USING ARTIFICIAL INTELLIGENCE IN SN ANALYSIS: BUILDING MODELS TO UNDERSTAND AND PREDICT USER BEHAVIOR

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ABSTRACT

Introduction: The study explores the use of artificial intelligence (AI) and sentiment analysis to predict personality traits and behaviors from the extensive data available on social networks. It aims to understand the dynamics of user interaction and the spread of viral content through AI-driven models.

Methods: The research applies various AI and machine learning techniques, particularly focusing on natural language processing (NLP), to analyze social media data. The methodology includes sentiment analysis to categorize text into distinct emotional responses and predictive analytics to forecast trends in user engagement and content virality.

Results: Results indicate that AI can effectively predict user behaviors and personality traits such as neuroticism, which correlates with higher aggression and more frequent, prolonged use of social media. The study identifies key patterns and trends that influence user interactions on social networks.

Discussion: The discussion centers on the implications of AI in social media analytics, addressing both the technological advancements and the ethical considerations of profiling user

behavior. It emphasizes the need for robust models that can handle the complexity and variability of data in social networks.

Conclusion: The research demonstrates that AI and machine learning are invaluable tools for analyzing social networks, providing insights that can enhance user engagement strategies and content delivery. The study advocates for continued development and refinement of AI models to better understand and predict user behavior.

Keywords: Big data analysis. Machine learning in SNs. Prediction of user activity. Classification algorithms. Detection of behavior patterns.

UTILIZAÇÃO DA INTELIGÊNCIA ARTIFICIAL NA ANÁLISE DE SN: CONSTRUÇÃO DE MODELOS PARA COMPREENDER E PREVER O COMPORTAMENTO DOS UTILIZADORES

RESUMO

Introdução: Este estudo investiga a aplicação de técnicas de inteligência artificial (IA) e análise de sentimentos para prever traços de personalidade e comportamentos a partir dos dados extensos disponíveis nas redes sociais. O objetivo é entender a dinâmica das interações dos usuários e a disseminação de conteúdo viral através de modelos baseados em IA.

Métodos: A pesquisa emprega diversas técnicas de IA e aprendizado de máquina, com foco especial em processamento de linguagem natural (PLN), para analisar dados de mídia social. A metodologia inclui análise de sentimentos para categorizar textos em respostas emocionais distintas e análise preditiva para prever tendências no engajamento dos usuários e na viralidade do conteúdo.

Resultados: Os resultados indicam que a IA pode prever efetivamente comportamentos e traços de personalidade dos usuários, como neuroticismo, que se correlaciona com maior agressividade e uso mais frequente e prolongado das redes sociais. O estudo identifica padrões e tendências-chave que influenciam as interações dos usuários nas redes sociais.

Discussão: A discussão foca nas implicações do uso da IA na análise de mídias sociais, abordando tanto os avanços tecnológicos quanto as considerações éticas do perfilamento de comportamentos dos usuários. Enfatiza a necessidade de modelos robustos capazes de manejar a complexidade e variabilidade dos dados em redes sociais.

Conclusão: A pesquisa demonstra que a IA e o aprendizado de máquina são ferramentas inestimáveis para a análise de redes sociais, fornecendo insights que podem melhorar estratégias de engajamento dos usuários e entrega de conteúdo. O estudo defende o desenvolvimento e refinamento contínuos de modelos de IA para melhor compreender e prever o comportamento dos usuários.

Palavras-chave: Análise de grandes volumes de dados. Aprendizagem automática em SN. Previsão da atividade do utilizador. Algoritmos de classificação. Deteção de padrões de comportamento.

UTILIZANDO LA INTELIGENCIA ARTIFICIAL EN EL ANÁLISIS SN: CONSTRUYENDO MODELOS PARA ENTENDER Y PREDECIR EL COMPORTAMIENTO DEL USUARIO

RESUMEN

Introducción: Este estudio explora el uso de la inteligencia artificial (IA) y el análisis de sentimientos para predecir rasgos de personalidad y comportamientos a partir de la extensa cantidad de datos disponibles en las redes sociales. El objetivo es comprender la dinámica de la interacción de los usuarios y la difusión de contenido viral a través de modelos impulsados por IA.

Métodos: La investigación aplica diversas técnicas de IA y aprendizaje automático, con un enfoque particular en el procesamiento de lenguaje natural (PLN), para analizar datos de medios sociales. La metodología incluye análisis de sentimientos para categorizar textos en respuestas emocionales distintas y análisis predictivo para pronosticar tendencias en el compromiso de los usuarios y la viralidad del contenido.

Resultados: Los resultados indican que la IA puede predecir eficazmente los comportamientos y rasgos de personalidad de los usuarios, como el neuroticismo, que se correlaciona con una mayor agresividad y un uso más frecuente y prolongado de las redes sociales. El estudio identifica patrones y tendencias clave que influyen en las interacciones de los usuarios en las redes sociales.

Discusión: La discusión se centra en las implicaciones de estos hallazgos para la comprensión del comportamiento de los usuarios en las redes sociales y el potencial de estas tecnologías para contribuir a la entrega de contenido personalizado y la publicidad dirigida. También se examinan los desafíos en la modelación precisa del comportamiento del usuario debido a la complejidad y variabilidad de los datos humanos.

Conclusión: La investigación demuestra que la IA y el aprendizaje automático son herramientas valiosas para analizar redes sociales, proporcionando perspectivas que pueden mejorar las estrategias de compromiso del usuario y la entrega de contenido. El estudio aboga por el desarrollo y refinamiento continuo de modelos de IA para comprender mejor y predecir el comportamiento del usuario.

Palabras clave: Análisis de big data. Aprendizaje automático en redes sociales. Predicción de la actividad de los usuarios. Algoritmos de clasificación. Detección de patrones de comportamiento.

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1. INTRODUCTION

An increasing number of people are using SNs (SN) platforms like Facebook, Twitter, and Instagram as a result of the Internet's and information technology's rapid growth. SN applications make for around 5% of all applications for smartphones (Riadi & Rafiq, 2022; Sheikhi, 2020; Yang, Zhang, Zhang, & Xia, 2019). It is sufficient to state that SNs are now the primary means of obtaining information. Nonetheless, the massive volume of user actions on social media platforms, such likes, comments, and re-posts readily contributes to the issue of information overload while showcasing the enormous potential of big data (Colombo et al., 2023; Y. Liu, Yang, Sun, & Bin, 2020).

Both domestic and international researchers have focused a great deal of emphasis on SN-based user activity prediction, in addition to the broad use of big data analysis, customized recommendation systems, and text mining in a variety of sectors. These days, SNs have a significantly bigger impact than newspapers and TVs thanks to their abundance of user behaviors, sentiments, and communication tools (Z. Liu & Song, 2024). User interaction analysis to identify the psychological trend and choice of users after developing an emotion prediction model. They conducted pertinent simulations and examined two important characteristics of SN users: the friend-dependent impact on society and the time connection between past and present feelings (Zheng & Ling, 2021).

Human behavior research greatly benefits from big analysis of the data of user patterns on social media platforms online (AlBaik & Al-Azhari, 2021). A dynamic model of user behavior was created by Rosa et al. (Rosa et al., 2020) and it describes both individual and group problems such as social anxiety, social identity, social engagement, and social connections. This model provides a methodical approach to identify subjects that are trending, analyzes the features of the power-law distribution within the topic time series intervals, and pinpoints the causes of the power-law pattern distribution behaviors with varying power exponents. how SN members' interactions and actions impact their subsequent actions.

Through distributed clustering of societal pressure and recognition by society of users, he developed the matching group dynamic model and retrieved the properties and distribution of group features, showing both individual and group aspects of user actions (Shahbaznezhad, Dolan, & Rashidirad, 2021).

By integrating the team-based filtering algorithm into the series recommendations model, able to harvest SN members' cascade features, such interaction frequency and relevancy (Yu et al., 2021). Bhattacharya et al. (Bhattacharya, Phan, Bai, & Airoldi, 2019) explored the

link between SN members' characteristics (e.g., age, gender, and ethnicity) and their actions (e.g., sharing and repost) by drawing on the idea of homogeneity.

They used multiple linear regression (MLR) and support vector regression (SVR) to anticipate the gender distribution of users uploading the same class of items and the click-through rate (CTR) of the same websites. They used a quick search method called linear discriminant analysis (LDA) to enable the creation of social groupings and the search for individuals with comparable interests.

User behavior in actual SNs is multifaceted and dynamic, driven by a range of variables such as interests outside of work, social influence, trending topics, and algorithmic changes on the website. Social scientists, platform operators, content producers, and marketing strategists all need to be able to predict user behavior in SNs. On SNs, user behavior is dynamic and always changing. Forecasts spanning several time periods might aid in comprehending these dynamic shifts and offer a temporal viewpoint for developing appropriate tactics.

Continuous and immediate patterns are taken into consideration when estimating user behavior at various time intervals, which improves the thoroughness and accuracy of forecasts. While long-term projections aid in understanding underlying, deeper patterns, short-term predictions can catch changes as they happen (Meng, Mao, Zhang, Wen, & Wu, 2019).

SNs provide an ideal setting for emotional AI. They are merely a large-scale, multi-person social structure, a phenomenon of the twenty-first century information society. In actuality, SNs serve as marketplaces where productive relationships are established between businesses' many stakeholders, including suppliers, customers, and manufacturers. SNs are a unique kind of networked services.

Using this structure, users create their profiles in accordance with the guidelines of a SN, select a group of friends, and share specific information with them, connecting all of their social connections with other network members. societal media has completely changed the way individuals communicate with one another and has opened up new avenues for addressing societal problems. However, it is clear that their effects on wellness vary depending on who and how they are used (Gerlich, Elsayed, & Sokolovskiy, 2023).

Aim

This article's goal is to investigate the application of AI to SN research, with a particular emphasis on how AI is used to create models that comprehend and predict user behavior.

Objective

1. Examine the role that SNs have in modern life and the difficulties of manually evaluating large volumes of social data

2. Analyze how well AI algorithms—like ML and deep learning—process massive datasets and spot trends in SN data.

3. Examine the steps involved in creating AI-powered SN analysis models, such as feature extraction, data preparation, and model training.

4. Talk about how community recognition methods, sentiment analysis, and network topology analysis are employed by AI models to comprehend user behavior in SNs.

5. Examine how AI may be used to anticipate user behavior, engagement patterns, and the spread of information in SN analysis.

6. Talk about the difficulties and restrictions that come with using AI in SN research, including moral issues like algorithmic prejudice and user privacy.

7. Analyze new developments and directions in AI-driven SN analysis, making predictions about possible uses in a range of fields such as social policy, cybersecurity, and healthcare.

2. MATERIALS AND METHODS

Related research claims that SNs can bring attention to qualities that people don't normally share with the outside world. When online users can learn more about a person than they can, it upends the notion held by individuals who think they know themselves. Similarly, the study (Carvalho & Plastino, 2021) notes that there is a substantial relationship between users' daily tweets and their personalities, particularly about the five positive qualities (Sharma & Jain, 2023).

What may be found out by textually analyzing the terms that people use in their tweets? For instance, the authors' findings show that extraversion is more strongly correlated with terms about family, while conscientiousness is more strongly correlated with terms about health. Facebook and Twitter are the most widely used SNs, per the article (Hourrane & Idrissi, 2019).

The article provides a business analysis feature that considers the usage of views in software that is applied to firms generally (Ligthart, Catal, & Tekinerdogan, 2021). This feature improves the opposing perspectives of the material. According to research conducted in (Shetty, 2021), it is advised that technology be developed such that, with the aid of vector support machines, opinion-free perception and exploration be made possible; in other words, opinions serve as the analysis. However, because tweets are evaluated generally, they lack a focused subject. they may then determine how they get at the outcome using systematized methods.

In the study (Gao, Wang, He, Feng, & Zhang, 2023), supervised learning with artificial neural networks is used to construct a tweet categorization model that divides Twitter account users into several groups. Through the use of personal online questionnaires and the qualitative technique of in-person interviews, data was gathered for this study from an accurate representation of network users. This approach accomplishes its goal by examining users' digital photos. Other teams have created a computerized summary system based on using methods based on latent semantic analysis to extract the most representative tweets semantic analysis that determines a tweet's popularity (Hourrane & Idrissi, 2019).

A different review (Salsabila & Setiawan, 2021) calculates people's personalities by creating a questionnaire based on the Big Five Inventory (BFI) traits and utilizing it on 295 Twitter users. Linguistic Inquiry Analysis and Word Count (LIWC) are combined with three machine learning techniques—K-Nearest-Neighbor (KNN), support vector machine (SVM), and Multinomial Naive Bayes (MNB) (Kaushik et al., 2022)—in this study to improve the performance of the personality prediction system.

These approaches serve as the foundation for the creation of a model that uses algorithms and autonomous learning techniques to predict university students' personalities (Huguet Benavent & Gandía Cabedo, 2021). This work incorporates various concepts from the suggested technique as well as the assumptions contained in the associated publications.

Apart from the models mentioned above, work (Villegas-Ch, Molina, Janón, Montalvo, & Mera-Navarrete, 2022) delves into the development of a data mining approach aimed at examining the opinions expressed in tweets about the unique authority for peace. This study aims to organize and carry out a sequence of actions that will enable this process to be carried out as efficiently and sustainably as possible. As a consequence, a model for data mining is put into practice to categorize the related tweets according to users' sentiments to ascertain their opinions on a certain subject and its workings (Abbas, Memon, Jamali, Memon, & Ahmed, 2019).

3. RESULT AND DISCUSSION

Prediction using AI

SNs are now the essential part of our regular activities, they are the sources of interaction, communication and information. As the number of social media sites increases, there is one immense pool of data created every second and a wide range of findings related to human behavior are achieved. Harnessing AI for SN analysis provides academics and companies with

insight, which they use to map out patterns, understand systems, and forecast users' behaviors (Pandey, Bhanodia, Khamparia, & Pandey, 2019). This article will touch on a few AI's SN role and its implications.

Understanding SNs: SNs are the main means of communication and interaction in our society, nowadays. Go into depth on the convolution of SNs, huge datasets that leads to difficult extraction of useful insights only via manual efforts (Haghani & Keyvanpour, 2019).

Role of Artificial Intelligence

Name Artificial Intelligence as a contemporary issue that deals with SN Analysis. Emphasize the power of AI in large data analysis, pattern recognition, and hidden relationship exploration tasks where a human cannot match it (Yuliansyah, Othman, & Bakar, 2020).

Building Models with AI

Talk about implementing the algorithms such as machine learning and deep learning to develop models for SN analysis. Cover the data preparation steps, attribute extraction, and training stage bringing to focus the importance of the dataset and the decision of algorithm (Imran, Ofli, Caragea, & Torralba, 2020).

Understanding User Behavior

Explain AI-driven systems are used for analyzing how users act in social web applications. Put attention on sentiment analysis, network topology analysis, and community detection techniques to get perception about users' preferences, interactions, and influencer networks (Shu et al., 2020).

Predictive Analytics

Address how AI could assert SN prediction in its analysis. Demonstrate how prediction models can be taught to forecast user behaviors, engagement behaviors, and viral content propagation trends. Emphasize the practical applications that cover the fields of intellectual advertising, content recommendation and crisis detection (Kumar, Ojha, Malmasi, & Zampieri, 2020).

Sentiment Analysis

The analysis of sentiment is the technique of classifying text into three divisive feelings using AI models and algorithms. A text's polarity is a numerical value that expresses how strongly a positive, neutral, or negative emotion is present (Di Martino & Delmastro, 2023). There are machine learning algorithms available now that have been trained to specialize in NLP (Dey, Alam, Alam, & Zaman, 2022). The text's polarity, which has values between -1 and 1, is the main focus of the sentiment analysis procedure.

A negative polarity is indicated by values less than zero, a neutral polarity is shown by values equal to zero, and a positive polarity is indicated by values larger than zero and near one. In this proposal, the sentiment analysis framework makes use of the Python TextBlob package. Because it provides a very straightforward API for doing NLP tasks, analyzing sentiment, noun extraction, text interpreting, and other activities, this library is frequently used in the analysis of text-based information. The original tweets liked tweets, and retweets from each user are all included in the retrieved dataset (Mehrabi, Morstatter, Saxena, Lerman, & Galstyan, 2021).

Following the identification of the categories, three tasks are used in the analysis. Getting the average negativity of every user's tweet is the first step. Depending on the users' country, it is crucial to determine the dialect of the tweets throughout this procedure. Since this work is being done in Ecuador, Spanish is the primary language used in the tweets. They do text analysis and convert the tweets into the English language when we use TextBlob. Assigning labels to the averages according to the range of -1 to 1 will determine if the comments are neutral, positive, or negative. In the third task, the polarities are labeled according to the most often occurring sensations (Panfilova & Turdakov, 2024).

Bowden-Green (Bowden-Green, Hinds, & Joinson, 2021) did a comprehensive evaluation of 159 papers on the connection between anxiety and social media activity. The following primary study areas were determined:

(1) aggressiveness, trolling, and overuse of social media;

(2) particular inadvertent patterns of network usage that reveal details about the user's neuroticism to his fellow users and subscribers;

(3) the arbitrary production of material that is specifically related to neuroticism (self-presentation, status updates, photographs),

(4) responses to Neuroticism-related content (likes, comments),

(5) features of user profiles (like network size),

(6) perspectives on the use of social media (inspiration, identity privacy).

The following findings were drawn concerning these subjects. There isn't any solid proof that those with high anxiety use social media more often, for a duration, or are more prone to act aggressively. It is unknown whether neuroticism and the number of likes, comments on other users' material, and status updates are related.

Despite having a strong need for social engagement, those with high anxiety have little SN relationships. Additionally, they use the SN in a rather passive manner—that is, they don't create a lot of material. For instance, research has demonstrated that SN users who are more active tend to exhibit qualities such as extraversion, conscientiousness, and openness to new experiences more when they are online and less when they are offline (Bunker & Kwan, 2021).

As a result, explanatory conceptions about social compensation are developed, such as the poor-get-richer or social media impacts of social compensation, among introverts in SNs (Cheng, Wang, Sigerson, & Chau, 2019). Azucar et al. conducted a meta-analysis to investigate the predictive ability of several social media digital footprint categories for identifying the most common five traits(Azucar, Marengo, & Settanni, 2018).

Following a meta-analysis, the correlation coefficients between digital traces and openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism were found to be 0.39, 0.35, 0.40, and 0.33, respectively. The impact sizes across characteristics did not differ from one another. Apart from digital footprints, demographic data was also used to enhance the prediction of neuroticism and agreeableness (with a tendency toward openness to experience).

Similar findings were found in a meta-analysis conducted by D. Marengo and C. Montag (Marengo & Montag, 2020). The model's accuracy increased when demographic traits and various kinds of digital traces were included, with the average accuracy of personality trait prediction being moderate (r = 0.3). Extraversion and agreeableness were the qualities with the highest and lowest predictive accuracy, respectively, at r = 0.39 and 0.28.

Building mathematical models that forecast psychological characteristics based on long-term data is now possible because of the quick development of big data statistics8 and ML techniques, such as deep learning. This method provides a discreet way to observe people, who frequently aren't aware that their behavior is being continuously assessed psychologically.

Using data on users of Facebook and their activities (N = 7438 from the myPersonality dataset) to create a model that predicts the Big Five characteristics is an example of a more contemporary method (Başaran & Ejimogu, 2021). Posting, tagging, membership in groups, like count, events, updates, and various demographic attributes were among the Facebook

activity indicators. The algorithm that was used produced promising results, correctly categorizing network users in 85% of situations using just their activity data.

Based only on user information from their Facebook profiles, an accuracy of 82.2 percent was achieved in identifying the Big Five qualities, even without accounting for age and gender. These were some of the online behavior markers that were listed: questions, posts; number of texts and photos in the feed; number of photos without texts; work; education; activities; sports; games; movies; groups; music; friends; subscriptions; hobbies and interests; likes; favorites; language; news feed; books;etc. The authors selected these specific digital traces based on the premise that social interactions and activity are the most representative of personality manifestations on social media platforms.

Researchers' findings about the Russian SN VKontakte demonstrate the connection between users' activity characteristics and personal traits. The relationships between the most often occurring terms in user-liked postings and personal traits are presented in the study by A.B. Goncharov and I.M. Azhmukhamedov. Regression model building was done using the found correlations as a training sample to predict the user's characteristics (Panfilova & Turdakov, 2024).

Vaid and Harari present the findings of research in which participants were asked to rate how frequently they used different social media platforms and networks with their personality traits. The usage of Facebook and messaging apps is linked to extraversion and openness, according to the authors' research. Additionally, linked to neuroticism is the usage of photo-sharing and microblogging websites. The country where the sample was taken caused variations in several of the results, according to the authors. Conscientiousness and the usage of media-sharing platforms are related, according to Vaid S. and Harari G.'s findings.

This finding supports an earlier study that connected conscientiousness to increasing use of the YouTube platform (Vaid & Harari, 2021). Similar to Vaid S. and Harari G.'s research, Bayer's study highlights the necessity of distinguishing between the many forms of social media usage under investigation to gain a deeper understanding of each user's own social media ecosystem and the platform elements that could influence their use (Bayer, Triệu, & Ellison, 2020).

New analytical opportunities have been made possible by ANN-based models using Twitter data in several fields, including bullying behavior detection (Sadiq et al., 2021) and urban traffic event prediction (Essien, Petrounias, Sampaio, & Sampaio, 2021). One of the most popular SN sites is Twitter. Regretfully, because of its enormous popularity, spammers have

started to target it as well. Numerous ANN-based techniques have been created up to this point by academics to identify spam on the SN (Zulfikar Alom, Carminati, & Ferrari, 2020).

Privacy-protecting standards enable us to stand up for our rights when there are arbitrary rules and large power imbalances. But when we use social media or mobile applications on a daily basis, whether we want it or not, a lot of information about our political, marital, and health condition is gathered online and used to anticipate our actions and preferences. This is because software developers use artificial intelligence algorithms with the intention of gathering, compiling, and processing massive amounts of data in order to advance their businesses. Yes, it is true that knowing there is a market for a product makes creating it much easier (Pawełoszek, Kumar, & Solanki, 2022).

This study aims to apply a philosophical evaluation of the influence of SNs on the development of teenagers in the setting of unrestricted information access. The research is a philosophical and methodological structuring of the essential and novel components of the contemporary worldview paradigm of gender identity. The inventive features of perception of the information flow have new socio-cultural qualities, even if the basic clusters of the digital worldview are identical to the paradigmatic elements of past periods.

The study also sought to determine if unrestricted use of social media in the absence of or under strong parental supervision influences teenage sexuality disclosure, as well as the link between social media and improvements in sexual behavior (Durmishi & Durmishi, 2022).

The report outlines the key patterns that will shape how technology advancements in the worldwide banking sector grow in the future. Digital robots and bots, immersive technologies, block chain technology, the Internet of Things, AI, open banking, hyper-personalized banking, cybersecurity, and quantum computing are creating new opportunities for process and service optimization and improving the financial sector.

A more creative and competitive global banking sector that can better serve client requirements and guarantee the reliability and safety of financial dealings will result from the implementation of these technologies. Future studies in this field may examine in further detail how certain technology advancements affect various international financial market segments and create financial institutions' adaption plans. Additionally, the study might broaden its focus and investigate how financial innovation affects the whole economy (Kolinets, 2023).

It has been demonstrated that the growing application of artificial intelligence makes it possible to generate accurate and effective conclusions inside complex analytical processes. The study's conclusions might be useful in Ukraine's efforts to optimize the country's contemporary medical sector in light of the advent of artificial intelligence technology and

globalization. Principles for modifying the medical industry's current algorithms in Ukraine to satisfy digitalization demands have been developed, and the necessity of this change has been proven (Sofilkanych, Vesova, Kaminskyy, & Kryvosheieva, 2023).

4. FUTURE DIRECTIONS

Observe how certain AI-assisted SN analysis is progressing and the promising future of possibilities. The advent of three new technologies—Graph Neural Networks, NLP, and Multimodal Data Analysis—is one of the primary advances that has changed the traditional understanding of data analytics. Let's examine a few machine learning applications in the domains of Internet security, healthcare, and social policy.

5. CONCLUSION

In this article, an artificial neural network-based model for predicting SN user behavior is developed. It performs better in terms of computing efficiency and prediction accuracy, but it might not be as good at managing vast amounts of data, interpreting the model, or responding to changing social behaviors. Subsequent investigations may optimize the model's intricacy even more, improve its comprehensibility, and continuously monitor and analyze new social behaviors.

Furthermore, to enhance user experience and financial value, a deeper integration of this prediction model with real SN services and tailored recommendation systems may be taken into consideration at the application level. This research is valuable since it opens up new technical avenues for future user behavior analysis in addition to improving the field of SN user behavior prediction.

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