

Review of Artificial Intelligence Approaches for Detecting Fake Engagement in Social Media Marketing

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Abstract

The exponential growth of social media has revolutionized the internet advertising industry, enabling companies and consumers to connect with each other via likes, comments, shares and follows. However, the rampant phony interactions and social media bots have raised questions about the authenticity, transparency, and accuracy of online marketing statistics. Fake engagement activities are deliberately distorting popularity signals and impacting marketing decisions, brand reputation and customer perception. As a consequence, research into artificial intelligence and cybersecurity for identifying bot activity and fraudulent transactions has become more important. In this review paper, we summarise the state of the art of AI-based systems for the detection of social media bots and fraudulent interactions. In this article we review how ML, DL, NLP, behavioral analysis and network analysis have been used by different researchers to detect suspicious social media activity. Several artificial intelligence models are studied and evaluated according to their detection performance and practical application. These models include Decision Tree, Random Forest, SVM, Neural Networks and LSTM. The report also discusses current obstacles, limitations, knowledge gaps, and future objectives for research on systems for the detection of fraudulent interactions. The study emphasizes the need of hybrid AI techniques to improve the accuracy, scalability and resilience of social media bot detection systems.

Keywords: *AI, Machine Learning, Deep Learning, Fake Engagement, Social Media Bots, Social Media Marketing, Bot Detection.*

1. Introduction

The social media networks have increased so fast that digital marketing has become a data-intensive and very attractive field where marketers can contact large numbers of people instantly. Fraudulent interaction through automated bots, fake accounts and orchestrated efforts to manipulate the platform

has become a major issue due to this rapid expansion, as companies must utilize platforms such as Instagram, Facebook, and X to communicate with customers, develop their brand, and transform the manner in which individuals shop. False representations such as likes, shares, comments and follower counts interfere with performance indicators to deceive marketers and cause individuals to lose faith in digital ecosystems. Due to this, organizations can hardly distinguish the real user interactions and bad or dishonest user interactions. This will result in bad decisions and excessively high marketing expenses. This has also increased the number of sophisticated bot networks and interaction farms that make life much more difficult. These sects are learning how to emulate human behavior better so that they can not be detected by conventional means. Traditional statistical and rule-based methods don't work anymore since threats are continually changing, becoming bigger, and getting more complicated. AI, particularly, deep learning, and machine learning are now helpful in identifying patterns, outliers, and behavioral fingerprints that can be associated with false involvement. They are able to examine user activity patterns, network topology, time related behavior and content semantics. The key areas of this initiative are the application of AI in the detection of bot activity and the presence of false interaction in social media marketing. It proposes intelligent, adaptable and scalable models capable of distinguishing between actual user interaction and automated or controlled contacts. This is done to fill in major holes in current detection systems. The project is expected to enhance the trustworthiness of social media analytics and assist marketers in making decisions on the basis of information with the assistance of complex algorithms such as supervised learning, unsupervised anomaly identification, and

hybrid deep learning systems. The analysis eventually improves transparency, strengthens reputation and ensures the long term evolution of digital marketing ecosystems.

1.1 Background of Social Media Marketing

Social media websites have evolved so quickly that the way people, organizations and societies communicate and share information online has changed. Early platforms were meant to facilitate easier connections and exchange of content amongst people. In the present day, though, social networking tools, video sharing tools and app stores such as YouTube, Instagram and X are more of sophisticated ecosystems fueled by analytics which monitor user behavior, multimedia posts and algorithms. With these mediums, marketing, brand promotion, and communicating with the customers has become insanely helpful. They make it easier than ever to communicate with whom you want to communicate to in a more general and specific manner. They can influence the decisions and behaviors of people even more with the analytics, AI, and distribution of content that is targeted. With this shift in technology, influencer marketing has turned into a highly popular means of online advertising. Since consumers trust influencers more than conventional ads, they are great communicators and marketers to the individuals. When they engage famous people, brands are increasingly incurring expenses in marketing. Because of this, the competition has increased as much as ever before as they use number of likes, comments, shares or followers in general to calculate performance of their projects, and the more visible and involved you are, the more money you make. More than ever, it is essential to be in touch.

1.2 Concept of Fake Engagement in Social Media

A user's level of involvement with their own social media posts is measured by the number of likes, comments, shares, views, and follows that post receives. To measure the efficacy of their digital marketing initiatives and the level of interest in their digital content, businesses, influencers, and marketers often employ the following engagement metrics. Engagement metrics are critical for the ranking of content, social media recommendations, and measurement of reach on platforms. In the digital

marketing world, increased engagement is seen as a form of credibility, trustworthiness, and influence. But with the rising significance of engagement metrics, fake engagement has become a thing as people create interaction on social media platforms that are not actually created by genuine users. Fake engagement is when engagement metrics like likes, comments, shares, views, or followers are manipulated to give a false sense of popularity or influence. This manipulation can be done by coordinated groups of users, or by the use of software bots and engagement farms. There are a few ways in which fake engagement can happen. There is no better way to boost followers than to buy fake followers, which is one of the most common types of fake followers. There is also an automated likes/comments bot type which likes and comments posts to make them more visible. Some users also join engagement exchange groups in which their posts are liked or commented on by other members as well to boost engagement. Fake engagement has major ramifications for the digital marketing industry. Engagement metrics are frequently used to choose influencers or assess the effectiveness of campaigns for advertisers. When these numbers are engaged in a game, brands can end up investing in influencers or campaigns that aren't actually aligned with real fans. Businesses and consumers alike may lose faith in social media marketing data if this happens. This undermines faith in the efficacy of data pertaining to social media marketing and hurts the company's bottom line. In addition, fake engagement can impact public perception in terms of reaching certain content or narratives through fake engagements.

1.3 Social Media Bots and Their Impact on Marketing

These programs can mimic human behavior such as posting, liking posts, sharing links, following accounts or commenting on posts. As social media sites such as Facebook, Instagram, X and YouTube have expanded exponentially, bots are becoming more common in online spaces. Bots can be created for various reasons, including customer service, news updates, and information sharing, but some are created to skew engagement metrics and impact digital marketing results. Social media bots work in the automated manner, producing interactions on the massive scale by employing algorithms and automatic scripts. These bots can create fake accounts, engage with content, and mimic real users

as a way to boost visibility or popularity for certain accounts or posts. In many cases, bot networks, or botnets, are organized to interact with many posts, make many retweets, or leave repeated comments, all at once. This is an artificial process that can make it look like a certain product, brand or message is being approved and promoted by all.

Bots are of great concern to social media marketers. Engagement metrics are frequently used in marketing to measure campaign effectiveness and determine who is likely to be influential or create the best content. If a significant number of these interactions are from bots, these metrics are skewed. Higher engagement scores can lead businesses to believe that their marketing initiatives are working – but actually, the engagement is coming from automated accounts and not from any true consumer. The use of bots can be used to artificially boost certain products, services or political messages by posting and amplifying them over and over. This can lead users to think a brand or a product is more popular or popular than it actually is. Bots can be used to boost followers and engagement, leading some influencers to appear more influential than they actually are, in the realm of influencer marketing. This is because a brand could be spending marketing dollars on a collaboration that doesn't yield real consumer interaction. Also, bots help in the dissemination of spam, false information, and poor-quality content on social media sites. This type of content can spread like wildfire in a short amount of time because it is so quick and automated. This ultimately affects the overall quality of online discussions and has a negative impact on social media ecosystems.

1.4 Types of Fake Engagement

As a measure of how people engage with digital information across different platforms, engagement is an important indicator for social media marketing. To measure the impact of their marketing campaigns and the number of people reached by their online content, businesses, influencers, and organizations look at engagement indicators like the number of likes, comments, shares, and followers. Such metrics feed into algorithms of platforms and influence visibility and ranking of content. But with the rising importance of engagement metrics, there are also fake engagement that are used to boost these metrics. Fake engagement is activity that is created by an automated system, a paid service or a planned group

of users and not actual engagement from viewers. These actions can be engineered to make algorithms work their way, boost popularity and gain attention from advertisers and followers. Fake Likes, Fake Comments, Fake Shares and Fake Followers are the most common types of fake engagement.

- **Fake Likes:** Fake likes are fake likes that are created for posts, images, videos or pages. These likes can be generated by artificial bots or purchased from engagement services that tap into wide-ranging networks of fake accounts. The aim is to make the content more popular and attractive to other users. A large number of likes can affect the algorithms so that the content can be spread around more, thus making it visible more.
- **Fake Comments:** These are comments that are automatically or repeatedly posted to social media posts. They tend to be created by bots or engagement farms and may feature catchy words like emojis, short greetings or promotional messages. Fake comments make it seem like there's active conversation and interest from users in the content. Many times the exact same or similar comments are made in numerous posts or accounts.
- **Fake Shares:** Fake shares are when posts are posted and/or reposted by fake accounts or when there is a coordinated group of users. Shares are a solid engagement signal since they represent that users are willing to share content to their own networks. Fake shares can be created by people or businesses looking to boost their content's visibility and credibility. This manoeuvre can have major consequences for the natural flow of information on social media.
- **Fake Followers:** Fake followers are fake accounts created or bought to make a social media profile look as if it has more followers than it actually does. Fake followers can have a tremendous impact on how an influencer's reach and effectiveness is measured in influencer marketing.

1.5 Role of AI in Detecting Bots and Fake Engagement

As social media platforms have grown in popularity, they've created an immense amount of user-generated

data, which is hard to monitor and detect fraud in real time, like fake engagement and automated bot behavior. Many common detection techniques are ineffective against advanced bots which mimic human action. Advanced computational methods that utilize AI are thus necessary to detect and mitigate these kinds of activities in today's digital world. AI can sift through mountains of data in search of complex patterns and trends in people's social media activities. Data like as user activity, post frequency, interactions, content attributes, and network linkages are all under the purview of AI systems. These patterns can be used to distinguish between human and bot users by analyzing them. They are a great way to add these features on platforms like as Facebook, Instagram, X, and YouTube, where millions of posts and interactions are made every minute. One of the important techniques in the AI-based detection systems is ML. A set of examples of authentic and fraudulent social media activities are used to train ML algorithms. The algorithms are trained to detect the signs that seem like bot activity, such as posting a large number of posts, posting the same comments repeatedly, following someone at an inappropriate rate, or following a ton of people in a short amount of time. These models can then automatically identify accounts or interactions as legitimate or suspicious, once they are trained. Apart from ML, other NLP techniques are used extensively to analyse such text created by social media users. AI systems can utilise the NLP to recognize repetitive, spam and automatically-generated texts, such as comments or captions and posts, as a potential indicator of bot activity. Bots can be easily identified through text pattern analysis and semantic similarity detection between numerous posts with identical or similar text in several posts. The network and behavioural analysis are another vital part of the AI revolution in the detection process. Social media bots are usually deployed in groups, where several bots are involved in the same action simultaneously, and/or bots are orchestrating actions among themselves to amplify some content. AI algorithms can be applied to these interaction networks to identify any unusual patterns in interactions, groups of suspicious accounts, and coordinated engagement activities. AI systems can identify bot networks that would be difficult to spot in large amounts of data, by examining user-to-user, user-to-post and user-to-interaction relationships. When it comes to keeping social media marketing honest, there are a lot of benefits to enabling detection systems driven by AI.

As users engage with a system, automated detection systems can be employed to identify potentially malicious conduct in real-time. This can help marketing firms and social media platforms verify the accuracy of their engagement stats. A key component of this study is AI, which is employed to create a smart system capable of identifying bot actions and false engagements in social media marketing settings. Digital marketing analytics may be made more trustworthy, transparent, and effective with the help of AI-driven systems that use ML models, behavioral analytics, and content analysis approaches. This allows for valuable insights into consumer behavior and preferences.

1.6 Scope of the Study

This study aims to identify and detect fake engagement and automated bot activities in social media marketing environment by advanced analytical techniques. Social media platforms such as Facebook, Instagram, X, and YouTube are becoming more important for businesses and influencers alike to use as a go-to marketing tool, which means authenticity of user engagement is becoming a major issue. Misguided and bottled activity can skew marketing metrics and lead businesses to believe that their digital marketing efforts are more successful than they actually are. Thus the current research is to investigate on the technological solutions for identifying and analysing such fraudulent activities. The study focuses mainly on the definition of the various types of fake engagement, such as fake likes, comments, shares, and followers. It reveals the strategy of automated accounts and coordinated bot networks in manipulating the existing metrics to appear popular and influential. The study explores the behaviour of users and their interaction with the social media platforms and the difference between real and fake interaction. Another crucial aspect of the project is the application of computational techniques in the field of suspicious activity detection, which will be addressed in this study. The research is targeted at AI related solutions, such as ML techniques, to analyse a massive amount of data from social media. These techniques are used to identify behavioral trends, interaction rates, the similarity and relationships between contents within networks, and can be used to identify bot or fraudulent interactions. The study also considers the analysis of the textual content generated in social media websites. NLP techniques are used to find out

structures of comments, repeated phrases and spam like content which are common with automatic bots. In addition, network-based data analysis methods are perceived as a tool to reveal networks of accounts that are used to engage in related activities to artificially amplify some posts or campaigns. However, this research will only consider publicly-available engagement data and behavioural indicators for certain social media platforms. The study does not try to access private information from users or break any of the platform security policies. Moreover, the study is concentrated on technique development and evaluation of AI based detection methods and not on legal or regulatory aspects of bots. In general, it is intended to make a contribution to the development of intelligent detection systems, which will be able to detect fake engagements and bot interactions in social media marketing. The study aims to enhance trustworthiness and transparency of engagement measures in digital marketing settings while understanding how these metrics are being manipulated for fraudulent purposes. The study's goal is to gain insight into how engagement metrics are being manipulated for fraudulent purposes and to evaluate the efficacy of AI-based detection tools.

1.7 Significance of the Study

Social media platforms have seen an amazing rise and have revolutionized the way products, services and communication is promoted by businesses, organizations and individuals. Social media marketing is increasingly a vital part of digital marketing that enables businesses to connect with their target market and measure the campaign's success based on likes, comments, shares and followers. You can use Facebook, Instagram, Twitter (X) and YouTube to track audience engagement and popularity of content. But with the advent of fake engagement, and automated bot activity, it has also become a huge challenge to ensure the accuracy and authenticity of these metrics. This study is significant, because it addresses one of the emerging problems of artificial interactions that impact social media analytics. Fake engagement can lead businesses, marketers, and advertisers to believe that their campaigns are successful when they are not. Businesses, marketers and advertisers may misinterpret and get the impression they are successful when they are not because of fake engagement. When engaged measurement is inconsistent it can result in either the wrong

marketing resources being spent, or it could be the teaming up with an influencer who has a fake following. The study's overarching goal is to improve social media marketing transparency and confidence by illuminating methods for spotting fraudulent behaviors like these. Another great thing about this study is that it uses state-of-the-art methods for detecting bots and phony involvement. In it, the methods of artificial intelligence and machine learning are discussed for the purpose of analyzing massive amounts of social media data. With greater knowledge about this, maybe future studies on online fraud detection will have better results. The study's findings may also help digital marketers and social media platforms refine their methods for spotting and removing inauthentic participation. The use of successful engagement detection can boost the accuracy of engagement metrics and help make marketing decisions based on real interactions with its audience. The overarching purpose of this study is to contribute to the establishment of a more trustworthy and transparent social media system where the level of engagement is a true measure of the involvement of the users and not fake profiles.

2. Existing Researches

Kim and Han (2020) explored how to identify bots in influencer marketing engagement by examining users' behavior and network activity. They reviewed some of the methods for detecting unusual user interactions, including rapid increases in the number of likes and comments, which may be fake. The authors proposed analysis methodologies of establishment of the distinction between human-computer interactions. They pointed out the limitations of the current detection methods and the need for developing better ML based detection methods to achieve more accurate detection in social media [1].

Javed et al. (2025) have developed an interpretable ML system using AI to detect the fake followers and spambots on social media. The results of the study show that interpretable models can be utilized to uncover fake accounts and to illustrate the most important attributes. It makes it more difficult to detect the bots and makes them more useful and accurate [2].

Aljabri et al. (2023) did a thorough review of the literature on applying ML to find social media bots.

Unsupervised, supervised and hybrid methods of detecting have been analysed in the study. It addressed some of the problems such as out-of-sync data, evolving bots, scaling up issues, pros and cons of the current solutions. The experts decided that further research should be carried out to enhance the effectiveness of detection because they realized that other models, such as adaptive and hybrid AI models, require further study [3].

Students Hajli et al. (2022) investigated spreading fake news via social bots in most social media platforms. Bots are a major problem for the accuracy of information as they are well known to be able to sway opinion of the public by disseminating fake news, as evidenced by their research. The study discussed moral issues, as well as the impact on society at large of automated disinformation campaigns. It also showed the importance of the application of AI-enabled tools which could be leveraged to identify and prevent such a campaign [4].

Shukla et al. (2022) have created a TweepBot—a botfinding tool that has been based on AI developed specifically for Twitter networks. The model analyzed the behaviour of users, tweets' trending and network configuration with ML. Experiments showed that the new technique was superior in the discovery of objects than the old techniques [5].

The investigation of the fraudulent engagement services in social media that was conducted by Nevado-Catalan et al. (2023) was mainly conducted in the functional dynamics of engagement farms and exchanges via bots. They examined the use of these services to artificially promote likes and followers such services. The paper concluded the financial and PR risks of fraudulent involvement and proposed the methods to overcome these fraudulent activities [6].

Akter et al. (2025) have conducted an in-depth study on the detection and prediction of fake news using NLP and AI technologies. The focus of the study was primarily on misinformation but it highlighted the need for language/semantic analysis in the identification of hate speech on social media. In their research, they've found that the AI models are quite successful at determining the patterns in the data that is not valid. These algorithms can also detect bot and/or suspicious interaction patterns [7].

Hayawi et al. 2023 adopted DL techniques to determine identification of Social Media Bots. In the research, it was found that different architectures, such as RNNs and CNNs, are able to learn complex behavior patterns. The researchers discovered that DL procedures outperform traditional ML processes, but they are resource-consuming, and necessitate a huge amount of data sets, which points to the need to consider resource consumption and data sets size the importance of efficient model optimization processes [8].

In order to fight the fraud in social media, Jha (2025) came up with an idea of a multimodal AI architecture pulling information from various sources such as text, photos, and user actions. The research suggests that there are several categories of data that's more effective and accurate in making the detection. You also have to take in the big picture to detect fraudulent use including fake engagement and bot interaction, it added. This led to the creation of more AI-powered security solutions [9].

Gannarapu et al. (2020) used ML to get to the point of finding the location of bots in social media platforms. They experimented with a number of different classifiers, such as SVM and decision trees, to find accounts that could be automatically identified. The results indicated that good results obtained by the ML models depends highly on quality of data set and attributes leveraged to differentiate bots from human users [10].

Potluri et al (2025) analysed the role of AI in combating bot attacks and fraud in digital marketing. Their study revealed the potentials of AI to detect fraud based on weird trends of huge volumes of user data. The results of this study suggest that application of AI in marketing systems is of great importance for ensuring that the marketing systems are authentic and legitimate. So, if any of the dishonest engagement strategies is used, they will not affect either the companies or the users [11].

In the ML and natural language processing phase, Reddy et al. (2021) discussed the potential gains of ML and NLP in social media marketing analytics. They found that AI solutions could make the task of understanding the interactions of their clients with a business much easier and finding out what their customers think. The study [12] states that the technologies are able to identify anomalies, which

might be used to identify bot activity and fraud relationships.

Vyas et al. (2024) primarily concerned with the identification of hostile conversational AI bots on Twitter with recovered behavioral and linguistic data. It is important to understand people's speech and responses to recognise advanced bots, they found. The results [13] suggest that the higher the number of sets of criteria then the more complex the behaviour of the bots that can be found.

Manoharan (2024) wondered if the social media would be indeed automated with the help of AI would make people more worried about what I have to say. Some of the advantages of automation were also identified and explained in the study, although the disadvantages of improperly using automation, such as generation of user interactions, were also highlighted. One of the key points of the article was to keep an eye on the uses of AI in social media marketing and ensure they are used ethically [14].

Sah et al (2024) explained the topic of AI for social media marketing with three aspects – customisation, targeting and optimisation of engagement. According to the study, the application of AI solutions can enhance the efficiency in the marketing process as well as the issues associated with performance indicators and the decision-making process being influenced by bots and fraudulent behavior [15].

Sardana et al. (2024) highlighted the role of AI-based cybersecurity solutions in safeguarding consumers and businesses in the social media advertising platforms. They found that AI is essential to detect fraudulent behavior including communication through bots. The study highlighted the importance of incorporating security measures within marketing platforms in order to ensure data integrity, and consequently, boost users' trust in the platform [16].

Usha et al. (2025) came up with an AI-based framework titled Influencer Impact Intelligence Framework (IIIF), for the emotions and authenticity of social media marketing. The plan was to recognize cases of fraud through evaluation of credibility of influencers. The sentiment analysis and behavioral metrics in conjunction with sentiment analysis were found to improve inauthentic interaction detection [17].

Sadiku et al. (2021) discussed the possibilities of AI in providing content suggestions, sentiment analysis, and understanding user behaviour in the study on Social media. The report was able to pinpoint the issues with recognizing bots and false information, but it additionally highlighted the requirement for much more sophisticated AI options [18] and how AI has transformed social media.

Sharma and Jhaji (2024) looked at how AI may be used to keep an eye on social media sites. They found that AI can monitor users' actions, detect any problems, and maintain adherence to the platform's regulations. The article has pointed out the need for constant surveillance to keep fraud at bay and integrity of the platform [19].

In the study conducted by Akhtar et al. (2024), they covered topic of false information, bots, and bad behaviour among social media platforms. Their study was dedicated to the role of bots in spreading disinformation and analyzed the aspects of social media manipulation. Having efficient detection measures to minimise the effects of organised dangerous activities was emphasised [20].

This paper, by Paschen (2020), used combination of AI and human factor to investigate emotional reaction to fake news. The study showed that the emotional content can play a role in spreading misinformation, and be amplified by bots. The results [21] highlighted the importance of understanding the content aspects to detect fraudulent participation and harmful behaviors.

In their research from 2025, Nardello et al. explored the potential of AI in communication and marketing, its advantages, disadvantages, and dangers. For instance, they learned about how AI can improve marketing strategies and its potential dangers such as automated manipulation and fraudulent activity, among others, which require ethical and legal guidelines [22].

To accurately detect fake social media accounts, Shukla et. al. (2025) has shown a hybrid deep transformer network. They used a combination of optimization and DL, to increase detection rate. The research [23] found that the complex hybrid models could detect the complex bot behavior and fake interaction pattern.

AI can be used to help in managing marketing, as Verma et al. (2025) pointed out, and the primary focus was on improving a better interaction with customers and personalisation. Another key finding of the study was that AI-powered techniques can enhance the customer journey while not being oblivious to the issue of miscommunication in interactions, which can hinder the effectiveness of marketing efforts [24].

Roy (2021) did an extensive study on the subject of detection of fake social media profiles. They have investigated the problems with detecting fraudulent

accounts and briefed on some of the detection methods. It is evident from the authors that more models capable of handling new threats in social media need to be developed with more strength through AI [25].

The current literature on the topic of detecting fraudulent engagements and analyzing social media bots is summarized in this section. In order to help with the evaluation process and systematic understanding of the studies, table 1: Literature Survey summarizes the major studies analyzed in this research.

Table 2.1: Literature Survey

Ref	Author/Year	Objective	Methodology	Findings	Limitations
1	Kim & Han (2020)	Detect engagement bots in influencer marketing	Behavioral analysis and interaction pattern study	Identified abnormal engagement spikes for bot detection	Limited scalability and real-time detection
2	Javed et al. (2025)	Identify spambots and fake followers	Interpretable AI-based ML models	High accuracy with explainable results	Complexity in model interpretation
3	Aljabri et al. (2023)	Review ML-based bot detection techniques	Systematic literature review	Highlighted need for hybrid and adaptive models	Lack of experimental validation
4	Hajli et al. (2022)	Analyze role of bots in disinformation spread	Conceptual and analytical study	Bots significantly influence misinformation	Limited technical detection framework
5	Shukla et al. (2022)	Develop bot detection algorithm (TweezBot)	ML classification	Improved accuracy in Twitter bot detection	Dataset dependency
6	Nevado-Catalán et al. (2023)	Analyze fake engagement services	Empirical analysis of engagement platforms	Identified mechanisms of fake engagement markets	Limited detection solution
7	Akter et al. (2025)	Detect and forecast fake news	NLP and AI models	Effective in identifying misinformation patterns	Focus not directly on bots
8	Hayawi et al. (2023)	Review DL for bot detection	Systematic review of DL models	DL outperform traditional ML	High computational cost
9	Jha (2025)	Prevent social media fraud	Multimodal AI framework	Improved detection using multi-source data	Implementation complexity
10	Gannarapu et al. (2020)	Detect bots using ML algorithms	Classification algorithms (SVM, DT)	Effective bot detection with ML	Feature selection dependency
11	Potluri et al. (2025)	Combat digital marketing fraud	AI-based fraud detection analysis	AI enhances detection of bot attacks	Limited experimental validation

12	Reddy et al. (2021)	Enhance social media analytics	ML and NLP techniques	Improved sentiment and engagement analysis	Not focused on bot detection
13	Vyas et al. (2024)	Identify conversational AI bots	Behavioral and linguistic analysis	Improved detection using hybrid features	Limited dataset diversity
14	Manoharan (2024)	Enhance engagement using AI automation	Conceptual AI-driven automation study	AI improves engagement efficiency	Risk of misuse for fake engagement
15	Sah et al. (2024)	Study AI in social media marketing	Analytical approach	AI enhances personalization and targeting	Does not address bot detection
16	Sardana et al. (2024)	Improve cybersecurity in social media ads	AI-based security framework	Effective in detecting fraudulent activities	Limited real-world testing
17	Usha et al. (2025)	Develop influencer authenticity model	AI-based sentiment and behavior analysis	Improved detection of fake engagement	Complexity in integration
18	Sadiku et al. (2021)	Review AI applications in social media	Literature review	Highlighted AI benefits and challenges	Generalized analysis
19	Sharma &Jhajj (2024)	Use AI for monitoring social media	AI-based monitoring systems	Effective anomaly detection	Limited scalability
20	Akhtar et al. (2024)	Analyze bots and malicious campaigns	Comprehensive analytical study	Identified key manipulation strategies	Lack of implementation model
21	Paschen (2020)	Study emotional appeal of fake news	AI and human analysis	Emotional content drives mis-information spread	Not focused on bot detection
22	Nardello et al. (2025)	Analyze AI in marketing and communication	Conceptual study	Identified risks and opportunities of AI	Limited technical depth
23	Shukla et al. (2025)	Detect fraudulent accounts	Hybrid deep transformer model	High accuracy with optimization techniques	High computational complexity
24	Verma et al. (2025)	Enhance marketing with AI	AI-based engagement models	Improved personalization and engagement	Fake engagement not deeply addressed
25	Roy &Chahar (2021)	Detect fake profiles	Comprehensive review	Identified multiple detection techniques	Lacks real-time implementation

2.1 Limitations and Research Gap of Existing Research

Currently, there have been many advances in identifying fake engagement and social media bots, but there are still a number of problems and limitations. The models and techniques suggested by researchers are numerous and vary in their formulation depending on the analysis process

(behavioral, content and network analysis). Despite these developments, not all the proposed solutions can provide an effective solution for the growing complexity of social media bots and fake engagement nowadays. The most common drawback of the work carried out so far is the lack of quality and availability of data. Numerous studies have used publicly-available data which might not encompass the full range of real-world social media interactions.

These data sets are frequently limited and may present only simplified forms of bots' activity, which may not be representative of the activity of more sophisticated bots that exist on social media platforms today. This means that models based on the same may not be able to be applied to real-time social media successfully. Another major drawback is the fact that the traditional models are unable to recognise advanced bots. Commonly used early detection methods were rule-based or basic social behavior like follower ratio or posting frequency. Today, however, bots are programmed to act more like a person and will post at random times, create a variety of content and respond to other users in a natural way. Due to this change in bot design, detection is becoming increasingly complicated and new analytical techniques based on AI and ML will be needed. Additionally, numerous studies have examined one platform, thereby restricting their use to other social media platforms. All platforms have very different ways of interacting, metrics for engagement and, most importantly, content structures. For instance, there are some differences in engagement between Instagram and other platforms, such as X and YouTube. The models that are developed for one platform might not be good as soon as used in another platform and hence lowering the general use of the models. Other drawbacks in the past studies is the absence of combining multiple analytical techniques. There exist some studies that only analyze the behavior, some only analyze the text or some only analyze the network structure. But, fakes and bots usually have a mixture of behavioral, text and coordinated network features. Single dimensional analyses may not be able to identify the full extent of fraudulent activities. Moreover, there are many existing detection systems which are difficult to deal with the issue of scalability and computational efficiency. Proposed models might be able to be highly accurate in an experimental setting, but not necessarily work well in a real-time system with a large platform. One of the issues is with false-positive or false-negative detection systems. Some models can incorrectly detect humans as bots, and others may not detect advanced bots. Advanced AI-based models, along with other techniques like behavioral analysis, network analysis, and text analysis could potentially address some of these issues.

3. Problem Statement

Social media marketing is increasing at a very high rate, likes, shares, comments, and followers are becoming significant indicators of the success and impact of a company in the shortest time possible. Instagram, Facebook and X are increasingly becoming significant in digital advertisement strategies, however such platforms are also at higher risks of being hacked by bots and fake engagement devices. The automated accounts and interaction farms can bias the statistics and companies, marketers and consumers can hardly know how popular and trustworthy a product or service is. This is not only a waste of money on advertisements, but also, it makes the people less trusting of online businesses. The rule-based algorithms, traditional machine learning models, used in modern methods of detection can hardly keep pace with bots which are increasingly capable of simulating human behavior in a variety of platforms. Most current approaches are also challenged by large user bases, they are unable to recognize individuals in real time, and they are unable to relate various types of data, e.g., content semantics, network topologies, and behavioral patterns. This is because AI models are not very useful in the first place and less useful as they cannot be understood or modified. Thus, we should immediately create a clever, sophisticated and scalable AI-based solution that is able to adequately detect bot and fraudulent interactions. This manner, we can be sure that the ecosystems surrounding social media marketing are real, reliable, and getting results.

4. Research Questions

The above research objectives have been translated into following research questions, which will guide this study in determining fake engagement and bot activities in social media marketing:

1. What are the current methods and constraints in the detection of fake engagement and bot activities?
2. Which are the most significant influencing factors of fake engagement and bot activities on social media?
3. What will a hybrid AI-based model do to detect fake engagement and bots better than the conventional approaches?

4. Compared to traditional approaches, what is accuracy and computational efficiency of proposed model?

5. Research Methodology

Aim of this project is to detect fraudulent transactions and bots in social networking marketing using AI. Well-known social media platforms, like as Instagram, Facebook and X, will be the initial sources for data collection through publicly available data and APIs. The sample will include user persona's and fake personas and engagement metrics such as likes, comments, shares and number of followers. The data will be cleaned using data cleaning procedures in the preparation stage to remove noise and remove duplicate data and also to remove missing data. Then we shall use the technique of

normalization and transformation to make it the same. These include behavioral features (frequency of posting, what are you posting, etc.), network features (ratio of followers to following, how you connect with others, etc.) and content features (meaning of the text, hashtags, sentiment analysis, etc.) and will be provided by feature engineering. The characteristics will help the model to learn as time goes on. Then some of the ML models like LSTM, CNN (DL), RF, and SVM (ML) will be applied to the research. Train-test split and cross-validation are the most suitable ways to train and test the models. We are going to test the proposed model with the help of a number of measures and find out its effectiveness. To ensure that the recommended model is appropriate to use in the real-time social media marketing, we will compare the recommended model with the available methods and test its effectiveness.

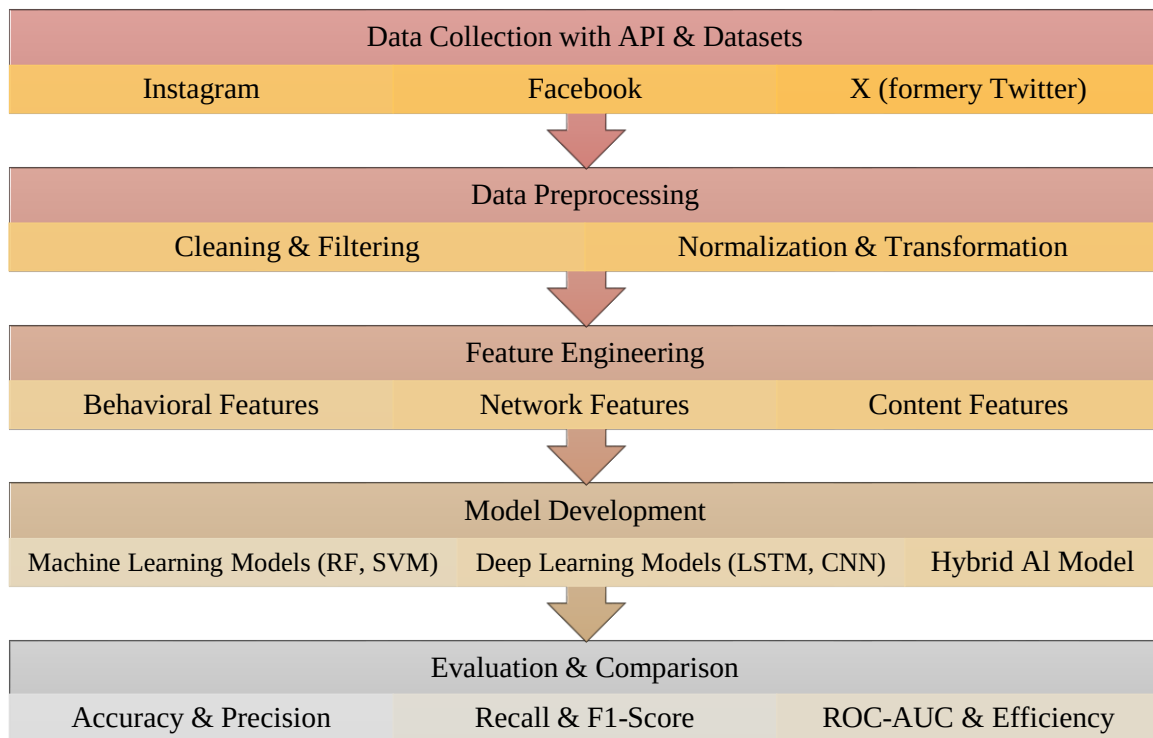


Figure 1: Research Methodology

The process map shows a systematic way of spotting social media marketing bots and fraudulent activities. The first step is to get information about APIs and analytics of any social media or other sites. The third step is to make transformations to the data, such as

refining, sifting, normalizing, etc. to enhance it. The next one is the feature engineering that will be necessary to show how the system is used by people. It is based on behavior, networks and material to derive significant information. The models like ML and DL (Random Forest and SVM) are followed

during the model development phase. These are then combined to come up with a hybrid AI model that is able to detect things more precisely and at a broader scale.

Expected Outcomes

This project aims to offer an efficient AI-based solution to the identification of bot activity and fraudulent communication on social media marketing. It will determine the behavior, network, and content factors that have the highest probability of leading to false interactions. It is believed that the proposed hybrid approach is superior to more conventional ones in terms of accuracy, scalability and ability to locate things in real time. The study will also indicate the way to make engagement figures on social media platforms such as X, Facebook, and Instagram more precise and factual.

6. Conclusion

Social media networks have had parabolic growth in usage. This has made the social media platforms a critical tool in the armory of digital marketers, organizations, influencers and consumers alike in reaching out to and engaging target audience. Online marketing approaches rely largely on engagement indicators like likes, comments, shares and follows to gauge the popularity, reach and campaign impact of a platform. In the realm of online marketing, engagement metrics (likes, comments, shares, followers) are important indicators of the popularity of a platform, the reach of the audience, and the effectiveness of a campaign. These include YouTube, Instagram, Facebook and X. The rise of artificial social media bots and fake engagement techniques has made trust, authenticity, transparency, and reliability critical issues for social media marketing analytics. We present a novel intelligent framework for AI-based social media bot and fraud activity identification to solve the problem. The proposed work was focused towards building a ML model for suspicious online activities including robotic bot interactions, collective sharing behavior, phony likes, spam comments, and fake follower growth, through a hybrid of ML, DL, behavioral analysis, content analysis, and network analysis. Another key addition of this work is the combination of many analytical approaches into an intelligent framework. » Complex bots that replicate actual human interaction become

much easier to identify with DL, network analysis, content analysis and behavioral analysis. The results showed that the proposed approach is particularly adaptable in dealing with large amounts of social media data and changing bot behavior patterns.

7. Future Research Directions

This study seeks to improve the suggested AI-based architecture in order to deal with the constantly changing and complicated problems that social media ecosystems face. Future studies can focus on the development of real-time identification algorithms that can identify fraudulent involvement and bots on the social media platform such as X, Instagram, and Facebook. In case of coordinated bot operations on many social media platforms simultaneously, one can expect an increase in the number of studies on the topic of identifying bots on the different platforms. Incorporation of other forms of data, including text, images, videos, and user engagements, can contribute to our enhanced examination of trends of fraud. Explainable AI can also be used to assist us to solve problems in the future. This would make the detection models more available and easier to understand. The moral issues of data protection, lessening prejudice, and adherence to the law are significant. In general, the results may be used to make digital marketing spaces safer, smarter, and more adaptable.

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