Lecture Notes in Networks and Systems 1221

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K. T. V. Reddy *Editors*

Soft Computing and Signal Processing

Proceedings of 7th ICSCSP 2024, Volume 1

Springer

Lecture Notes in Networks and Systems

Volume 1221

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Editors

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ISSN 2367-3370 ISSN 2367-3389 (electronic)
Lecture Notes in Networks and Systems
ISBN 978-981-96-0923-9 ISBN 978-981-96-0924-6 (eBook)
https://doi.org/10.1007/978-981-96-0924-6

Preface

The **International Conference on Soft Computing and Signal Processing (ICSCSP-2024**) was successfully organized by Malla Reddy College of Engineering and Technology, an UGC Autonomous Institution, during **June 21–22, 2024**, at Hyderabad. The objective of this conference was to provide opportunities for the researchers, academicians, and industry persons to interact and exchange the ideas, experience, and gain expertise in the cutting-edge technologies pertaining to soft computing and signal processing. Research papers in the above-mentioned technology areas were received and subjected to a rigorous peer-review process with the help of program committee members and external reviewers. The ICSCSP-2024 received a total of 248 papers, each paper was reviewed by more than two reviewers, and finally, 55 papers were accepted for publication in Springer LNNS series.

Our sincere thanks to **Dr. Aninda Bose**, Senior Editor, Springer Publications, India, **Dr. Suresh Chandra Satapathy**, Professor and Dean R&D, KIIT, for extending their support and cooperation.

We would like to express our gratitude to all session chairs, viz., Dr. Nagender Kumar S., Associate Professor, Department of CSE, Central University, Hyderabad, India; Dr. Veningston K., Assistant Professor, Department of CSE, National Institute of Technology, Srinagar, India; Dr. Rajeev Tiwari Professor and Dean, School of Computer Science, IILM University, India; Dr. P. Chandra Sekhar Reddy, Professor, Department of CSE, Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad, India; Dr. Y. Vijayalata, Dean and Professor Department of CSE, Vardhaman College of Engineering, Hyderabad, India; Dr. Padmalaya Nayak Professor, Department of CSE, Gokaraju Lailavathi Womens Engineering College, India; Dr. L. Mary Gladence, Professor, Department of IT, Sathyabama Institute of Science and Technology, India; and Dr. P. Rohini, Professor, Department of CSE, ICFAI University, India, for extending their support and cooperation.

We are indebted to the program committee members and external reviewers who have produced critical reviews in a short time. We would like to express our special gratitude to publication chair **Dr. Suresh Chandra Satapathy**, KIIT, Bhubaneswar, for his valuable support and encouragement till the successful conclusion of the conference.

We express our heartfelt thanks to our Chairman, **Sri. CH. Malla Reddy** Garu, Chief Patron, Founder Chairman, MRGI, Patrons **Sri. CH. Mahendar Reddy**, Secretary, MRGI, **Sri. CH. Bhadra Reddy**, President, MRGI, **Dr. V. S. K. Reddy**, Vice Chancellor MRU, **Dr. S. Srinivasa Rao**, Principal and Convener, **Dr. T. Venu Gopal**, Dean-Students Welfare, Organizing Chair **Prof. P. Sanjeeva Reddy**, Dean, International Studies.

We would also like thank organizing secretaries **Dr. K. Mallikarjuna Lingam, HOD, ECE, Dr. D. Sujatha HOD (CI), Dr. G. Sharada HOD (IT), Dr. S. Shanthi, HOD (CSE); Dr. M. V. Kamal, HOD (ET)**, for their valuable contribution. Our

sincere thanks to all the coordinators, organizing committee, and other committee members for their commendable contribution in successful conduct of the conference.

Last, but certainly not least, our special thanks to all the authors for their applaudable technical contributions which have made our proceedings rich and exemplary.

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Conference Theme: Technological Innovation Towards the Digital Transformation Arena

Emerging technologies are transforming the way academic institutions foster innovation. Technology will continue to act as a catalyst in determining the future growth and sustainability of almost every global organization. Institutions that adopt and embrace these modern technologies and applications stand a greater chance at long-term success in the digital transformation arena.

Sustainable, incremental, and open innovation is the primary goal for sustainable development of a nation. Institutions in collaboration with industries can trigger the advocacy and generation of new ideas. The International Conference on Soft Computing and Signal Processing is working toward the same by providing a common platform for the professionals, academicians, and researchers working in the area of soft computing and signal processing to analyze state-of-the-art developments, innovations, and future trends and thereby contribute to the much-needed dissemination of latest developments and advances in these fields.

Soft computing and signal processing play a significant role in advancing technological innovation and improving infrastructure across various sectors. This aligns with the advancements in technology, such as soft computing and signal processing, to enhance industries and infrastructure for sustainable development.

Technological advancements in specific contribute towards the development of stable communities as well as cultural and economic advancement. The International Conference on Soft Computing and Signal Processing is an attempt in this direction and is conducted to create awareness and provide a common platform for the professionals, academicians, and researchers working in the area of soft computing and signal processing to analyze state-of-the-art developments, innovations, and future trends and thereby contribute to the much-needed dissemination of latest developments and advances in these fields.

In this context, soft computing encompasses topics such as computational intelligence, deep learning, optimization techniques, evolutionary algorithms, intelligent e-learning systems, soft sets, rough sets, fuzzy logic, neural networks, genetic algorithms and machine learning and signal processing encompasses emerging topics such as communication engineering, information theory and networks, electronics engineering and microelectronics, signal, image and speech processing, wireless

and mobile communication, circuits and systems, energy systems, power electronics and electrical machines, electro-optical engineering, instrumentation engineering, avionics engineering, control systems, Internet of things and cybersecurity, biomedical devices, MEMS and NEMS, radar signal processing, and VLSI signal processing which are all state-of-the-art topics having great deal of research potential.

It is a well-known fact that research plays a vital role in the sphere of teaching and academics. Hence, the conference aims to be an intellectual arena which encompasses ability for inclusive and sustainable industrial development (ISID) which will be the primary source of income generation and allow for rapid and sustained increases in living standards for all people. It also helps to exchange and exhibit mutual respect and understanding of ideas, philosophical principles, cognitive styles, and mindsets as well as acts of integrity and purposeful personal reflection.

The submitted papers are expected to cover state-of-the-art technologies, product implementation, ongoing research as well as application issues which will enable transformation in the socio-economic structures.

Contents

WhatsApp Chat Analysis and Spam Discovery Using Machine Learning Models

A. Krishna, Subhani Shaik, G. Sreeja, Bharat Kalyan, and Vijay Kumar

Abstract In the recent years, the WhatsApp app has been among the most effective for communication. Chats of numerous kinds that happen in a cluster of personnel and different kinds of subjects are included in WhatsApp chats. This application provides a detailed scrutiny of chats between users of a particular group and two individuals. Regardless of the topic on which the conversation is based, this web application can also be used to detect spam messages. This web application displays all messages, in the form of a graph every month, as well as the maximum used words and the active participant's conversation. This web application also detects spam messages by a person and shows the total of spam messages in a particular chat. The benefit of this tool is that it has been developed using straightforward Python modules like Pandas, Streamline, Seaborn, and Word Cloud, as well as machine learning algorithms that create data frames and produce numerous graphs that are then displayed in the application. These algorithms are effective and resource-light, making them suitable for large datasets.

Keywords WhatsApp chat analysis · Spam discovery · Machine learning

1 Introduction

WhatsApp chat is an open-source platform for all VoIP services throughout the world. Different type of operations performed by the users like message chatting, image transformation, voice messages, and video calls, and easily access their account through any mobile device [1]. The WhatsApp chat analyzer is the best tool for conversations between users. End users can easily operate WhatsApp conversations using the Internet [2]. Sometimes spam attacks through channels, it may be risks, due to the leaks of personal data and easy-to-access unauthorized data from mobile devices which is most dangerous [3].

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V. S. Reddy et al. (eds.), *Soft Computing and Signal Processing*, Lecture Notes in Networks and Systems 1221, https://doi.org/10.1007/978-981-96-0924-6_1

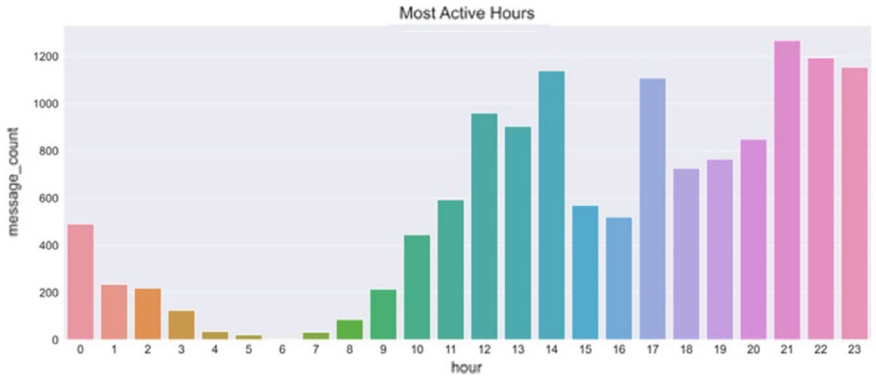


Fig. 1 Comprehensive data analysis on a WhatsApp group chat

WhatsApp has also been connected with data analysis in the recent days for find out insights of most active end user in that field. It acts as a ghost and sets the scheduling, and emojis in most recent times. So many libraries to use in practical implementation.

The following paper is arranged as follows section two describes the proposed system and system architecture. Section three discusses the methodology and implementation. Section four states the results and analysis. The final section concludes the paper (Fig. 1).

2 Proposed System and System Architecture

The proposed system of our research is based on a machine learning application that handles the ensemble learning application for WhatsApp chats [4]. This application analyzes the chats from personal and clusters. It provides total messages with monthly graph analysis on time-bound. It observes the words and persons who are in an active state. Based on this data, detect total spam messages transferred by end users [5]. In our research implementation purposes used Python libraries pandas, numpy, Matplotlib, and SciPy. The system also handles large datasets, it is suitable for chat analysis from different sources [6].

Our application provides an in-depth analysis of specific activities in WhatsApp chat [7]. Different activities are done between different end users at a given time with different emojis. Based on WhatsApp chat—statistical analysis to create innovative web applications [8]. It also provides day-wise, weekly, and monthly timeline graph analysis [9]. This system can find spam messages with details of sender along with total messages. Figure 2 shows the architecture of the proposed system.

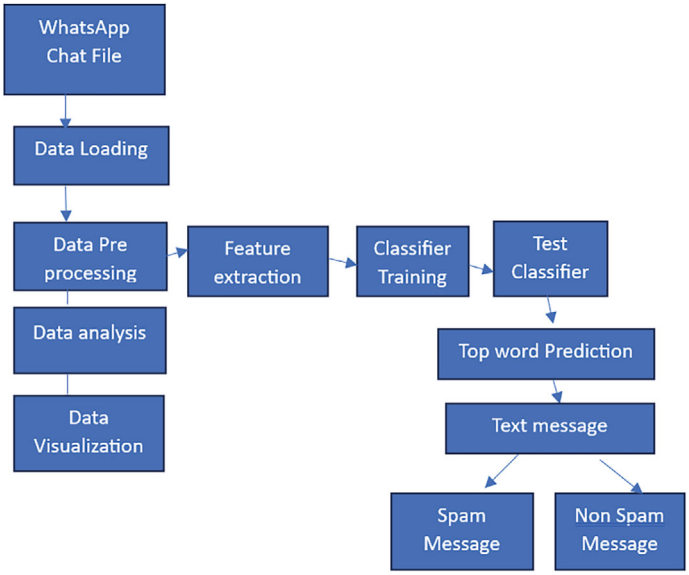


Fig. 2 System architecture

3 Methodology and Implementation

Machine learning algorithm models that compute the statistical data for analysis and develop for better performance on a particular activity. Machine learning procedure follows for the remaining computation for future improvement and prediction [10]. This process is based on training and testing of the dataset. The model learns to recognize patterns and relations of data understanding the purposes of unseen data. Multiple applications used this methodology for future decision prediction [11].

For successful implementation as follows

i. Collect document messages
ii. Cleaning the data
iii. Preprocessing of data
iv. Create and evaluate

3.1 Text Messages Collection

Collection of text messages focused across four facts. Message sent to person, received person, content type, and delivery time. Two different types of messages spam and ham. Our initial target is to investigate the classification of data.

3.2 Purification of Data

A data cleaning procedure takes place initially for further processing. The data cleaning process handles inaccurate, inconsistent, replicated data, and incomplete data. It can improve the quality of data. However past experiments' data had errors and data gaps [12].

3.3 Dataset Balancing

For the distribution of data classes, data class size can be reduced. The process leads to valued data from the dataset. Dataset balancing resolves memory issues.

3.4 Text Vectorization

Different accessing models for text vectorization to determine spam. So many challenges are faced in text vectorization. Multiple models are used for document vectors. After that determine the level of granularity for each statistic document.

3.5 Proposed Algorithm

I/P: File in text format
O/P: Analysis of data with spam detection
Begin
Start: From the application
Step 1: WhatsApp chat file uploaded from the application
Step 2: The uploaded document is verified whether it is valid or not. If it is not valid throw the error
Step 3: Finally set the all chat analysis
End

The proposed algorithm shows the procedure of data flowing from input to output with different stages and information of format for input and output.

v1	v2
ham	Go until jurong point, crazy.. Available only in bugis n great world la e buffet... Cine there got amore wat...
ham	Ok lar... Joking wif u oni...
spam	Free entry in 2 a wkly comp to win FA Cup final tkts 21st May 2005. Text FA to 87121 to receive entry question(std txt rate)T&C's apply 08452810075over18's
ham	U dun say so early hor... U c already then say...
ham	Nah I don't think he goes to usf, he lives around here though
spam	FreeMsg Hey there darling it's been 3 week's now and no word back! I'd like some fun you up for it still? Tb ok! XxX std chgs to send, å£1.50 to rcv
ham	Even my brother is not like to speak with me. They treat me like aids patent.
ham	As per your request 'Melle Melle (Oru Minnaminunginte Nurungu Vettam)' has been set as your callertune for all Callers. Press *9 to copy your friends Callertune
spam	WINNER!! As a valued network customer you have been selected to receivea å£900 prize reward! To claim call 09061701461. Claim code KL341. Valid 12 hours only.
spam	Had your mobile 11 months or more? U R entitled to Update to the latest colour mobiles with camera for Free! Call The Mobile Update Co FREE on 08002986030
ham	I'm gonna be home soon and i don't want to talk about this stuff anymore tonight, k? I've cried enough today.
spam	SIX chances to win CASH! From 100 to 20,000 pounds txt> CSH11 and send to 87575. Cost 150p/day, 6days, 16+ TsandCs apply Reply HL 4 info
spam	URGENT! You have won a 1 week FREE membership in our å£100,000 Prize Jackpot! Txt the word: CLAIM to No: 81010 T&C www.dbuk.net LCCLTD POBOX 4403LDNW1A7RW18
ham	I've been searching for the right words to thank you for this breather. I promise i wont take your help for granted and will fulfil my promise. You have been wonderful and a blessing at all times
ham	I HAVE A DATE ON SUNDAY WITH WILL!!
spam	XXXMobileMovieClub: To use your credit, click the WAP link in the next txt message or click here>> http://wap. xxxmobilemovieclub.com?n=QJKGIGHJJGCBL
ham	Oh k...i'm watching here:)
ham	Eh u remember how 2 spell his name... Yes i did. He v naughty make until i v wet.
ham	Fine if thatÕs the way u feel. ThatÕs the way its gota b

Fig. 3 Dataset (Messages) [13]

4 Results and Analysis

4.1 Dataset Description

For our research sample, WhatsApp data was taken from the Kaggle website.

The following stages for generating the results used machine learning algorithms.

1. Data cleaning
2. EDA
3. Text preparation
4. Model building
5. Evaluation
6. Improvement
7. Website
8. Deployment of project

4.2 Data Cleaning

Data cleansing is a process of different structural errors in data sets. That includes misspellings, syntax errors, wrong numerical entries, and missing values. Figure 3 shows the difference in messages reduced from before and after preprocessing (Fig. 4).

4.3 EDA

Exploratory Data Analysis (EDA) is crucial for developing effective machine learning models, such as scatter plots, histograms, box plots, and descriptive statistics, to identify trends and patterns in datasets. The following diagram shows data imbalanced data in pie chart (Fig. 5).

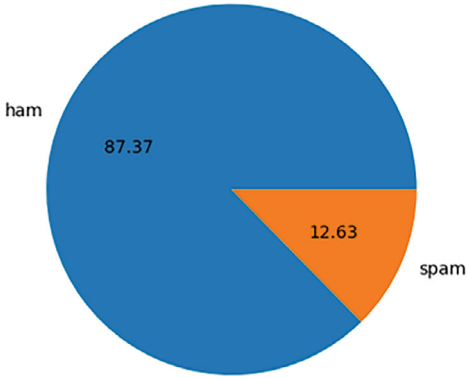
Fig. 4 Before and after data preprocessing

	v1	v2
2225	ham	Alrite jod hows the revision goin? Keris bin d...
4732	ham	Good Morning my Dear Shijutta..... Have ...
967	ham	What do u want when i come back?.a beautiful n...
461	ham	Great. Never been better. Each day gives even ...
2912	ham	Kindly send some one to our flat before <D...

```
# renaming the cols
df.rename(columns={'v1':'target','v2':'text'},inplace=True)
df.sample(5)
```

	target	text
2167	ham	Yes.he have good crickiting mind
4025	ham	Oh ok.. Wat's ur email?
471	ham	How long has it been since you screamed, princ...
2224	ham	I prefer my free days... Tues, wed, fri oso ca...
5241	ham	Its a part of checking IQ

Fig. 5 Exploratory data analysis



Heatmaps are used in numerous forms of analytics but are commonly used to demonstration user behavior on exact web pages (Fig. 6).

4.4 Data Preprocessing

Preprocessing is a method to clean the text data and make it ready data for the model. This data contains, noise in numerous procedures like emotions, punctuation, and manuscripts in dissimilar cases. The following things focus on data preprocessing (Fig. 7).

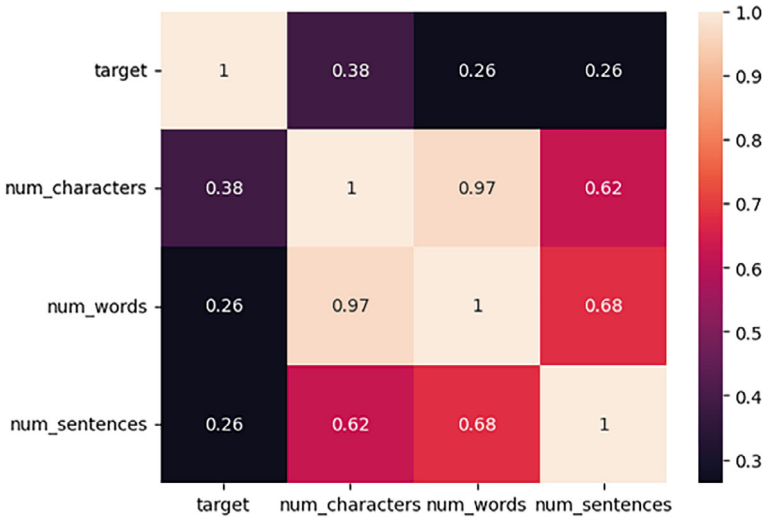


Fig. 6 Heat map for sentences, words, and characters

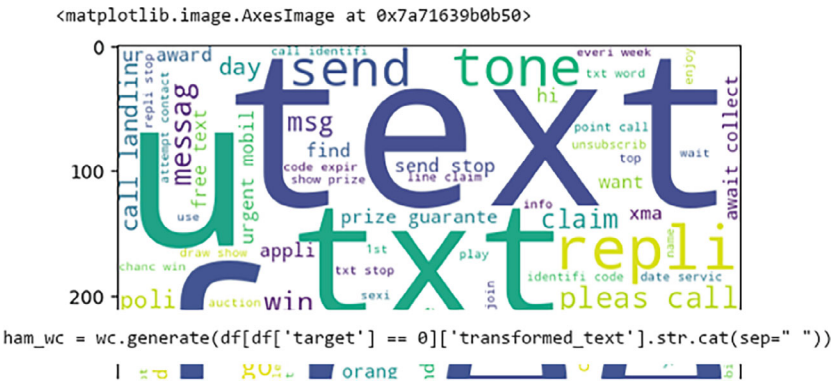


Fig. 7 Mostly used words

Letter cases
Tokenization
Removing specific characters
Removing stop words
Punctuation stemming

4.5 Model Building

The combination of LR and DT provides an accuracy rate of 97.2%. Finally, the experimental results show that hybrid machine learning algorithms and individual machine learning predict the same optimal accuracy results. Few algorithms only generate less amount of accuracy rate. It is also based on a dataset, that is one reason. Our experiment shows that more than 97% accuracy rate (Fig. 8 and Table 1).

5 Conclusion

Regardless of the topic on which the conversation is based, this web application can also be used to detect spam messages. This web application displays all messages, in the form of a graph every month, as well as the frequently used words and the active participant's conversation. This web application also detects spam messages by a person and shows the total spam messages in a particular chat. The benefit of this tool is that it has been developed using straightforward Python modules like Pandas, Streamline, Seaborn, and Word Cloud, as well as Machine Learning Algorithms that are used to create data frames and generate various graphs that are then displayed in the application. These machine learning algorithms are effective and resource-light, making them suitable for large data sets. SVM, Naïve Bayes, logistic regression, and decision tree. Hybrid machine learning algorithms were used to form an ensemble model with an accuracy of 98%.