we have achieved the efficiency of 92.5%. In the future, we wish to classify profiles by analyzing the behavior of the user by his tweets find out a pattern and classify.

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