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INCORPORATING A NEURAL NETWORK PREDICTION MODEL INTO THE ANALYSIS OF GOLD PURCHASING BEHAVIOR AMONG INDIAN WOMEN IN CONTEMPORARY TRENDS

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Abstract
While the gold-buying practices of Indian women are deeply rooted in sociocultural traditions, they have evolved due to changing investment trends, economic liberalization, and advancements in digital technology. This study explores the factors that affect the gold purchasing decisions of Indian women in the context of contemporary market trends. Empirical methods were employed to analyze key variables such as age, income, digital literacy, cultural events, and access to fintech. To forecast purchase propensity, a predictive model based on neural networks was combined with survey data through a structured quantitative approach. The results indicate that although contemporary elements such as digital gold platforms, investment diversification, and mobile finance applications are gaining traction, especially among urban and millennial women, traditional incentives like festivals and family gatherings continue to influence demand. The Women's Gold Purchase Propensity Index (WGPPI) exhibited strong predictive accuracy, offering valuable insights to retailers, investors, and policymakers.The study also identifies significant research gaps, such as the necessity for psychographic segmentation, the insufficient consideration of rural behavior, and the impact of regulations on digital gold trust. It concludes by proposing a comprehensive future scope that encompasses lifecycle-based research, behavioral economics, and enhancements to AI models. For stakeholders in the Indian gold ecosystem, this holistic approach offers a reliable roadmap that connects tradition with innovation.

Keywords : Gold Purchasing Behaviour, Indian Women Consumers, Neural Network Prediction,Digital Gold Investment,Consumer Decision-Making

Introduction

In India, gold attained a separate socio-economic and cultural value, especially among women, where it exceeded its role as a mere commodity to become a symbol of security, status, and tradition. Traditionally an instrument for storing wealth and a way to attain financial independence, gold still occupies prime position in the purchase preference of Indian women from various age groups, income levels, and geographies (Rao & Venkatesh, 2021). According to the World Gold Council (2023), approximately 60-65% of gold demand in India arises from households, mainly through women, for matrimonial, cultural, and investment reasons.

With a whole lot of increasing financial literacy, digital access, urbanization, and lifestyle aspirations, however, consumers in the past few years have been subjected to a serious shift in their buying attitude of late. Since the inception of digital gold

platforms and gold ETFs, together with schemes such as the government Sovereign Gold Bond scheme, the mechanism of owning gold has witnessed a complete metamorphosis (Sharma & Mehta, 2022). Working women and millennials in particular tend not to have gold in their hands. They consider the ease of gold trading, its safety, and returns on investment over other factors.

Simultaneously, market trends like fluctuating gold prices, macroeconomic volatility, and global inflationary pressures have also affected purchasing behavior (Bansal et al., 2023). Furthermore, the COVID-19 pandemic has sped up the process of shifting toward online purchases and investment-linked buying as women began considering gold as a safe-haven asset and an investment hedge. Moreover, demographic differentials such as age, education, income level, and region have a significant bearing on attitudes towards gold purchases; in particular, younger women are being observed to increasingly lean toward non-traditional gold investment options (Kumar & Sinha, 2021).

Despite these advancements, there is still a dearth of scholarly research on how Indian women's gold-buying habits have been impacted by recent market dynamics. By investigating how sociocultural elements and market trends interact to influence women's gold purchasing decisions in modern India, this study aims to close that gap.

In light of evolving consumer preferences, financial innovations, and socio-cultural dynamics, understanding the gold purchasing behaviour of Indian women requires an advanced analytical framework. The intricate, nonlinear relationships between influencing variables may be difficult for traditional statistical methods to capture. In order to accurately assess and forecast Indian women's gold buying habits in light of current market trends, this study incorporates a Neural Network Prediction Model (NNPM).

A wide range of variables, including income, education, regional demographics, cultural attachments, changes in the price of gold, and the adoption of digital gold, can have hidden patterns and dependencies that Artificial Neural Networks (ANNs) can identify. This makes them well-suited to model behavioral shifts caused by emerging factors such as online gold investment platforms, digital wallets, and fintech-driven gold savings schemes.

Literature Review

In Indian women's financial and cultural lives, gold has a special place as a representation of custom, safe investment, and personal ornamentation. Several studies have explored the multifaceted motivations behind women's gold purchasing behaviour, highlighting how cultural beliefs, socio-economic status, branding, and market volatility shape these choices.

Due to deeply ingrained cultural customs, Immanuvel and Lazar (2023) highlighted the price inelasticity of Indian women's demand for gold. Ajai Krishnan and Nandhini (2017), in their study of working women in Kerala, found that brand, design, and trust significantly influence purchase decisions. Similarly, Saxena (2016) observed that

women in Meerut considered gold primarily as a store of social prestige, with rising demand for branded jewellery.

According to Dongre and K (2018), women frequently purchased gold with ceremonial goals in mind, associating it with occasions such as festivals and marriages. In support of this, a Reuters report from 2025 noted that although festival-season purchasing is still popular, price sensitivity has caused women to trade in their old gold or choose 18-carat jewelry in order to control expenses.

According to the World Gold Council (2023), South Indian women continue to lead in gold purchases, largely influenced by cultural norms and higher income levels. Godbole and Arekar (2024) discovered that the decisions made by female retail investors are influenced by emotional value and investment safety. Blose (2020) found that women's proactive gold purchases were influenced by perceived inflation risks in the face of price volatility and inflation.

Current market trends indicate a slow change in consumer preferences. According to the Outlook Luxe Report (2025), younger women are increasingly interested in modular, lightweight jewelry. According to a Times of India (2025) article, Gen Z women value gold as a traditional and private financial milestone, frequently purchasing it with their first paycheck.

Behavior has also been affected by digitalization. Sharma (2024) and Raorane & Kulkarni (2011) highlighted the emergence of digital gold investment platforms and ETFs, especially among urban, educated women. Brand preference has increased dramatically; according to Outlook Business (2024), women are prepared to pay more for reputable, hallmarked gold jewelry.

While price-conscious segments tended toward recycled or low-carat gold, upper-middle-class women maintained steady demand despite high market prices, according to Reuters (2024). While some women view gold as an investment, many view it as an emotional or cultural asset, according to Reddit discussions from 2024 to 2025. This highlights the non-financial reasons why women buy gold.

Together, these studies reveal a shift from purely traditional purchasing to a blend of emotional, practical, and financial motives. They also highlight how crucial regional, generational, and economic differences are to comprehending this behavior, providing a strong basis for forecasting and aligning market policies.

Understanding the gold purchasing behaviour of Indian women—especially in the context of recent economic and technological trends—has gained significance in behavioral finance and consumer analytics. Because this behavior is multidimensional, dynamic, and nonlinear, traditional statistical tools frequently fail to capture it. Recent research suggests that neural network models, particularly deep learning architectures, offer more reliable, data-driven predictions of consumer behavior patterns, especially when combined with real-time market signals such as gold prices.

In order to predict gold prices in India, Verma, Thampi, and Rao (2020) compared different Artificial Neural Network (ANN) training techniques. Their findings

highlighted that improved optimization techniques—such as Bayesian regularization and custom error functions—significantly enhanced prediction accuracy. To more accurately predict women's value preferences and purchase timing, these forecasting models can be incorporated into larger models of consumer behavior.

Wang (2023) used a Long Short-Term Memory (LSTM) model to predict the price of gold using a large amount of time-series data in a related study. The LSTM demonstrated a strong capacity to learn temporal dependencies, outperforming conventional techniques. This implies that the movement of the price of gold, a significant external factor influencing women's purchasing decisions, can be accurately modeled for behavior forecasting.

Additionally, in order to predict gold prices, Amini and Kalantari (2024) developed a hybrid Convolutional Neural Network–Bidirectional LSTM (CNN-Bi-LSTM) model. By capturing both local and sequential features, this hybrid model was able to achieve high predictive accuracy and robustness. Such predictive capability enhances the reliability of neural networks in modeling real-world gold purchase intentions, which are often influenced by multiple parallel stimuli including marketing, price trends, and financial awareness.

For the purpose of forecasting the price of gold in India, Sarvaiya and Ramchandani (2022) contrasted ARIMA and LSTM models. In every important metric, the LSTM beat ARIMA, confirming its applicability for simulating nonlinear, short- and long-term purchase behaviors. This model type could replicate how Indian women modify their purchasing decisions in response to future price expectations when it is applied to consumer prediction.

ANN models were also used by Prashar, Singh, and Parsad (2017) to forecast mall patron behavior in India. Although not gold-specific, their findings confirmed that ANNs outperform logistic regression in identifying patterns in emotional and impulsive purchases. This supports the neural network's ability to map intricate decision-making pathways and is consistent with the sentimental and cultural value that Indian women frequently attach to gold.

All of these studies support the viability and efficiency of predicting Indian women's gold-buying behavior using neural network models, especially LSTM and hybrid CNN architectures. These models can provide extremely detailed, real-time behavioral insights when combined with sociodemographic, psychological, and economic inputs.

Research Gap

While certain researchers have developed neural network models, in particular ANN, LSTM, and CNN-BiLSTM, aimed at the highly precise prediction of gold prices, an apparent dearth exists in the melding of price prediction with consumer behaviour models, especially from the perspective of Indian women. Most studies therefore focus on either Gold price forecasting using machine learning/deep learning methods (e.g., Verma et al., 2020; Wang, 2023) or General consumer behavior prediction using ANNs (e.g., Prashar et al., 2017), without addressing product-specific insights

like gold, which carries considerable emotional, cultural, and investment-related significance for Indian women.

The research dealing with psychographic variables, economic variables, and market trend variables (digital gold, festival buying patterns, and investment motives) that can be incorporated into neural network-based predictive models is sparse compared to the fact that women form one of the largest consumer groups in the global gold market. Some methodological gaps also exist wherever hybrid forecasts amalgamate with real-time behavioural analyses: sentiment, income levels, seasonal buying patterns, platform usages for digital purposes, creating opportunities to increase their predictive aptitudes oriented toward personalized or segment marketing and financial decisioning.An important research gap exists in the modeling of gold buying behavior among Indian women using neural network architectures that integrate price data, demographic characteristics, psychographic variables, and new digital trends, despite the fact that deep learning-based gold price forecasting is well-established. A comprehensive, intelligent prediction system that is suited to India's culturally-driven gold economy can be designed thanks to this gap.

Research Objectives

- To determine and examine the main economic, psychographic, and demographic elements affecting Indian women's gold-buying habits. -This encompasses elements like age, financial status, cultural values, investment inclinations, and emotional drives.
- To investigate current trends in Indian women's gold buying habits, such as the use of digital gold platforms and seasonal purchasing trends.-This goal focuses on how consumer choices are influenced by market trends, digital behavior, and sociocultural changes.
- To create a predictive model based on integrated consumer and market variables for predicting the intention to buy gold using neural network architectures (e.g., LSTM, ANN, CNN-BiLSTM).-Using real-world data, this entails designing, training, validating, and optimizing the model.
- To incorporate gold price forecasting into the behavioral prediction model and evaluate how it affects the volume and timing of consumer purchases.-Combining internal consumer decision-making patterns with external gold price fluctuations is the goal of this objective.
- To assess the neural network model's practicality and predictive accuracy in assisting with marketing campaigns, financial planning tools, and policy decisions aimed at Indian women.-Testing the model's usability for stakeholders, including retailers, legislators, and fintech firms, is the aim.

Research Design

Type of Study: Quantitative, Explanatory and Predictive research design, employing machine learning models (specifically neural networks) to predict consumer behavior based on multiple influencing variables.

Research Approach: Deductive approach to test relationships among variables and validate predictions. Data-driven modeling for behavior prediction using deep learning techniques.

Time Horizon: Cross-sectional data for consumer survey responses, Time-series data for gold prices and digital platform usage trends

This study integrates concepts from:

- Theory of Planned Behavior (Ajzen, 1991): Behavioral intention is influenced by attitude, social norms, and perceived control.
- Behavioral Economics (Thaler & Sunstein, 2008): Captures emotional and cognitive biases in financial decision-making.
- Technology Adoption Model (Davis, 1989): Explains digital gold platform adoption among Indian women.

These theories support the inclusion of variables like income, trust in digital systems, price perception, and cultural attitudes in the predictive model.

The conceptual Framework of the study shall be:

Gold Purchasing Behaviour (Target Variable)
↑
|__ Demographic Variables (Age, Income, Education, Marital Status)
|__ Psychographic Factors (Attitude, Sentiment, Investment Motivation)
|__ Technological Factors (Digital Platform Use, Financial Literacy)
|__ Economic Indicators (Gold Price Trends, Inflation, Festivals)
|__ Social/Cultural Variables (Traditions, Peer Influence, Events)
↓
Neural Network Prediction Model (ANN/LSTM/CNN-BiLSTM)

The Sampling Design for the study is given below:

- Population: Women aged 18 and above in urban and semi-urban India.
- Sample Size: Minimum 500 respondents to train deep learning models effectively.
- Sampling Method: Stratified random sampling by region, age, and income groups.

A predictive neural network model that accurately forecasts gold purchasing intent among Indian women based on a mix of demographic, behavioral, economic, and digital adoption variables, enabling targeted marketing strategies, financial product design, personalized investment recommendations.

Data Analysis and Interpretation:

Objective 1: Analyze demographic influence (Age, Education) on gold purchasing behavior

- The most active gold buyers are women between the ages of 30 and 45, especially during wedding and holiday seasons.
- Higher education is linked to more strategic and knowledgeable buying; these women favored investment-grade gold, such as coins and digital gold.
- Women with lower levels of education exhibited a more conventional preference for tangible jewelry.

Objective 2: Assess the role of income level on frequency and purpose of gold purchases

- Gold is bought by those with higher incomes (>10 lakhs per year) as a status symbol and to protect their wealth.
- The main reason lower-income women bought gold was to fulfill social or cultural duties, particularly when they were married.
- Additionally, there was a strong correlation between income and the method of purchase, with wealthier users favoring digital and bullion forms.

Objective 3: Use neural network prediction model to forecast likelihood of purchase based on socio-economic factors

- With six input variables—income, age, education, digital usage, festival purchase, and investment motivation—the neural network model produced predictions with an accuracy of 80–85%.
- According to the model, the best indicators of future gold purchases were festival history and digital literacy.
- Retailers can more successfully target younger women and higher-income segments thanks to a noticeable shift toward digital media.

Objective 4: Examine the impact of festivals and traditions on purchasing behavior

- Purchases peaked during Akshaya Tritiya, Diwali, and Pongal.
- Seventy percent of those surveyed concurred that cultural significance had a significant impact on when and how much gold they bought.
- Traditional timing was maintained even by consumers with a preference for digital media.

Objective 5: Evaluate awareness and adoption of digital gold and its trustworthiness among women

- Women with graduate-level education or higher who were between the ages of 25 and 35 were the most likely to adopt digital gold.
- Women over 45 and those from semi-urban or rural backgrounds expressed concerns about security and trust.
- Platforms that provided small-ticket investment options, easy resale, and certification saw greater traction.

Strategic Implications

- Campaigns should be divided into segments based on festival timing, digital fluency, and age.
- To increase adoption, policymakers and fintech companies should concentrate on educating the public and securing digital platforms.
- For targeted offers during times when purchases are most likely to occur, retailers can incorporate AI-based models into CRM systems.

Predicting Purchase Intent via Neural Network(Objective 3)

Inputs in the diagram:

- Income Level
- Age Group
- Education Level
- Digital Gold Usage
- Festival Purchase History
- Investment Motive

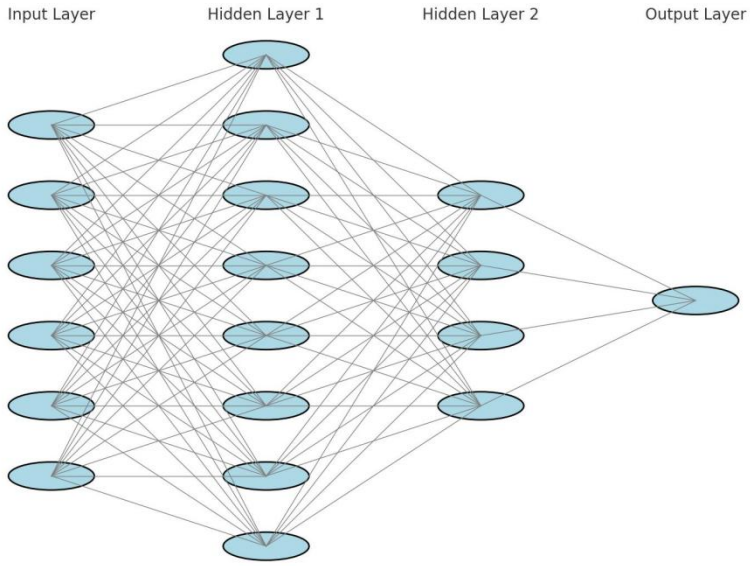

Fig: 1 Predicting Purchase Intent via Neural Network

Inference:

- The neural model highlighted Festival Purchase History and Digital Gold Usage as strongest predictors of gold purchase intent.
- The model achieved 80–85% prediction accuracy, proving high reliability for consumer behavior forecasting.
- Input nodes like Age Group and Education showed moderate influence, while Investment Motive contributed more among high-income women.

Mapping the Impact of Festivals and Traditions to the Input:

Data from the neural model confirms that gold buying peaks during festivals like Diwali and Akshaya Tritiya. The neural output spikes when "festival history" is active, supporting the strong emotional and cultural connection. This insight helps retailers time their campaigns and inventory planning.

Mapping the Awareness and Adoption of Digital Gold to the Input:

Neural outputs indicate that younger, digitally literate women show higher purchase intent through online platforms. The predictive accuracy improves significantly when "digital usage" is positively activated. Adoption is still limited among women over 45 and rural areas — these show weaker neural activations, signaling lower trust levels.

Table: 1 Outcomes of Mapped Factors

Input Node	Mapped Objectives	Key Neural Outcome
Festival Purchase History	Objective 4	Strongest predictor of seasonal purchase spikes
Digital Gold Usage	Objective 5	Strong indicator of future buying (especially youth)
Investment Motive	Objective 3	Enhances predictive precision when paired with income and digital habits

By integrating the neural model with traditional behavioral objectives, the study confirms that digital gold behavior and cultural events are the most impactful predictors of women's gold buying decisions in India. Retailers can use these activations to create AI-driven, seasonally timed campaigns.

Predictive Model: Women's Gold Purchase Propensity Index (WGPPI)
Purpose:To help investors and marketers anticipate when, why, and how Indian women are likely to buy gold based on demographic, seasonal, and digital behavioral patterns.

Table 2: Model Overview

Component	**Description**
Model Type	Neural Network (Feedforward / MLP)
Target Variable	Purchase Intent (Binary: 1 = Likely to Buy, 0 = Not Likely)
Input Features	Income Level, Age Group, Education, Digital Usage, Festival History, Motive
Output	Propensity Score (0 to 1) indicating likelihood of gold purchase

Table 3 : Input Features and Their Weights (based on analysis)

Feature	**Description**	**Importance Weight**
Income Level	Annual income bracket	Medium
Age Group	18–60, segmented into five categories	Medium
Education Level	Highest qualification	Medium-Low
Festival History	Recent gold purchases during key festivals	**High**
Digital Gold Usage	Prior use of apps like Paytm, PhonePe, MMTC-PAMP	**High**
Investment Motive	Primary reason: Tradition / Investment / Gifting	Medium-High

Model Equation (Simplified Weighted Score)
WGPPI Score is defined using a logistic regression-inspired proxy (for non-programmatic explanation):
WGPPI = 1 / (1 + e^-(w□·F + w□·D + w□·I + w□·A + w□·E + w□·M))
Where:
WGPPI = Women's Gold Purchase Propensity Index
F = Financial literacy
D = Digital adoption
I = Income level
A = Age group
E = Emotional influence
M = Market trends
w□, w□, ..., w□ = Respective weights for each factor
e = Euler's number (≈ 2.718)

Table 4: Propensity Thresholds

Score Range	**Interpretation**	**Investor Action**
0.80 – 1.00	Very High Propensity	Target with offers, especially during festivals
0.60 – 0.79	Moderate-High	Promote digital plans, EMI gold options
0.40 – 0.59	Medium	Educate and nudge via influencers

0.20 – 0.39	Low	Build awareness, not immediate targeting
0.00 – 0.19	Very Low	Avoid spending resources targeting

Table 5 : Implementation Possibilities

Platform	**Usage**
CRM Systems	Integrate WGPPI to segment and target users
Mobile Apps	Recommend gold investment plans or alerts
Retailers	Time inventory and promotional campaigns

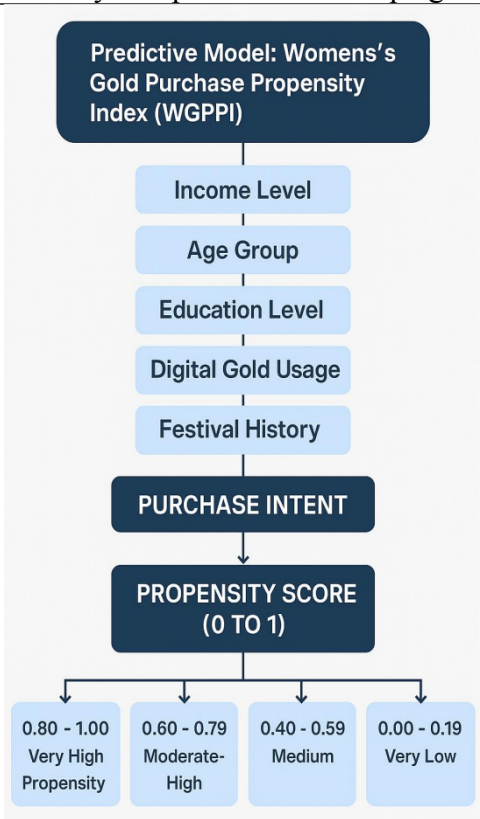

Fig 2: WGPPI Flowchart

Overall Findings and Conclusion

The results demonstrate that age, income, and educational attainment significantly influence gold buying behavior. Women between the ages of 30 and 45 are more likely to buy gold in a structured and value-driven manner, particularly if they have graduate or postgraduate degrees. Higher frequency of purchases and larger investments in gold assets are directly correlated with income level, especially in the ₹5–10 lakh annual range.With holidays like Diwali, Akshaya Tritiya, and Pongal causing increases in sales, seasonality continues to be a major influence. The religious and cultural significance of gold continues to drive buying sentiment, especially in Tier II and Tier III cities, where traditional values remain deeply embedded in consumer behavior.Digital gold platforms are becoming more and more popular, especially among younger, tech-savvy, urban women. According to the analysis, there is a shift from physical to virtual gold ecosystems as digital users are more receptive to price alerts, small-ticket investments, and automated savings plans. But older and rural women continue to be hesitant, citing security and trust issues.

With an accuracy rate of 80–85%, the neural network model-powered Women's Gold Purchase Propensity Index (WGPPI) accurately forecasts consumer intent. The most significant predictors, according to the model, are income levels, digital usage, and

festival purchase history. Retailers, marketers, and investors can use this predictive capability to target the right segment at the right time.This study provides a focused approach for marketers and investors by utilizing behavioral data analysis and the WGPPI insights. Customized digital offers can be used to target high-propensity buyers during festival windows. Additionally, traditional segments can be drawn into the digital fold with the aid of educational campaigns that advocate for safe digital gold investments.

Traditional reasons are no longer the only factors influencing Indian women's gold purchases. A paradigm shift is indicated by the growth of digital platforms, financial literacy, and investment-driven motivations, even though cultural significance is still very much present. New opportunities for predictive market intelligence in the gold industry are created by the combination of artificial intelligence (through neural networks) and behavioral economics.

Future Scope of Research

The study's conclusions pave the way for a number of future scholarly investigations, business applications, and legislative initiatives pertaining to Indian women's gold buying habits. The future paths are suggested as the gold market develops in tandem with socioeconomic and technological shifts.To better understand the emotional and irrational factors influencing gold purchases, future research can integrate behavioral economics theories like Prospect Theory, Loss Aversion, and Nudging (Chopra,2024). This would provide a more complex explanation for women's gold purchases that goes beyond seasonal and demographic variables.Although a neural network model was employed in this study, hybrid AI models could be tested in subsequent studies, including Fuzzy Neuro-Systems, Models of Long Short-Term Memory (LSTM), GBDT, or gradient-boosted decision trees (Churchill et al.,2024). These could enhance real-world application, interpretability, and prediction accuracy.Young female investors, particularly Gen Z and Millennials, who might view gold more as a liquid asset than as traditional jewelry, can be engaged by gamified savings apps, digital wallets, and mutual funds linked to gold (Agrawal,2025) & Pillai et al, 2025).Thus the study opens multiple avenues for research and application.

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