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AI-Driven Influencer Marketing: A Machine Learning Analysis of Gen Z Consumer Behavior

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Abstract - *This research examines the role of credibility in skincare product preferences and purchase intentions of Gen Z consumers influenced by endorsements from AI-powered social media influencers. Based on Source Credibility Theory, Commitment and Trust Theory, and Theory of Planned Behavior, this research explores the impact of perceived credibility, trust, product attitudes, content quality, and AI personalization on social media interactions and purchase intentions. A quantitative cross-sectional survey study was conducted among Gen Z social media users, employing a structured questionnaire. Data analysis was conducted through correlation and regression analysis, as well as clustering and machine learning techniques in Python. The findings show that there are extremely positive correlations between the key variables, and social media interaction and AI personalization are the most influential factors in determining purchase intentions.*

Keywords - *AI personalization, influencer marketing, trust, engagement, purchase intention.*

I. Introduction

Artificial intelligence (AI) has transformed social media marketing by allowing platforms to offer personalized and data-driven content. Influencer marketing has thus emerged as a prominent marketing tool in the skincare market, where consumers turn to trusted recommendations to alleviate uncertainty. The effectiveness of influencers is enhanced when they are viewed as credible and trustworthy sources [12];[15], and existing literature verifies that credibility can enhance trust and trust-related outcomes [5];[13]. Generation Z is a significant segment as they are actively engaged with social media platforms for product discovery and decision- making. In the online context, trust alleviates uncertainty and fosters consumer responses [10];[14], and product attitude is a reliable predictor of purchase [1]. Moreover, content quality and AI personalization can improve relevance and decision- making [2];[4] and social media engagement bridges the perceptions to purchase intention [11];[18]. Hence, this study investigates the role of credibility, trust, product attitude, content quality, and AI personalization in influencing engagement and purchase intention of influencer-marketed skincare products among Gen Z consumers.

II. Research Gap

Though influencer marketing research is prevalent, most of it still remains grounded in traditional contexts and has not yet fully addressed the role of AI personalization in content visibility and its subsequent effects on purchasing decisions

[2];[17]. We understand that credibility builds trust and influences consumer behavior [12];[15] and purchase outcomes [5];[13], yet there is a lack of studies that integratecredibility and trust constructs with AI personalization, particularly in the skincare industry. Attitudes also play a role in purchase intentions [1];[9] and content quality affects online outcomes [4];[8], yet their combined effects on AI-powered influencer marketing have not been fully investigated. Engagement is usually considered an outcome measure and not a connecting mechanism between credibility, trust, content quality, and AI personalization to purchase intentions [11];[18]. To this, the lack of emphasis on Gen Z, who are known to heavily depend on social media platforms for purchasing decisions.

A. Research Objectives*:*

- To examine the role of AI-powered influencer endorsement in shaping Gen Z's purchase intentions for skincare products.

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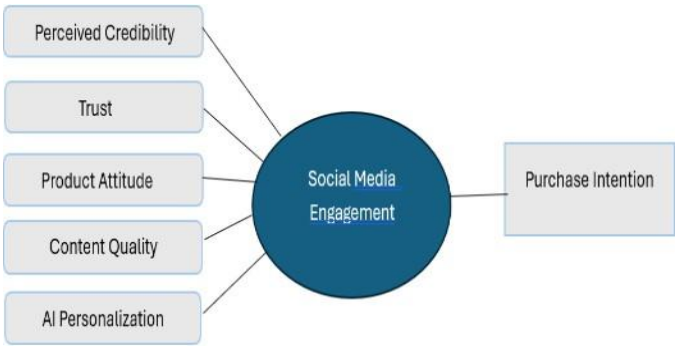
- To examine the relationship between attitudes and purchase intentions.

B. Problem Statement:

AI-driven influencer marketing has become a powerful strategy in the skincare industry, especially on social media platforms where Generation Z consumers actively search for product information and recommendations. However, Despite the increasing use of AI-based personalization and influencer endorsements, there is still limited clarity on how these AI-driven factors shape consumers' trust, product attitudes, engagement, and ultimately their purchase intention. Most existing studies focus on influencer credibility and trust in traditional settings, but fewer studies explain how AI personalization and content quality interact with credibility-based perceptions in influencing consumer behavior. In addition, social media engagement is often examined as an outcome rather than as a mechanism that links credibility, trust, and personalization to purchase decisions. Therefore, this study addresses the need for an integrated understanding of how AI-driven influencer endorsements influence Gen Z consumers' skincare purchase intention.

Figure 1 Research Framework



III. LITERATURE REVIEW:

A. Perceived Credibility:

Perceived credibility is the degree to which consumers regard an influencer's message as credible and believable. Credibility is primarily determined by expertise and trustworthiness, which affect the acceptance of persuasive communication [12];[15]. In the context of skincare influencer marketing, credible influencers can make recommendations seem authentic and valuable, thus diminishing uncertainty and enhancing purchase behavior [5][13].

B. Trust

Trust is a consumer's belief in the honesty and reliability of influencer information. It is particularly important in online settings, in which consumers are dependent on indirect information. Relationship marketing literature suggests that trust is fundamental to the consumer relationship and behavioral outcomes [14], and in e-commerce, it is shown to diminish risk and enhance purchase intention [10]. Trust is also considered to be closely related to credibility [12];[15].

C. Product Attitude

Product attitude is the overall consumer evaluation of a product and is a strong predictor of purchase intention [1];[9]. Influencer reviews and demonstrations influence skincare attitudes, particularly for high-involvement products [5]. AI personalization further enhances attitudes by providing relevant influencer content, which underpins positive evaluations [16].

D. Content Quality

Content quality is defined as the informativeness, accuracy, clarity, and usefulness of marketing communication, which affects engagement and behavioral intention [4]. In the context of influencer marketing, high-quality content decreases perceived risk and fosters more positive consumer responses [8]. Studies indicate that high-quality influencer content positively impacts trust, engagement, and purchase intention, particularly in AI-optimized environments [13].

C. AI Personalization

AI personalization is the process of adapting content to users' preferences and behaviors to

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enhance relevance and engagement [3]. In influencer marketing, personalization helps reduce information overload and enhance decision-making by presenting content relevant to consumer needs [17]. The S-O-R framework defines personalization as a stimulus that shapes internal evaluations and behavioral outcomes [14]. Empirical evidence indicates personalization can enhance trust and purchase intention among Gen Z consumers [2].

D. Social Media Engagement

Social media engagement is the process of users' interaction with content on social media platforms through liking, commenting, and sharing [11]. The S-O-R framework defines engagement as a behavioral outcome that is stimulated by credible and personalized influencer content [14]. Engagement enhances consumer connection and purchase intention [18].

E. Purchase Intention

Purchase intention is a measure of consumers' willingness to purchase a product and is a reliable predictor of actual behavior [1]. In influencer marketing, influencers influence attitudes and intentions as opinion leaders [9]. AI personalization and engagement further enhance purchase intention, especially for high-involvement products such as skincare [6].

IV. METHODOLOGY

This research employed a quantitative, cross-sectional survey design to examine the impact of AI-based influencer endorsement on purchase intention of skincare products among Gen Z consumers. The survey questionnaire was designed to collect data from Gen Z social media users who frequently interact with influencer-driven skincare content. The constructs of interest—perceived credibility, trust, product attitude, content quality, AI personalization, social media engagement, and purchase intention—were operationalized using items adapted from existing theories and previous research. The conceptual framework is based on Source Credibility Theory [12];[15], Commitment-Trust Theory [14], and the Theory of Planned Behavior [1]. The analysis was conducted using in Python. Descriptive statistics and correlation analysis were used to examine the relationships between the constructs. Regression analysis was also conducted to examine the predictive validity of the models. Furthermore, machine learning models (Logistic Regression and Random Forest) were used to compare the classification accuracy and identify the top predictors of purchase intention. To facilitate further interpretation, cluster analysis and PCA visualization were conducted to segment the respondents based on their engagement, trust, AI personalization, and purchase intention.

V. RESULTS

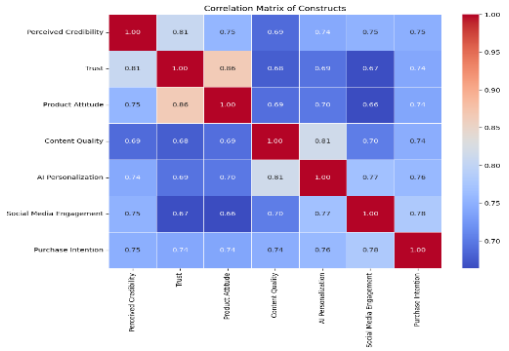

Figure 2 Correlation Matrix of Study

The correlation matrix (Figure 2) reveals strong positive correlations between all constructs, with values ranging from 0.66 to 0.86. Trust and Product Attitude are most strongly correlated (r = 0.86), suggesting that positive trust is linked to positive product attitudes. Perceived Credibility is strongly correlated with Trust (r = 0.81), and Content Quality and AI Personalization are also strongly correlated (r = 0.81). Purchase Intention is positively correlated with all variables, but most strongly with Social Media Engagement (r = 0.78)

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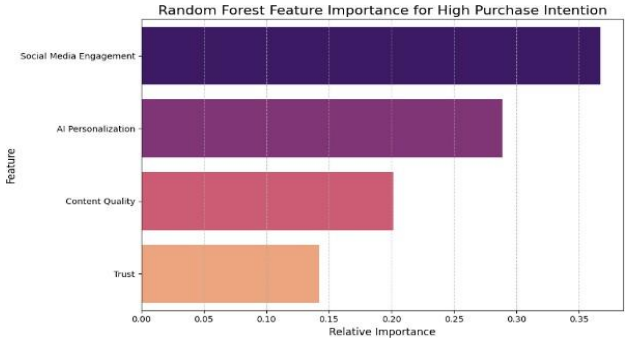
and AI Personalization (r = 0.76). In general, the results confirm the proposed framework by verifying strong correlations between the key determinants of purchase intention.

Table 1Logistic Regression Model Performance Metrics

Metric	Value
Accuracy	0.8889
Precision	0.9474
Recall	0.8182
F1-Score	0.8780

The Table 1 shows the logistic regression model achieved an accuracy of 0.889, indicating that 88.9% of predictions were correctly classified. The precision of 0.947 suggests high reliability in predicting positive cases, while the recall of 0.818 indicates that 81.8% of actual positive instances were correctly identified. The F1-score of 0.878, which balances precision and recall, reflects strong overall classification performance. These results demonstrate that the Logistic Regression model effectively predicts outcomes for the given dataset



.Figure 3 Random Forest Classifier (Alternative Model Comparison)

Fig.3 - The Random Forest model indicates that Social Media Engagement is the most influential predictor of high purchase intention, with a relative importance of 0.37, followed by AI Personalization (0.29), highlighting the significant role of engagement and personalized content. Content Quality demonstrates moderate importance (0.20), while Trust has the lowest contribution (0.14), suggesting it is comparatively less impactful. Overall, the results emphasize that interactive engagement and AI-driven personalization are the strongest determinants of consumers' purchase intention in this study.

Table 2 Comparison of Classification Model Performance (Logistic Regression vs Random Forest)

Metric	Logistic Regression	Random Forest
Accuracy	0.8889	0.9111
Precision	0.9474	1.0000
Recall	0.8182	0.8182
F1-Score	0.8780	0.9000

Table 2 - The performance comparison between Logistic Regression and Random Forest models indicates that Random Forest outperforms Logistic Regression across most evaluation metrics. Random Forest achieved higher accuracy (0.911 vs. 0.889) and a perfect precision of 1.000 compared to 0.947 for Logistic Regression, while both models had the same recall (0.818). The F1-score was also higher for Random Forest (0.900 vs. 0.878), reflecting a better balance between precision and recall. These results suggest that Random Forest is the more effective model for predicting the target outcome in this study.

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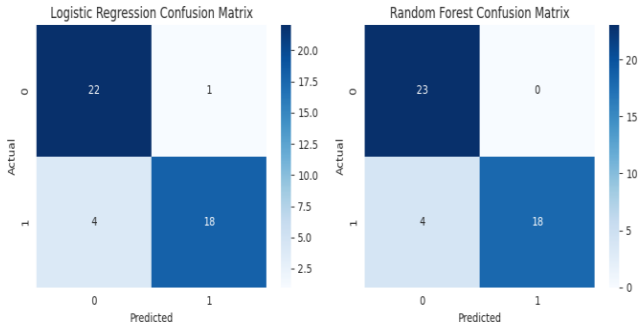

Figure 4 Logistic Regression vs Random Forest

Fig.4 - The confusion matrices for the Logistic Regression and Random Forest models show their classification performance across classes 0 and 1. For Logistic Regression, 22 cases of class 0 and 18 cases of class 1 were correctly predicted, with 1 false positive and 4 false negatives, indicating some misclassification of positive cases. The Random Forest model correctly classified 23 cases of class 0 and 18 cases of class 1, with no false positives but the same

4 false negatives, demonstrating improved accuracy in predicting class 0. Overall, Random Forest shows slightly better classification performance than Logistic Regression due to fewer misclassifications.

Table 3 Cluster Analysis Results

Cluster	Social Media Engagement	Trust	AI Personalization	Purchase Intention
0	3.037879	3.260101	3.421717	3.229798
1	1.960227	1.937500	2.113636	2.005682
2	4.171875	4.131250	4.290625	4.143750

Table 3 - The cluster analysis revealed three distinct consumer segments for engagement, trust, AI personalization, and purchase intention. Cluster 1 had the lowest mean score on all variables, which indicated less engagement, lack of trust, less perceived personalization, and less purchase intention. Cluster 0 had moderate scores, which indicated a neutral to moderately positive response to AI- driven influencer marketing endorsements. Cluster 2 had the highest scores on all variables, which indicated highly engaged consumers with high trust, high perceived personalization, and high purchase intention. The results clearly indicate the existence of segment differences, and Cluster 2 is the most desirable segment for AI-driven influencer marketing in the skincare industry.

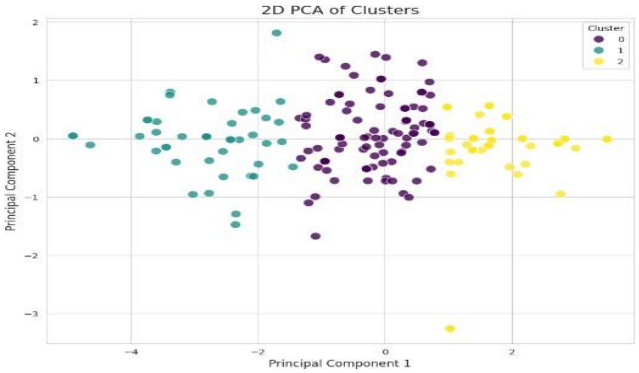

Figure 5 Cluster Analysis Results

Fig.5 - The 2D PCA visualization illustrates the separation of the three clusters based on Social Media Engagement, Trust, AI Personalization, and Purchase Intention. Cluster 1, positioned on the left, represents respondents with lower scores

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across all variables, indicating low engagement, trust, and purchase intention. Cluster 0 occupies the central region, reflecting moderate levels of these variables, while Cluster 2, located on the right, exhibits the highest scores, indicating strong engagement, trust, and purchase intention. The PCA plot supports the validity of the clustering results by demonstrating distinct consumer segments with varying responses to AI-driven influencer marketing.

Table 4 Linear Regression Model Performance Metrics

Metric	Value
R-squared (R^2)	0.8613
Mean Absolute Error (MAE)	0.2978
Root Mean Squared Error (RMSE)	0.3904

Fig.5 - The 2D PCA visualization illustrates the separation of the three clusters based on Social Media Engagement, Trust, AI Personalization, and Purchase Intention. Cluster 1, positioned on the left, represents respondents with lower scores across all variables, indicating low engagement, trust, and purchase intention. Cluster 0 occupies the central region, reflecting moderate levels of these

variables, while Cluster 2, located on the right, exhibits the highest scores, indicating strong engagement, trust, and purchase intention. The PCA plot supports the validity of the clustering results by demonstrating distinct consumer segments with varying responses to AI-driven influencer marketing.

Table 5 Linear Regression Model Performance Metrics

Metric	Value
R-squared (R^2)	0.8613
Mean Absolute Error (MAE)	0.2978
Root Mean Squared Error (RMSE)	0.3904

Table 4 - The Linear Regression model achieved an R^2 of 0.861, indicating that approximately 86.1% of the variance in the dependent variable is explained by the independent variables, reflecting a strong model fit. The Mean Absolute Error (MAE) of 0.298 suggests that predicted

values deviate from actual values by an average of 0.30 units, while the Root Mean Squared Error (RMSE) of 0.390 indicates good predictive accuracy, with some larger errors present. Overall, the results demonstrate that the Linear Regression model provides reliable and effective predictions on the test dataset.

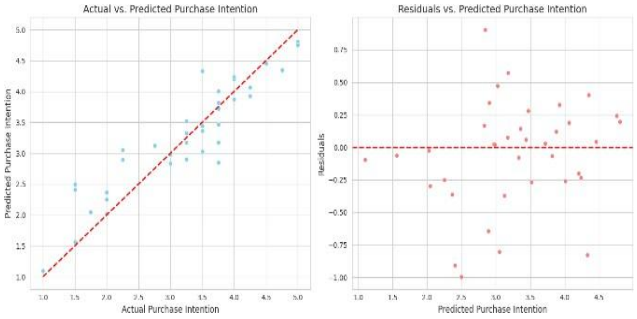

Figure 6 Diagnostic Plots for the Linear Regression Model

Fig.6 - The diagnostic plots for the Linear Regression model show strong predictive performance. In the Actual vs. Predicted plot, most points lie close to the diagonal reference line, indicating high alignment between predicted and observed purchase intention values. The Residuals vs. Predicted plot shows residuals distributed around zero without a systematic pattern, suggesting that prediction errors are mostly random and balanced across predicted values. Although a few residuals deviate slightly, the overall spread is

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limited, indicating no major issues with heteroscedasticity or bias. These results confirm that the Linear Regression model provides reliable predictions and fits the data well.

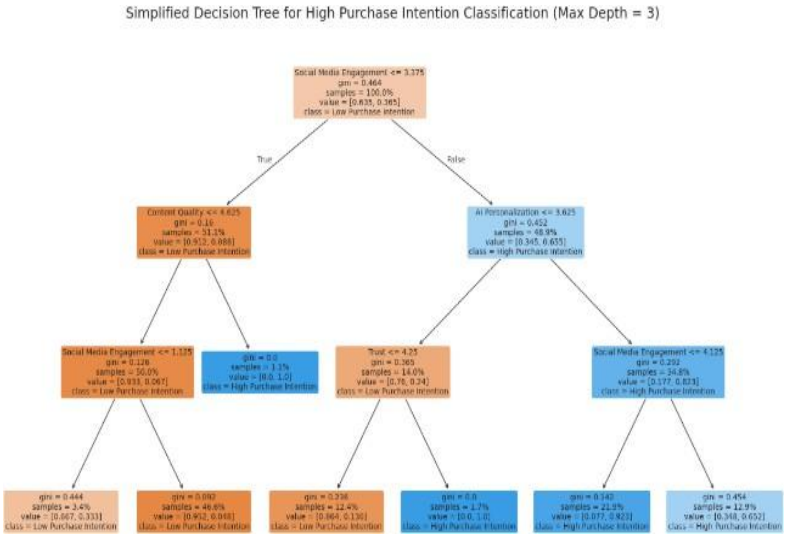

Figure 7 Decision Tree Model for High Purchase Intention Classification

Fig.7 - The Decision Tree model classified respondents into High and Low Purchase Intention based on Social Media Engagement, Content Quality, AI Personalization, and Trust. Social Media Engagement served as the root node, indicating its primary role in distinguishing purchase intention levels. Decision rules show that low engagement predicts low purchase intention, whereas higher engagement, combined with strong AI Personalization and Content Quality, increases the likelihood of high purchase intention. Trust acts as a supporting predictor at deeper nodes, strengthening decisions after engagement and personalization are considered. Overall, the Decision Tree provides interpretable rules demonstrating how engagement, personalization, content quality, and trust collectively influence consumers' purchase intention for skincare products.

VI. **DISCUSSION**

The study supports the proposed framework concerning the manner in which AI-powered influencer endorsement influences skincare purchase intent among Gen Z. For all factors considered, we observe very strong positive correlations (r = .66-.86): credibility, trust, product attitude, content quality, AI personalization, and engagement are strongly interrelated. The strong credibility-trust correlation corresponds to Source Credibility Theory [12];[15], while the trust-product attitude correlation corresponds to relationship marketing concepts that consider trust a key antecedent of positive online assessments [14];[10].Regression analysis shows that the model accounts for a large amount of behavior (R^2 = .861), consistent with theories that consider attitude a primary predictor of purchase intention [1];[9]. Random Forest is superior to Logistic Regression, suggesting that non- linear relationships between engagement, credibility, and AI- powered factors are present. Social media engagement is identified as the most important predictor, consistent with engagement-based theories [11];[18]. AI-powered personalization and content quality also play a significant role, suggesting that personalized high-quality influencer content is an important factor in enhancing relevance and purchase intent [2];[4];[8]. Cluster analysis reveals three distinct groups of consumers, with the high-acceptance group displaying the highest engagement, trust, perceived AI personalization, and purchase intent. In general, the findings suggest that credibility and trust provide the foundation, while social media engagement and AI-powered personalization are the primary channels through which influencer endorsement influences skincare purchase intent among Gen Z

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VII. CONCLUSION

This study highlights that AI-driven influencer marketing plays a major role in shaping Generation Z consumers' skincare purchase intention. The findings confirm that perceived credibility and trust remain essential foundations for building positive product attitudes, especially in online environments where consumers depend heavily on influencer information. Results also show that content quality and AI personalization strengthen consumer engagement by making influencer messages more relevant and useful. Importantly, social media engagement emerged as the strongest driver of purchase intention, suggesting that interactive behaviors such as liking, commenting, and sharing act as a key mechanism that converts perceptions into actual buying intention. Overall, the study concludes that AI personalization and engagement enhance the effectiveness of influencer endorsements, making them highly influential in Gen Z skincare decision-making

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