



Enhancing Sustainable Consumption Using Artificial Intelligence

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Abstract

Identifying abandoned accounts is crucial as they can be breeding grounds for fraud or used as fake accounts, and addressing platform disorder is an important part of sustainable development, Their accumulation causes chaos. This research aims to use the C4.5 algorithm to build a decision tree due to its speed and ability to manage categorical and numerical inputs in identifying features to classify Facebook accounts as active, abandoned, or deactivated by determining the number of days since the last interaction on the account. Data was obtained from a website and manually from other sources. The results of the decision tree demonstrated the discrimination capabilities derived from machine learning. The research presented a solution for recycling or deleting accounts to mitigate the damage caused by the accumulation of abandoned and deactivated accounts on the Facebook platform. The biggest obstacle for the researcher was the sample, as Facebook accounts are subject to privacy laws, and previous literature and studies have not addressed the treatment and recycling of these accounts. The results were satisfactory in the diagnostic process, providing a reliable method to ensure the safety and sustainability of interactions on this platform, which includes billions of users around the world.

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1. Introduction

Consumerism means using digital technology more sustainably (digital sharing applications, energy efficiency) where digital technology itself impacts (hosting the digital environment, less data) and relies on weak digital forces, including control of the economy and responsibility in industry for a low-cost digital world. This relates to conscious digital choices, reducing the digital footprint of online life, and using tools such as digital policies that affect the digital environment and its circularity, shifting from mere investment to digital contribution [1][2]. With the increasing number of people using social media and Facebook regarding the sustainability of social media, the number of people who stop using these sites due to the death of a person or influencer, leaving due to threats, blackmail, work, or job transfer has also increased. Discovering the smart hole in Facebook using a tree

algorithm reveals the benefits of current methods to reclaim these customers, but to permanently remove these benefits or have them used by others without compromising privacy [4][3]. The Decision Tree Algorithm and the Random Forest, both intelligent algorithms, were used to explore how digital technology contributes to sustainable development. Artificial intelligence (AI) technologies guide sustainable practices. For example, predictive analytics can forecast user demand for environmentally friendly online platforms, enabling companies to reduce clutter and manage their supply chains. When users perceive that their peers, influencers, or online communities support the use of AI, their trust in the technology is likely to increase. This aligns with social cognition theory, which emphasizes the role of observational learning and peer approval in shaping attitudes. From a sustainability perspective, trust becomes even more critical, as users increasingly demand accountability,

privacy protection, and adherence to environmental values from brands that utilize advanced data analytics tools [5][6]. These classifications may include analyzing user activity patterns, such as login frequency, content posting, and interactions. While account reactivation is not directly addressed, understanding these metrics and classification methods helps determine whether an account is abandoned, suspicious, or in violation of Facebook's terms of service. Furthermore, AI-powered data facilitates tailored engagement strategies for users interested in social media platforms, thereby increasing their loyalty and interaction. However, because concerns such as algorithmic bias and data privacy can undermine user trust, the ethical implications of using AI and predictive analytics must be considered to promote sustainable platform use strategies that positively impact societal and environmental goals. By balancing these technological advancements with ethical considerations, abandoned accounts can be viewed as part of digital waste, and addressing the problem of neglected Facebook accounts by identifying inactive profiles and potentially archiving or deleting them can reduce the digital environmental impact of data storage. Artificial intelligence can automate this process, ensuring compliance with data privacy regulations [7][8][9]. Social media plays a role in shaping user behavior, alongside the dual challenge of abandoned accounts and their sustainability. Based on recent research findings, it is highlighted how machine learning algorithms contribute to detecting abandoned accounts due to forgetfulness, threats, the death of their owner, or a change in their geographical location, in addition to predictive analytics and ethical decision-making, as the number of social media users, including Facebook, increases, impacting sustainable consumption in the digital world [10][11]. The research gap lies in the rapid growth of social media users, which highlights the problem of abandoned and inactive accounts. Abandoned accounts are those whose owners have been inactive for extended periods, as well as accounts disabled due to violations or at the account owner's request. These accounts pose a challenge to data analysis, and their accumulation creates chaos. Is it possible to recycle these accounts or utilize them later, as they may negatively impact the quality of results from marketing algorithms, behavioral analysis, and user experience enhancement? The research paper is structured as follows: Section Two presents previous studies; Section Three discusses relevant works, materials, and research methodology; Section Four describes the experiment and the results obtained; and Section Five presents a discussion of the experimental findings.

2. Previous studies

Researchers at [12] used social network analysis techniques to detect fake accounts by analyzing relationships and interactions between users. Using advanced machine learning algorithms,

they proposed a knowledge-based decision tree classifier. This method focused on identifying communication patterns, such as groups of fake accounts that behave similarly or perform coordinated actions. In [13], the researchers developed an intelligent system (FBChecker) that enables users to detect fake Facebook accounts using supervised data mining techniques. The system first collects data on a range of behavioral and informational attributes derived from the user's friends' profiles. The collected data is then validated to increase the accuracy of the detection process. Two methods were used: the k-NN algorithm and a special exclusion parameter. A set of supervised data mining algorithms was implemented using the RapidMiner data science platform to detect fake accounts. The researchers in [14] also conducted semi-structured interviews with 59 participants. Participants were recruited by sharing study information via email and social media, posting in public places, using a chain sampling method, and leveraging the authors' personal relationships. The researchers obtained the primary authentication code, such as a password, to be stored in a digital medium (such as a text file or email) or a physical medium (such as a notebook) to access the abandoned account in case it was lost. In [15], he set up a work test through two experiments. Initially, the entire dataset, including SCLE estimates, was used, while in the second, the character with missing values was excluded. Finally, validation criteria were calculated. As a baseline in each experiment, a cross-validation method with 10 attributes and $k=2$ was used for institutional algorithms for two classes (true and fake). From the above, it is clear that most studies have addressed the detection of fake accounts or the interruption of the platform's service to customers, but the research presented seeks to detect abandoned and deactivated accounts, which are accounts that their owners left for long periods for certain reasons such as death, forgetting the password, or due to the terms and conditions of use that vary according to the geographical location, or due to international relations that prevent the use of a certain application.

3. Decision Tree

Decision tree algorithms are a prominent type of machine learning algorithm. They are used to analyze and classify data into categories using a series of decisions. The C4.5 algorithm is one of its types. This algorithm is a fundamental element in supervised machine learning, where it classifies instances into a number of categories using a divide-and-conquer method, i.e., breaking down complex problems into simpler forms. The function is then called for each part of the problem, thus solving complex problems. It is effective in various applications, including identifying patterns indicative of computational activity effectively by determining the depth of the decision tree, handling continuous values and training data with missing values, and improving computational efficiency.

[16][17]. Using a decision tree for the C4.5 algorithm is similar to how a logical XOR gate works in a system for identifying and processing Facebook accounts. For example, the decision tree can analyze patterns of user activity (or inactivity) to predict account abandonment. This involves supervisory learning, where the algorithm learns from categorized data (accounts known to be abandoned, deactivated, or active).

4. Research Methodology

Decision trees can be used to make rule-based decisions and are discussed as part of artificial intelligence algorithms. Building a decision tree model to differentiate between active and inactive Facebook accounts using user behavior data involved analyzing various user activities. This included examining posting frequency, interaction with other users (likes, comments, and shares), login patterns, profile updates, and types of content consumed. The model will be trained on a dataset of categorized accounts (active vs. abandoned and inactive). A decision tree algorithm will then identify the most relevant behavioral traits to establish branching classification rules. The system can then flag accounts likely to be abandoned for review or automated action, such as deactivation or archiving, to improve platform performance. The decision tree approach can categorize abandoned accounts based on activity, profile completeness, and other factors to predict their likelihood of reactivation. The model's accuracy depends on the quality and comprehensiveness of the behavioral data, as well as appropriate feature engineering and model tuning. An abandoned or inactive account can be identified by factors that contribute to its abandonment or inactivity. Figure (1) Probability of leaving accounts.

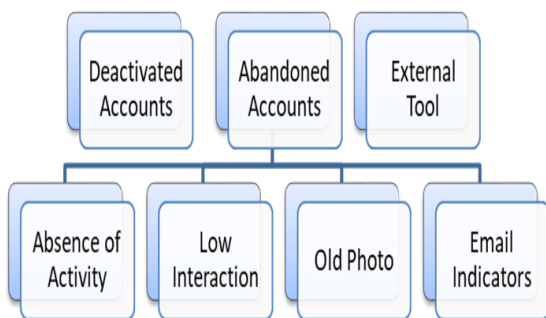


Figure 1: A Probability of abandoned accounts

Abandoned Accounts: are those whose owner has not logged in or interacted with them for a long time.

Deactivated Accounts: It is an account that has been officially suspended by the platform or by the user.

Absence of Activity: There has been no status update, posts, or interactions for months or years, a very long time.

External Tool: Some programs or analytics can show the activity of a page or account on a periodic basis, such as social media analytics tools.

Low Interaction: Few or no comments or likes on the posts.

Old Photo: The profile pictures and cover photos haven't been updated in years.

Email Indicators: If the account is linked to an inactive email address, the account may be abandoned.

4.1. Building and evaluating a decision tree model

Using the Stanford SNAP – Social Network Datasets website [18], we prepared the data to be used as a research sample. Some accounts were also selected manually. Facebook account information is subject to specific rules, which presented a challenge in the research. Account classification was determined using a decision tree, specifically the C4.5 algorithm, an improved version of ID3. The researcher chose this type of decision tree due to its accuracy compared to other decision tree methods [19], as demonstrated by previous studies. The study consists of two phases: training followed by testing and evaluation of the results.

1- Training Phase:

To predict the state of a Facebook account, which depends on several factors, the C4.5 algorithm was used to generate a decision tree, and the WEKA program was used to implement the C4.5 algorithm, the data contained in a file with the extension (ARFF) is loaded after the data has been loaded and the attributes have been specified. The dataset used in the training phase included 50 active accounts, 50 abandoned accounts, and 50 deactivated accounts. This dataset was used to build a decision tree model. After building the model, we obtained the decision tree.

2- Evaluation (Testing) Phase:

This tree helps in making decisions regarding the types of Facebook accounts: whether they are abandoned or deactivated. First, we verify whether an account is active or not. Based on the answer, we proceed and follow up according to the structure of the following diagram, which illustrates the decision tree for understanding Facebook page relationships.

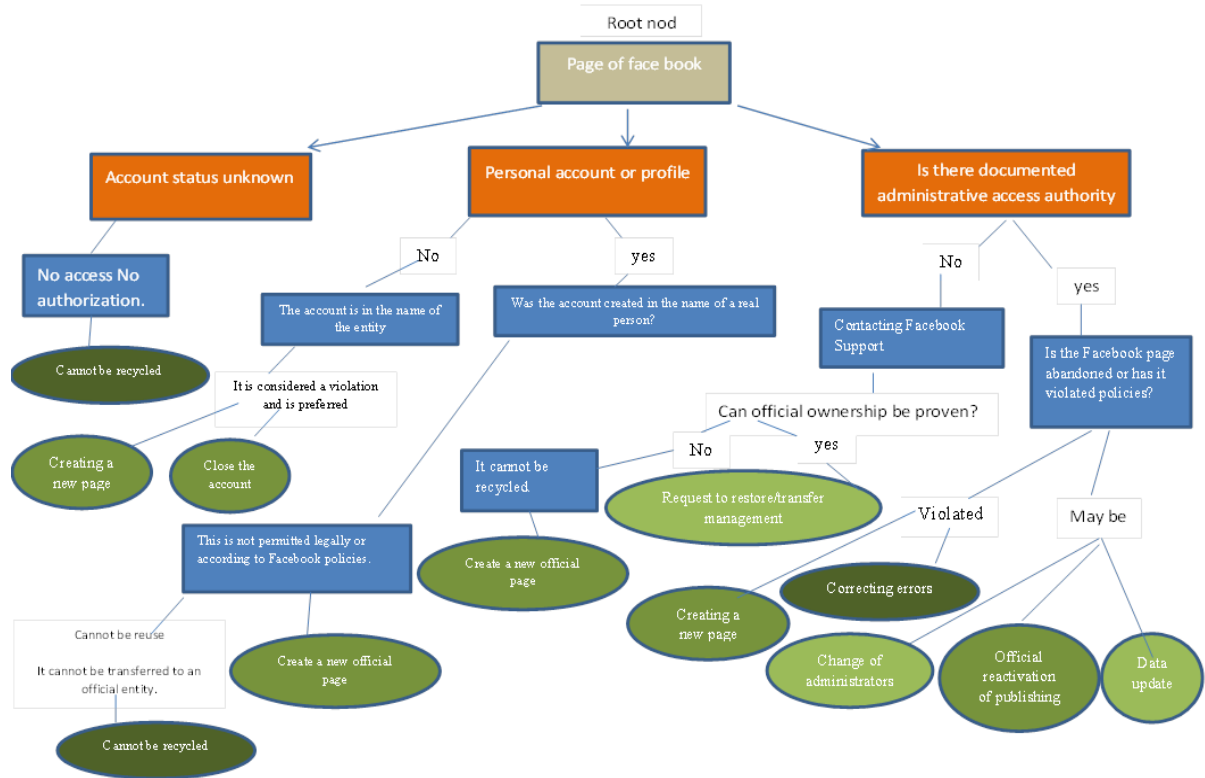


Figure2: A diagram for using Facebook user

behavior data to build a model capable of accurately distinguishing between active and Abandoned accounts or Deactivated Account

The data used in this research was partly obtained manually and partly from the SNAP website. Each dataset comprised 50 accounts (active, abandoned, and deactivated). We prepared the data to suit the classification process by constructing a decision tree using the C4.5 algorithm. The output from the training phase was then tested using the open-source WEKA data analysis software. The

proposed approach incorporates feature engineering techniques, enhancing the performance of machine learning models. This indicates that effective detection of abandoned and deactivated Facebook accounts can be achieved using smaller datasets when advanced machine learning techniques are applied. Table (1) explains the variables in the study.

Table 1: Explanation of the dataset used in the study

Description	Type	Variable
The Facebook page is inactive	Digit	Page no active
The Facebook page is active	Digit	Page active
Profile or Personal account or Unknown account	Categories	Classification1 Dependency Page
Unknown account No recycling No access and no official authorization	Categories	Classification2 Dependency account
Was the account created in a real person's name?	Categories	Classification3 Profile status

Description	Type	Variable
It is not legally permissible, nor is it permissible under Facebook's policies, to reuse or transfer it to an official entity.		
Does the official body have documented administrative access? The account is in the name of the entity (which is a violation in principle).	Categories	Classification4 Official page
Account closure or Creation of an alternative official page	Categories	Classification5 Cases of violation
Create a new official page or Link it to the official website	Categories	Classification6 Personal account
Is the page just abandoned, or is it violating policies?	Categories	Classification7 Page status
Can official ownership be proven? (Request for recovery/transfer of management)or (Create a new official page)	Categories	Classification8 Abandoned status
Data update e or Change of administrators or Official reactivation of publishing	Categories	Classification8 Abandoned status

Steps of the algorithm used in the search

- Calculate the entropy of the entire dataset(Login last Facebook accounts).
- Determine the amount of information gained for each attribute(6 attributes).
- If necessary, calculate the gain ratio(0.85).
- Select the attribute with the highest gain as the decision node(Administrative access).

- Divide the dataset based on the values of the selected attribute (Active, DE active, Abandoned).
- Repeat the process for each resulting subset.

RUN information

Scheme : weka.classifiers.tree.C4.5

Instance :	50
Attributes :	6
	Last Login Days Ago
	Interaction Rate
	Data Freshness
	Sessions
	Admin_Flag
	Post Last Month
.Cluster 0	Active
Cluster 1	Abandoned
Cluster -1	DEactive

The correlation matrix displays the relationships between variables for different attributes in the dataset for the accounts, as shown in **Figure 3**. The coefficients range from 0 to 1, indicating the strength and direction of the linear relationship between pairs of attributes for the accounts, where 1 indicates an abandoned account, -1 indicates a deactivated account, and 0 indicates an active account. Analyzing this matrix helps identify attributes with high correlation (either positive or negative), which contributes to feature selection, dimensionality reduction, and understanding the relationships within the data [20][21]. High correlations can sometimes indicate redundancy between attributes. For example, users might post an image, video, or text, while an automated program might repeat the same phrase to maintain account activity [22][23]. In Table 2, we observe that 50% of the accounts in the sample are active, while 18.18% are inactive. This is a small percentage compared to the active accounts, but it still represents a significant proportion if the researcher obtains a larger number of other Facebook accounts in the future. **Figure 4** shows the account's appearance when searched for or accessed. **Figure 5** shows the correlation matrix based on

attributes such as age, gender, date of birth, and location.

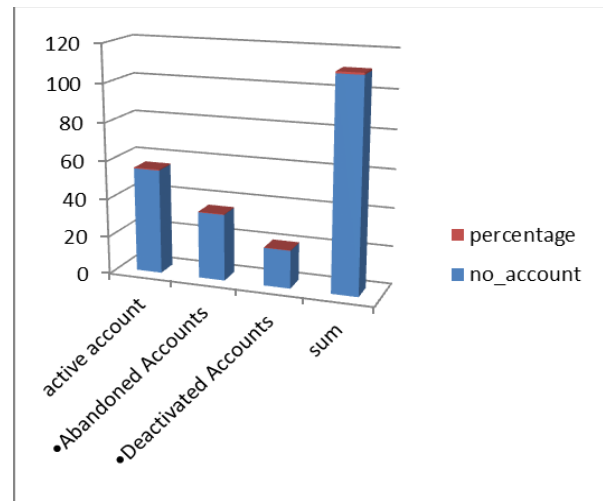


Figure 3: distribution of sample elements according to the type of account.

Table 2: distribution of sample elements according to the type of account

Type of Account	No_ account	Percentage
Active Account	55	50%
Abandoned Accounts	35	31.81%
Deactivated Accounts	20	18.18%
Sum	110	0.9999

As shown in **Figure 5**, the data distribution depends on the characteristics; for example, 4% of accounts are abandoned due to relocation or travel, 5% are abandoned at the owner's request, and 3% are abandoned due to gender. This sample is relatively small considering the total data collected, but it still occupies space on the platform.

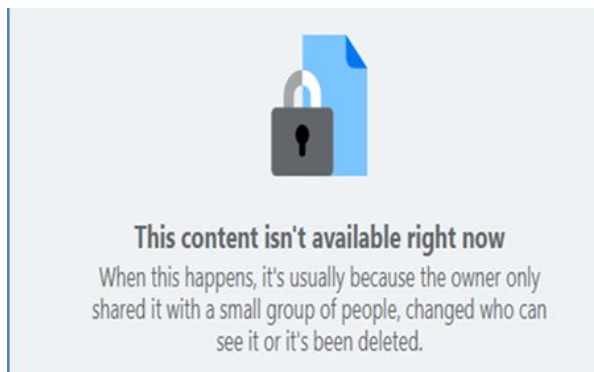


Figure 4: Deactivated Account

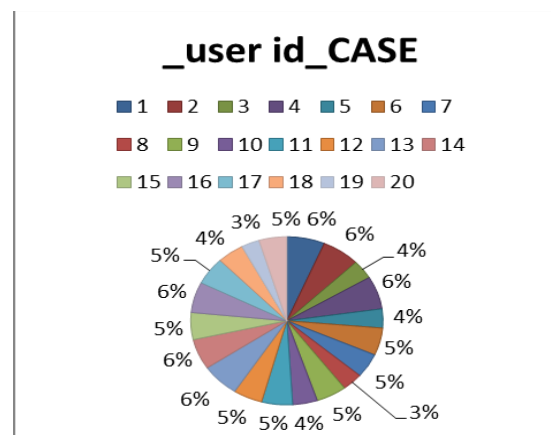


Figure 5: Correlation matrix for understanding data and selecting unused facebook accounts properties (abandoned)

Table(2) shows that the percentage of abandoned accounts is 31.81%, which is a significant percentage for the research sample. This figure includes both active accounts and accounts deactivated due to (violation of platform policies, suspicious activity, fake or fraudulent accounts, or

user requests to deactivate their accounts). These accounts place a burden on the platform and consequently affect its sustainability. Figures (6) and (7) provide examples of abandoned (inactive) accounts.

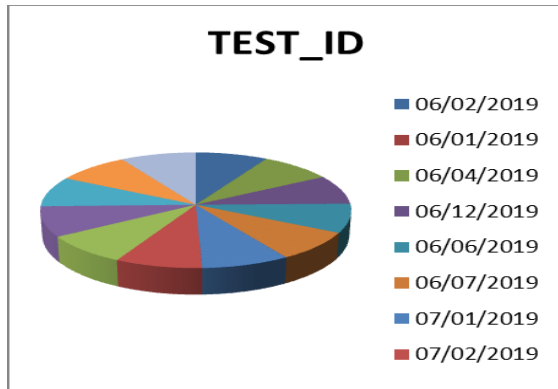


Figure 6: A chart of Abandoned accounts



Figure 7: Abandoned Account

Conclusion

Abandoned or deactivated accounts can be considered "waste" or a digital burden on social media platforms because they consume resources, create chaos, and become a breeding ground for fake or fraudulent accounts. This reduces the platform's quality and distorts the user experience. Even if they are not automatically deleted, they remain inactive and burden the platform's digital infrastructure. The results obtained from using the C4.5 algorithm confirm its practical effectiveness, as the percentage of deactivated accounts is 18.18%. This is a small percentage compared to active accounts, but it still occupies a significant amount of space if applied to a larger number of platform accounts, abandoned or deactivated accounts can be recycled if there is administrative access or official proof of ownership, but personal accounts cannot be recycled or used by an official entity. Feature-selection algorithms are applied to reduce the number of extracted rules, thus improving detection efficiency. This pioneering approach offers an effective solution to mitigate the damage caused by the accumulation of abandoned and deactivated accounts on the Facebook platform

by analyzing account behavior such as posting frequency and login times, thereby keeping the platform clean. Creating a new official page, verifying it, and linking it to the official website of the university or relevant entity provides a reliable method to ensure smooth online interactions. This study can also be applied to other platforms to explore the potential benefits of utilizing and repurposing abandoned or deactivated accounts. The use of artificial intelligence algorithms ensures the financial and technical sustainability of the Facebook platform and creates complex interactions that impact the future of technology and society.

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Conflict of interest

None.

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