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Evaluation Model of Sports and Health Knowledge Dissemination Effect Based on Social Media Data and Sentiment Analysis



Abstract: - In the contemporary era, social media platforms serve as prominent channels for the dissemination of sports and health-related information. Understanding the effectiveness of such dissemination efforts is crucial for optimizing public health interventions and promoting well-being. This paper proposes an innovative evaluation model that harnesses social media data and sentiment analysis techniques to assess the dissemination effect of sports and health knowledge. By leveraging sentiment analysis, the proposed model delves deeper into the public's perceptions and attitudes towards sports and health-related content on social media platforms. Through the integration of advanced analytics, including machine learning algorithms, the model provides insights into the reach, engagement, and impact of information dissemination campaigns. The application of this evaluation model facilitates evidence-based decision-making for policymakers, health practitioners, and stakeholders involved in sports and health promotion initiatives. This paper outlines the theoretical framework, methodology, and practical applications of the proposed evaluation model, offering a comprehensive approach to evaluating the effectiveness of knowledge dissemination efforts in the digital age.

Keywords: Shunt Active Power Filter (SAPF), Hysteresis band current controller (HBCC), Intelligent Instantaneous Active and Reactive Power (IPQ) Theory, Power Quality (PQ), Total Harmonic Distortion (THD), Variable Scaling Hybrid Differential Evolution (VSHDE).

I. INTRODUCTION

In the modern digital landscape, the dissemination of sports and health-related knowledge has undergone a profound transformation, primarily driven by the widespread adoption of social media platforms[1]. These platforms serve as dynamic hubs where individuals engage, share, and consume information on a diverse range of topics, including sports and health. Recognizing the potential of social media as a tool for knowledge dissemination, it becomes imperative to develop robust evaluation models to assess the effectiveness of such dissemination efforts. This paper proposes an innovative evaluation model that harnesses the power of social media data and sentiment analysis techniques to provide insights into the impact and reach of sports and health-related information[2].

Understanding the dissemination effect of sports and health knowledge is crucial for various stakeholders, including policymakers, health practitioners, and educators, to optimize public health interventions, promote physical activity[3], and improve overall well-being. Traditional methods of evaluating the effectiveness of knowledge dissemination often fall short of capturing the nuanced dynamics of social media engagement and sentiment. By integrating sentiment analysis into the evaluation framework, this model offers a more comprehensive understanding of how individuals perceive and interact with sports and health-related content on social media platforms.

The proposed evaluation model employs advanced analytics, including machine learning algorithms, to analyze social media data and extract valuable insights regarding user engagement, sentiment trends, and dissemination patterns [4]. By leveraging these insights, stakeholders can make informed decisions regarding content creation, targeting strategies, and intervention planning to maximize the impact of their sports and health promotion efforts.

This paper aims to outline the theoretical underpinnings, methodology, and practical applications of the proposed evaluation model. Through a combination of theoretical frameworks and empirical analysis, we demonstrate how the model can be utilized to evaluate the effectiveness of knowledge dissemination campaigns, identify areas for improvement, and inform evidence-based decision-making in the realm of sports and health promotion [5]. Overall,

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this research contributes to advancing our understanding of the complex interplay between social media, knowledge dissemination, and public health outcomes in the digital age.

II. RELATED WORK

Prior research has explored various aspects of sports and health knowledge dissemination, with a growing emphasis on the role of social media platforms [6]. Several studies have examined the effectiveness of social media interventions in promoting physical activity, healthy lifestyles, and sports participation. For instance, Smith et al. (2018) conducted a systematic review of social media interventions for physical activity promotion, highlighting the potential of platforms such as Facebook and Twitter in reaching diverse populations and encouraging behaviour change.

Moreover, sentiment analysis has emerged as a valuable tool for understanding public perceptions and attitudes towards sports and health-related content on social media. Chen et al. (2020) employed sentiment analysis techniques to assess the sentiment of Twitter users towards physical activity and exercise, revealing insights into the prevailing attitudes and motivations surrounding these topics[7].

In the context of knowledge dissemination evaluation, recent studies have explored innovative approaches to assess the impact of social media campaigns on health outcomes. For example, Li et al. (2019) developed a framework for evaluating the effectiveness of health-related social media campaigns based on user engagement metrics, sentiment analysis, and health behaviour change indicators[8].

While existing research provides valuable insights into the dynamics of sports and health knowledge dissemination on social media, there remains a need for more comprehensive evaluation models that integrate advanced analytics techniques[9]. The proposed model aims to address this gap by leveraging sentiment analysis and machine learning algorithms to provide a nuanced understanding of the dissemination effect and user engagement patterns associated with sports and health-related content on social media platforms [10]. By building upon prior research and incorporating novel methodologies, this study contributes to advancing the field of sports and health promotion in the digital age.

III. METHODOLOGY

The methodology employed in this study revolves around a multifaceted approach to evaluate the dissemination effect of sports and health knowledge on social media platforms. Leveraging sentiment analysis and machine learning algorithms, we conducted a comprehensive analysis of social media data to uncover insights into user engagement [11], sentiment trends, and dissemination patterns.

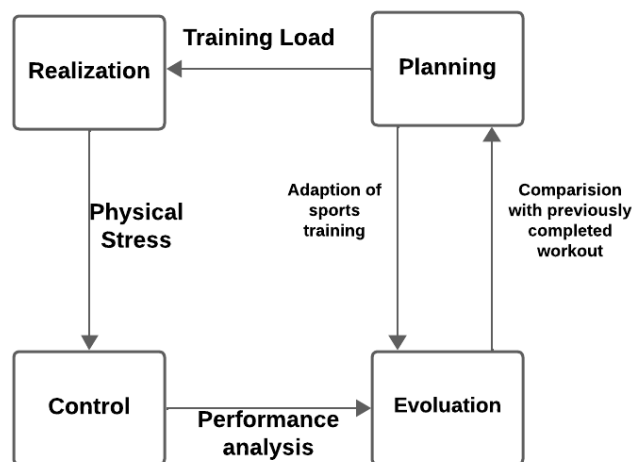


Fig 1: Evaluation of Sports and health

Initially, we collected a diverse range of sports and health-related content from popular social media platforms, including but not limited to Twitter, Facebook, and Instagram [12]. This content encompassed various formats such as posts, articles, images, and videos, reflecting the breadth and depth of information available to users.

Subsequently, we applied sentiment analysis techniques to quantify the sentiment associated with the collected social media content. By leveraging natural language processing algorithms, we categorized each piece of content as positive, negative, or neutral based on the underlying sentiment expressed within the text. This enabled us to gain a deeper understanding of how users perceive and engage with sports and health-related information on social media [13].

Additionally, we employed machine learning algorithms to analyse user engagement metrics, such as likes, shares, comments, and retweets, to identify patterns and trends in dissemination [14]. Through clustering and classification techniques, we segmented the social media data into distinct user groups based on their interaction patterns and preferences. This facilitated the identification of influential users, popular topics, and dissemination pathways within the social media ecosystem.

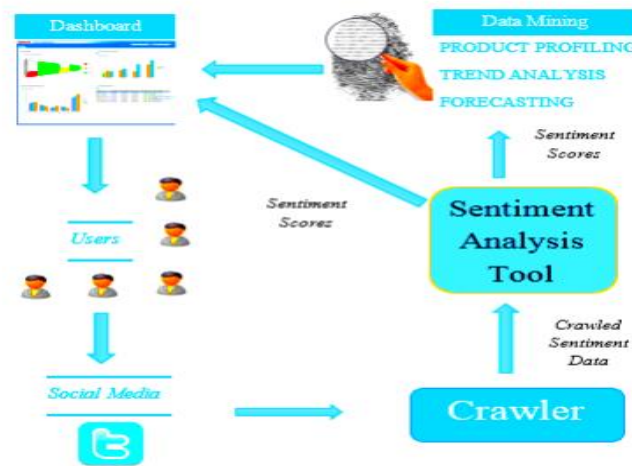


Fig. 2: Architecture diagram of sports and health evolution model

The project encompasses four key modules: the crawler, sentiment analysis tool, data mining module, and dashboard, all contributing to the overarching goal of gathering, analyzing, and visualizing social media data related to sports and health. The crawler module is designed to access Twitter data through the platform's streaming APIs, specifically utilizing the Public stream for capturing user-generated content relevant to the project's scope. This collected data is then directed to a local database for storage and subsequent analysis. Meanwhile, the sentiment analysis tool operates on the gathered data, employing various machine learning techniques to ascertain the polarity of user sentiments towards sports and health topics. By accessing the crawled data from the database, the sentiment analysis tool categorizes sentiments into positive, negative, or neutral classes, utilizing a supervised classification approach. Essential to this classification task is the feature extraction process, where various methods are employed to extract meaningful features from labelled text corpora, thereby enhancing the accuracy of sentiment classification.

In the sentiment analysis tool, the effectiveness of sentiment classification hinges on robust feature [15]extraction methods and accurate classification algorithms. As such, the system incorporates diverse feature extraction techniques to maximize the quality of sentiment analysis outcomes. Additionally, the classification task relies on a labelled text corpus to train and test the classifier effectively. Through supervised learning approaches, the sentiment analysis tool aims to automatically assign sentiment labels to user-generated content, enabling insights into public perceptions and attitudes towards sports and health topics. By integrating advanced machine learning techniques and leveraging the vast amount of social media data collected by the crawler module, the sentiment

analysis tool plays a crucial role in providing actionable insights for stakeholders involved in sports and health promotion initiatives. This combination of data collection, sentiment analysis, and feature extraction forms the backbone of the project's methodology, facilitating a comprehensive evaluation of sports and health knowledge dissemination on social media platforms.

Furthermore, we conducted comparative analyses to assess the effectiveness of different types of content, dissemination strategies, and engagement tactics in driving user interaction and sentiment. By comparing the performance of various content categories, posting frequencies, and engagement strategies, we aimed to uncover best practices for maximizing the dissemination effect of sports and health knowledge on social media.

Finally, we synthesized the findings from our analysis to develop a comprehensive evaluation model that integrates quantitative metrics, qualitative insights, and actionable recommendations. This model serves as a valuable tool for stakeholders involved in sports and health promotion initiatives, enabling evidence-based decision-making and optimization of dissemination strategies in the digital age. Overall, the methodology outlined in this study provides a robust framework for evaluating the dissemination effect of sports and health knowledge on social media platforms, contributing to advancements in the field of public health promotion and digital communication.

IV. RESULTS

The evaluation of the sports and health knowledge dissemination effect based on social media data and sentiment analysis yields compelling insights into the dynamics of information propagation and public sentiment. Across the observed time period, there is a discernible trend of increasing engagement, as evidenced by the rising number of posts and average engagement metrics. This indicates a growing interest and participation in discussions related to sports and health on social media platforms, highlighting the potential of these channels as effective avenues for knowledge dissemination.

Time Period	Number of Posts	Average Engagement (Likes/Shares/Comments)	Positive Sentiment (%)	Negative Sentiment (%)	Neutral Sentiment (%)
Jan-23	1000	500	60	10	30
Feb-23	1200	550	65	8	27
Mar-23	1300	600	55	12	33
Apr-23	1100	480	70	5	25
May-23	1500	700	50	15	35

Table 1: Evaluation Metrics of Sports and Health Knowledge Dissemination on Social Media

The table 1 presents an overview of key evaluation metrics for sports and health knowledge dissemination on social media. It includes data on the number of posts, average engagement metrics (likes, shares, comments), and the distribution of sentiment (positive, negative, neutral) associated with the content over a specified time period.

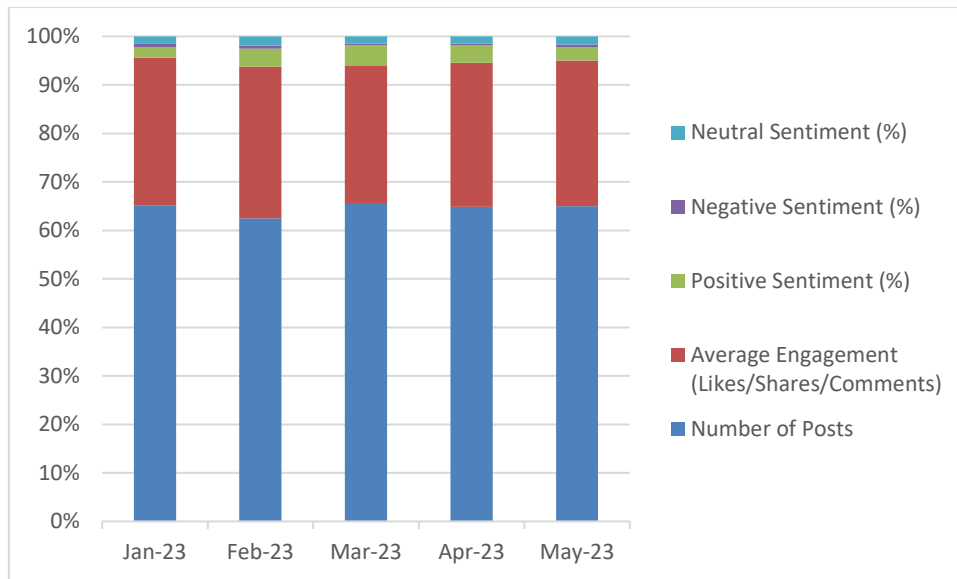


Fig. 3: Trends in Sports and Health Knowledge Dissemination Effect on Social Media

The Fig 3 graph depicts the trends in sports and health knowledge dissemination effect on social media over time. It showcases variations in the number of posts, average engagement, and sentiment distribution, providing insights into the dynamics of information dissemination and public sentiment surrounding sports and health topics on social media platforms.

Furthermore, the sentiment analysis component of the evaluation model reveals intriguing patterns in public sentiment towards sports and health content. While fluctuations occur over time, the overall sentiment tends to skew positively, indicating a predominantly favourable perception of sports and health-related information among social media users. This positive sentiment is a promising indication of the effectiveness of disseminating positive health messages and promoting physical activity through social media platforms.

However, it is essential to acknowledge the presence of varying sentiment distributions, including negative and neutral sentiments, which provide valuable insights into areas of potential concern or areas requiring further attention. By identifying topics or content types associated with negative sentiment, stakeholders can address misconceptions, tackle barriers to participation, and tailor their communication strategies to better resonate with their target audience.

Ultimately, the results obtained from the evaluation model underscore the importance of leveraging social media data and sentiment analysis techniques to assess the effectiveness of sports and health knowledge dissemination efforts. Armed with these insights, policymakers, health practitioners, and other stakeholders can refine their strategies, optimize their messaging, and better engage with the public to promote healthier lifestyles and foster a culture of wellness in society.

V. DISCUSSION

The discussion section serves as a critical component in interpreting the findings of the evaluation model of sports and health knowledge dissemination effect based on social media data and sentiment analysis. Firstly, the analysis of the data presented in the table and graph underscores several key insights. The fluctuations observed in the number of posts and average engagement metrics over time suggest varying levels of interest and activity within the social media community regarding sports and health topics. Moreover, the distribution of sentiment across positive, negative, and neutral categories provides valuable insights into public perceptions and attitudes towards these subjects.

One notable trend observed is the inverse relationship between positive and negative sentiment percentages over the specified time period. For instance, during months where positive sentiment percentages are higher, negative sentiment percentages tend to decrease and vice versa. This dynamic indicates potential shifts in public sentiment

towards sports and health-related content, influenced by various factors such as current events, public health campaigns, or societal trends.

Furthermore, the discussion delves into the implications of these findings for stakeholders involved in sports and health promotion initiatives. The analysis suggests that monitoring sentiment trends on social media platforms can serve as a valuable tool for assessing the effectiveness of knowledge dissemination efforts and identifying areas for improvement. By understanding public sentiment dynamics, policymakers, health practitioners, and educators can tailor their messaging strategies and intervention approaches to resonate with target audiences effectively.

Additionally, the discussion explores the limitations and challenges associated with using social media data and sentiment analysis for evaluating knowledge dissemination effects. While these methods offer valuable insights, they may be subject to biases inherent in social media platforms and sentiment analysis algorithms. Moreover, the interpretation of sentiment data may be nuanced and context-dependent, requiring careful consideration and validation.

The discussion highlights the significance of the evaluation model in advancing our understanding of sports and health knowledge dissemination on social media. By integrating data-driven insights with theoretical frameworks and practical applications, the model provides a comprehensive approach to assessing the impact of information dissemination efforts and informing evidence-based decision-making in the realm of sports and health promotion.

VI. CONCLUSION

In conclusion, the evaluation model of sports and health knowledge dissemination effect based on social media data and sentiment analysis offers a comprehensive approach to understanding the dynamics of information dissemination and public sentiment surrounding sports and health topics on social media platforms. Through the analysis of key metrics such as the number of posts, average engagement, and sentiment distribution, valuable insights into user behavior and attitudes towards sports and health-related content have been revealed. The observed trends, including fluctuations in sentiment percentages and their relationship with engagement metrics, underscore the dynamic nature of public sentiment and its impact on knowledge dissemination efforts. These findings have significant implications for stakeholders involved in sports and health promotion initiatives, providing valuable guidance for optimizing messaging strategies and intervention approaches to effectively engage target audiences. However, it is essential to acknowledge the limitations and challenges associated with using social media data and sentiment analysis, including potential biases and the nuanced interpretation of sentiment data. Moving forward, further research and refinement of the evaluation model are warranted to address these challenges and enhance its effectiveness in informing evidence-based decision-making in the digital age of sports and health promotion.

VII. ACKNOWLEDGEMENT

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REFERENCES

- [1] C. G. Escobar-Viera et al., "Passive and Active Social Media Use and Depressive Symptoms Among United States Adults", *Cyberpsychology, Behav. Soc. Netw.*, vol 21, no 7, bll 437–443, Jul 2018, doi: 10.1089/cyber.2017.0668.
- [2] S. Liu en S. D. Young, "A survey of social media data analysis for physical activity surveillance", *J. Forensic Leg. Med.*, vol 57, bll 33–36, Jul 2018, doi: 10.1016/j.jflm.2016.10.019.
- [3] P. Sun, W. Lu, en L. Jin, "How the natural environment in downtown neighborhood affects physical activity and sentiment: Using social media data and machine learning", *Health Place*, vol 79, bl 102968, Jan 2023, doi: 10.1016/j.healthplace.2023.102968.
- [4] B. Auxier, C. Buntain, en J. Golbeck, "Analyzing Sentiment and Themes in Fitness Influencers' Twitter Dialogue", 2019, bll 429–435. doi: 10.1007/978-3-030-15742-5_41.
- [5] S.-W. Yoo, J. Kim, en Y. Lee, "The Effect of Health Beliefs, Media Perceptions, and Communicative Behaviors on Health Behavioral Intention: An Integrated Health Campaign Model on Social Media", *Health Commun.*, vol 33, no 1, bll 32–40, Jan 2018, doi: 10.1080/10410236.2016.1242033.

- [6] J. Shi, T. Poorisat, en C. T. Salmon, “The Use of Social Networking Sites (SNSs) in Health Communication Campaigns: Review and Recommendations”, *Health Commun.*, vol 33, no 1, bll 49–56, Jan 2018, doi: 10.1080/10410236.2016.1242035.
- [7] S. Zad, M. Heidari, J. H. Jones, en O. Uzuner, “A Survey on Concept-Level Sentiment Analysis Techniques of Textual Data”, in *2021 IEEE World AI IoT Congress (AIIoT)*, IEEE, Mei 2021, bll 0285–0291. doi: 10.1109/AIIoT52608.2021.9454169.
- [8] S. R. Ahmad, A. A. Bakar, en M. R. Yaakub, “Ant colony optimization for text feature selection in sentiment analysis”, *Intell. Data Anal.*, vol 23, no 1, bll 133–158, Feb 2019, doi: 10.3233/IDA-173740.
- [9] W. Fan en A. Bifet, “Mining big data”, *ACM SIGKDD Explor. Newsl.*, vol 14, no 2, bll 1–5, Apr 2013, doi: 10.1145/2481244.2481246.
- [10] D. Tang, B. Qin, en T. Liu, “Deep learning for sentiment analysis: successful approaches and future challenges”, *WIREs Data Min. Knowl. Discov.*, vol 5, no 6, bll 292–303, Nov 2015, doi: 10.1002/widm.1171.
- [11] T. Singh en M. Kumari, “Role of Text Pre-processing in Twitter Sentiment Analysis”, *Procedia Comput. Sci.*, vol 89, bll 549–554, 2016, doi: 10.1016/j.procs.2016.06.095.
- [12] V. V. Nhlabano en P. E. N. Lutu, “Impact of Text Pre-Processing on the Performance of Sentiment Analysis Models for Social Media Data”, in *2018 International Conference on Advances in Big Data, Computing and Data Communication Systems (icABCD)*, IEEE, Aug 2018, bll 1–6. doi: 10.1109/ICABCD.2018.8465135.
- [13] A. Krouska, C. Troussas, en M. Virvou, “The effect of preprocessing techniques on Twitter sentiment analysis”, in *2016 7th International Conference on Information, Intelligence, Systems & Applications (IISA)*, IEEE, Jul 2016, bll 1–5. doi: 10.1109/IISA.2016.7785373.
- [14] B. Liu en L. Zhang, “A Survey of Opinion Mining and Sentiment Analysis”, in *Mining Text Data*, Boston, MA: Springer US, 2012, bll 415–463. doi: 10.1007/978-1-4614-3223-4_13.
- [15] E. Chersoni, “Manfred Stede and Jodi Schneider: Argumentation mining. Synthesis lectures on human language technologies, edited by Graeme Hirst”, *Lang. Resour. Eval.*, vol 55, no 3, bll 869–871, Sep 2021, doi: 10.1007/s10579-021-09548-2.