



Enhancing Customer Engagement with Generative AI: A Dynamic Approach to Personalized Daily Coupon Deals

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ABSTRACT

The 'Ask Coupon AI' system integrates generative AI into a Content Management System (CMS) to offer personalized daily coupon deals, significantly enhancing customer engagement. This AI-powered chatbot provides real-time, customized coupon recommendations, addressing the limitations of traditional coupon distribution methods. The system leverages advanced algorithms to analyze customer data, ensuring highly relevant and timely offers. Additionally, it automates creating and managing coupon deals, improving operational efficiency and reducing errors. This paper discusses the implementation, including API integrations, personalized user interfaces, and real-time data processing, highlighting the system's potential to revolutionize coupon management and customer interaction.

Keywords: 'Ask Coupon AI', Content Management System (CMS), generative AI

INTRODUCTION

For many years, coupon deals have been a cornerstone of marketing strategies in the business world. These tools are highly effective for attracting new customers and retaining existing ones to encourage repeat purchases. They provide tangible value to the consumer by offering savings and provide businesses with a surefire way to improve sales and customer loyalty. However, the traditional coupon deal distribution and personalization methods, like mailing and e-mailing, often need more finesse to accommodate the nuanced preferences of the single customer and the dynamic nature of consumer behavior. This highlights the need for a more dynamic and efficient approach that can overcome the current system's limitations.

With their reliance on broad segmentation and static offers, traditional coupon systems often fall short of meeting today's customers' diverse and dynamic needs. By implementing Generative AI, we can overcome these limitations and enhance the personalization of the coupons, increase redemption rates, boost customer satisfaction, and capitalize on more business opportunities. This advanced approach also eliminates the time-consuming manual procedures and potential for errors associated with traditional methods, enhancing operational efficiency. As market competition grows, businesses must adopt more sophisticated strategies for reaching customers. Generative AI, a type of artificial intelligence that can automatically create new content based on existing data, such as text, images, and even individually personalized marketing offers, is one such strategy. It promises to revolutionize how businesses interact with customers through customized coupon deals, offering a more efficient and effective solution.

Another significant advantage of generative AI over traditional methods in coupon deals is better personalization. Generative AI can analyze large amounts of customer data from purchases, surfing behavior, and social media activities to create highly customized offers. For example, if a customer mostly buys organic products, AI will generate coupons for these organic products. Chances of redemption and customer satisfaction will rise. Another critical advantage of Generative AI in coupon deals is its ability to automate the creation and management process with unparalleled efficiency. The system can auto-generate coupon deals and distribute them to users with zero human involvement, saving the precious time and effort marketing teams need to invest in their campaigns. This level of operational efficiency minimizes errors and reduces the likelihood of errors with manual processes. The

system's ability to learn from customer interactions continuously ensures that its relevance and effectiveness increase over time due to algorithmic refining, further enhancing operational efficiency.

Generative AI's agility in reacting to real-time changes in customer behavior and market trends is a significant advantage over most traditional coupon systems. This adaptability reassures the audience that the system can quickly and agilely adjust to consumer preferences, seasonal trends, or emerging market conditions, thereby maintaining the relevance and attractiveness of coupon deals and improving customer satisfaction. This adaptability is a crucial feature of Generative AI, ensuring its effectiveness and relevance in a rapidly changing market.

Generative AI facilitates natural language interactions, creating an increasingly engaging and interactive customer experience. The generative AI chatbot or voice assistant will allow customers to express their preferences, ask for specific deals, or simply give feedback. This interaction ability, unique to Generative AI, will drive greater customer satisfaction and yield businesses valuable insight into customer preferences and behaviors that help refine marketing strategies further. Finally, implementing Generative AI to create and manage daily coupon deals represents a significant advancement over traditional methods. It provides better personalization, automation of processes, reaction to real-time changes, and construction of interactive customer experience—making it a powerhouse solution for businesses looking to maximize their coupon strategy. This white paper introduces this new concept and suggests an architecture that uses Generative AI to revolutionize how companies interact with their customers through personalized coupon deals.

PROBLEM STATEMENT

Despite the general acceptance of coupon deals in principle, several challenges still exist in their effective and efficient execution. These include:

No Personalization

Traditional coupon distribution methods usually address customer preferences while reducing their effectiveness.

Ineffective Management

Creating and managing coupon deals manually are time-consuming and have a high possibility of error.

Static Offerings

The existing systems usually need to catch up with the real-time changes in customer behavior and preference.

Customer Engagement

Limited customer interaction restricts the ability to pick up worthwhile feedback and improve the offering.

Coupon Overload

More coupons should be provided to the customer. The customer suffers from "coupon overload." If customers are bombarded with too many generic coupons, they often tune out all offers, even those that are most relevant.

Fraud and Misuse

Coupon systems are always open to fraud and abuse. Customers may pass on coupons, use them more than once, or exploit the system's weaknesses.

Tracking and Measuring Effectiveness

Traditional coupon systems are very rarely able to track and measure effectiveness in most coupon campaigns. Also, with data in the right places, it becomes easier to obtain the ROI of certain efforts and, hence, plan accordingly for future campaigns.

Limited Reach

Compared to other traditional modes of coupon distribution, such as printed coupons or email newsletters, the reach is limited. Customers must be aware of offers if they have not visited the store or checked emails.

PROPOSED SOLUTION

Our innovative solution, powered by generative AI, changes how companies create and manage daily coupon deals. It solves the intrinsic challenges of traditional coupon systems by dynamically generating and improving offers in natural language with the customer, ushering in an era of personalized, effective, and engaging coupon management.

Better Personalization: No one can match generative AI when it comes to understanding and analyzing large reams of customer data, from purchase history to browsing behavior to social media interactions. This allows the AI to craft highly personalized coupon deals tailored to individual tastes and preferences. For instance, if a customer buys eco-friendly products repeatedly, AI-generated exclusive discounts on sustainable items will make the coupons highly relevant and appealing. In addition, this level of personalization also increases the redemption rate, besides improving customer satisfaction and customer loyalty.

Automate Creation and Management: Creating and managing coupon deals is time-consuming and full of errors. Our AI system completely automates it—from creating unique coupon codes to multi-channel distribution. By removing manual intervention, the AI ensures its accuracy and efficiency, freeing more time for marketing teams to work on strategic activities. It learns from every customer interaction to fine-tune the algorithms for more efficient future deals. This can also be used to automate detecting and cleaning up coupons past their validity dates so that only valid offers will be shown to customers.

Adapting to Real-Time Changes: Consumer behavior and market trends change constantly. Traditional static coupon systems are mainly incapable of matching the pace in this domain and frequently make deals irrelevant. Our AI solution at generative AI is designed to adapt in real-time, instantly reacting to changes in customer preference and market dynamics. To remain relevant and timely, the AI modulates the coupon offers accordingly, whether it's flash demand for seasonal products or a new trend.

Improved Customer Engagement: At the very core of our solution is the capability of engaging customers through natural language interactions. Customers can indicate their preferences, solicit specific deals, or offer feedback through chatbots or voice assistants. Furthermore, it makes the coupon experience more engaging and provides relevant insights into customers' needs and wants. The two-way dialogue will thus let the business continue to fine-tune its offerings toward a more responsive and satisfying customer experience.

First, we turn the archaic coupon system into a dynamic, individualized, and effective customer engagement and retention tool through generative AI. By leveraging greater personalization, management automation, real-time sensitivity, and refinement in customer engagement, we deliver the most modern way of satisfying businesses and their customers.

ENHANCED SOLUTION ARCHITECTURE

The solution architecture for the Generative AI-based daily coupon deals ensures seamless interaction, efficient data management, intelligent AI analytics, robust integration, and secure deployment. The following section presents an improved elaboration of each component, followed by a detailed architecture diagram.

1. User Interaction Layer

NLP Engine: Allows customers to understand natural language through queries and feedback when interacting with the system.

Chatbot Interface: A user-friendly interface lets customers use text to communicate with the AI system.

2. Data Management Layer

Customer Data Repository: A database storing elaborate customer profiles, their preferences, affiliate links, and so on.

Coupon Database: All existing coupons and promotional offers are stored in this database and are continuously updated.

3. AI and Analytics Layer

Generative AI Model: Employs cutting-edge machine learning algorithms to generate and optimize personalized coupon deals based on customer data and interactions.

Recommendation Engine: Suggests the most likely relevant deals to the customer based on his preferences and behavior.

Feedback Loop: This loop continuously improves the AI model's performance regarding customer feedback and engagement metrics for personalization and relevance.

4. Integration Layer

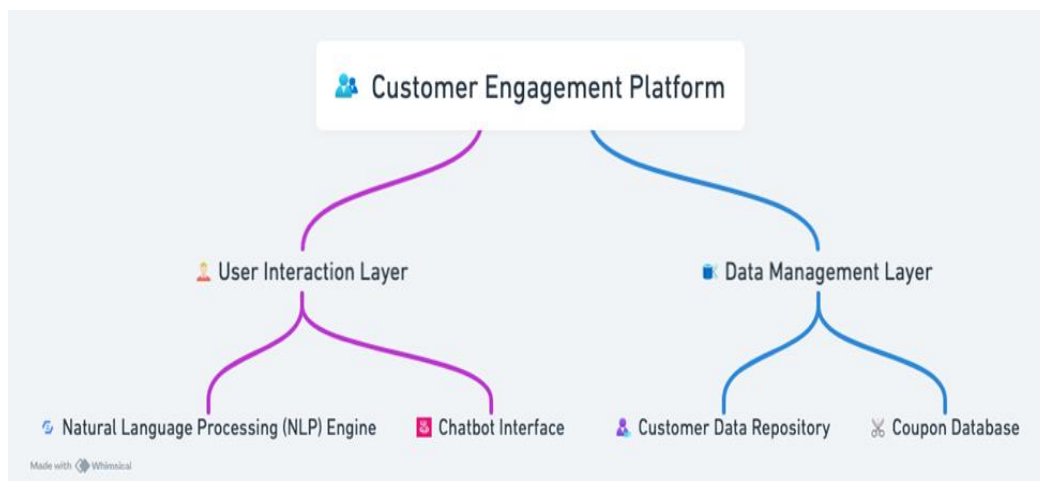
API Gateway: The API gateway enables secure and efficient communication with external platforms like linkmydeals.com to pull incremental feeds promptly.

Middleware: This involves moving data around the system to ensure the different parts blend without a hiccup.

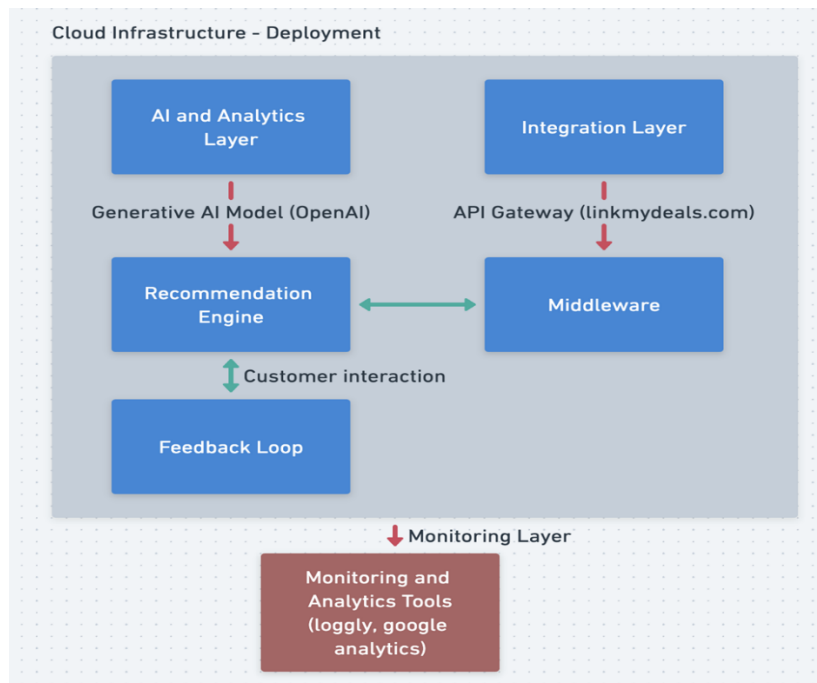
5. Deployment and Monitoring Layer

Cloud Infrastructure: Scalable, reliable, and secure hosting for AI systems and their components.

Monitoring and Analytics Tools: Constantly monitor system performance, user engagement, and deal effectiveness to drive data-led improvement and optimization.



Flow Chart 1: User Interaction Layer and Data Management Layer



Flow Chart 2: AI and Analytics Layer, Integration Layer, and Deployment and Monitoring Layer

IMPLEMENTATION

1. Development Of a CMS Website

The backbone of the coupon deals website is a professional CMS platform that helps create, manage, and share content. A modern web framework incorporates front-end technologies like HTML, CSS, JavaScript, and relevant libraries/ frameworks like React.js. Structured data was stored using relational database MySQL, but the coupon data was stored in a vector database, Pinecone, which has the user, coupon deals, and user preferences. Implemented safe user authentication using systems using OAuth and some hand-built authentication systems to help guarantee that the system will perform safe login and registration procedures. It is a mobile-friendly website with responsive design techniques in CSS, media queries, and other frameworks, namely Bootstrap.

2. Plugin For the Delas from LinkMyDeals.Com

A plug-in was developed to automate importing coupon deals from LinkMyDeals.com, transform them into dynamic records within the CMS database, and handle API integration using their exposed RESTful APIs to fetch real-time coupon deals from LinkMyDeals.com. Did API request handling, data parsing, and error handling. A scheduler using Cron jobs has been implemented to pull new deals periodically and remove expired ones. This ensures that the database is always kept updated. Used Object Relational Mapping to convert fetched deals into dynamic records with unique identifiers, either deal ID or coupon ID. Object-relational mapping makes database operations seamless.

```
import requests
import schedule
import time
from datetime import datetime, timedelta
import pinecone

# Configuration
API_URL = 'https://api.linkmydeals.com/v1/getDeals'
API_KEY = 'linkmydeals_api_key'
PINECONE_API_KEY = 'pinecone_api_key'
PINECONE_ENVIRONMENT = 'us-west1-gcp'

# Initialize Pinecone
pinecone.init(api_key=PINECONE_API_KEY, environment=PINECONE_ENVIRONMENT)
index_name = 'coupon-deals'
if index_name not in pinecone.list_indexes():
    pinecone.create_index(index_name, dimension=128)
```

```
index = pinecone.Index(index_name)

def fetch_deals():
    """
    Fetch all deals from LinkMyDeals.com
    """
    response = requests.get(API_URL, headers={'Authorization': f'Bearer {API_KEY}'})
    if response.status_code == 200:
        return response.json()['deals']
    else:
        raise Exception('Failed to fetch deals: ' + response.text)

def save_deals(deals):
    """
    Save deals to Pinecone
    """
    for deal in deals:
        deal_id = str(deal['deal_id'])
        metadata = {
            'title': deal['title'],
            'description': deal['description'],
            'coupon_code': deal['coupon_code'],
            'start_date': deal['start_date'],
            'end_date': deal['end_date'],
            'updated_at': deal['updated_at'],
            'website_address': deal['website_address'],
            'website_logo': deal['website_logo'],
            'coupon_direct_link': deal['coupon_direct_link']
        }
        vector = [0] * 128
        index.upsert(vectors=[(deal_id, vector, metadata)])
    print('Deals saved to Pinecone.')

def one_time_feed_pull():
    """
    Perform a one-time feed pull to fetch all deals
    """
    condition = check_condition()
    if condition:
        deals = fetch_deals()
        save_deals(deals)
        print('One-time feed pull completed successfully.')
    else:
        print('Condition not met for one-time feed pull.')

def incremental_feed_pull():
    """
    Perform an incremental feed pull to fetch only new or updated deals
    """
    last_updated = get_last_updated_time()
    if last_updated:
        last_updated = datetime.strptime(last_updated, '%Y-%m-%d %H:%M:%S')
    else:
        last_updated = datetime.min

    deals = fetch_deals()
    new_deals = [deal for deal in deals if datetime.strptime(deal['updated_at'], '%Y-%m-%d %H:%M:%S') >
last_updated]
```

```

save_deals(new_deals)
print('Incremental feed pull completed successfully.')

def get_last_updated_time():
    """
    Get the last updated time from Pinecone
    """
    query_result = index.query(vector=[0] * 128, top_k=1, include_metadata=True)
    if query_result and 'matches' in query_result and query_result['matches']:
        return query_result['matches'][0]['metadata']['updated_at']
    return None

def check_condition():
    """
    Check the condition for one-time feed pull
    Implemented a custom algorithm to perform one-time pull
    """
    last_run = get_last_updated_time()
    if last_run:
        last_run = datetime.strptime(last_run, '%Y-%m-%d %H:%M:%S')
        if datetime.now() - last_run < timedelta(days=1):
            return False
    return True

# Schedule the incremental feed pull every 20 minutes
schedule.every(20).minutes.do(incremental_feed_pull)

# Run one-time feed pull based on condition
one_time_feed_pull()

# Run the scheduled tasks
while True:
    schedule.run_pending()
    time.sleep(1)

```

3. Plugin To Train Coupon Data

Designed a plug-in that periodically trains coupon data by applying generative AI algorithms. This will allow you to reap the power of OpenAI's GPT-4o in enhancing personalization in coupon recommendations. Cleaning and formatting the data concerning the coupons is a step that is much needed to have quality input for AI training. The API of OpenAI's GPT-4 model was used and developed scripts to periodically train the model with the updated coupon information for better accuracy of recommendations. We integrated the trained AI model into the CMS for real-time access to the AI generative coupon database.

4. Customer Registration and Preference Management

Customers can log onto the CMS website and set up preferences for personalized coupons. A user registration system with form validation, secure storage of passwords like hashing with bcrypt, and verification through email has been implemented, as well as a user interface that allows customers to set and update their preferences. These preferences should be stored in the database by linking them with user profiles.

5. Personalized Home Page with Featured Deals

After logging in, customers are taken to a home page that shows featured deals based on their preferences. Developed a Personalization Algorithm to match user preferences with available deals and feature them on the home page. Depending on the user data and preference, server-side or client-side rendering will dynamically load personalized content at runtime.

6. Real-Time Coupon Extraction using 'Ask Coupon AI' Chatbot

A chatbot, 'Ask Coupon AI,' was developed so that customers could engage with it and fetch coupons based on their requirements in real time. This involved plugging the trained GPT-4 model into the chatbot to make it interactively efficient at providing relevant and accurate coupons. Implemented messaging protocols WebSockets, for smooth and real-time interaction between a user and a chatbot. A user-friendly in-built chat interface inside the CMS website for seamless interaction with the 'Ask Coupon AI' chatbot.

The coupon deals website implemented many state-of-the-art technologies and frameworks for a smooth and personalized user experience. From developing a CMS to integrating generative AI for coupon recommendations, everything has been done with immense care to provide the best performance and user satisfaction in real-time chatbot interactions.

RESULTS AND DISCUSSION

Title	Author	Categories	Tags	Date
Book Now and fly later, Dallas to Manila roundtrip fare as low as \$1,093.99*	admin	Uncategorized	--	Published 2024/03/14 at 10:59 pm
Book Now and Travel Through Oct 31, 2024. Travel dates, Departing 27th Aug'24. *Last price checked on July 12, 2024	admin	Uncategorized	--	Published 2024/03/14 at 10:22 pm
Hotel deals 125X125	admin	Uncategorized	--	Published 2024/03/14 at 9:43 pm
Back to School Deal!	admin	Uncategorized	--	Published 2024/03/14 at 9:41 pm
Save on a Great Hotel !! Get up to \$159 Off our fees on hotel bookings Use promo code HOTEL15 Book Now !!	admin	Uncategorized	--	Published 2024/03/14 at 9:34 pm
Save 20% Business Class Special with Coupon Code	admin	Uncategorized	--	Published 2024/03/14 at 9:14 pm
\$100 Off Any Flight	admin	Uncategorized	--	Published 2024/03/14 at 8:23 pm
Popular Airline Deals	admin	Uncategorized	--	Published 2024/03/14 at 7:26 pm
Trip to Athens, Greece!	admin	Uncategorized	--	Published 2024/03/14 at 7:12 pm
Save at One Travel with Up to \$24 Off Flights to Mexico City	admin	Uncategorized	--	Published 2024/03/14 at 7:07 pm

Figure 1: Backend displaying the imported deals from linkmydeals.com

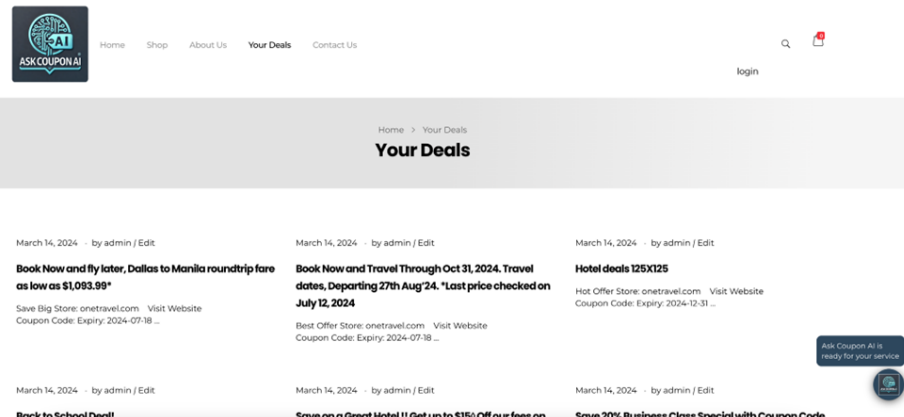


Figure 2: Home page of a user based on travel preference customizations

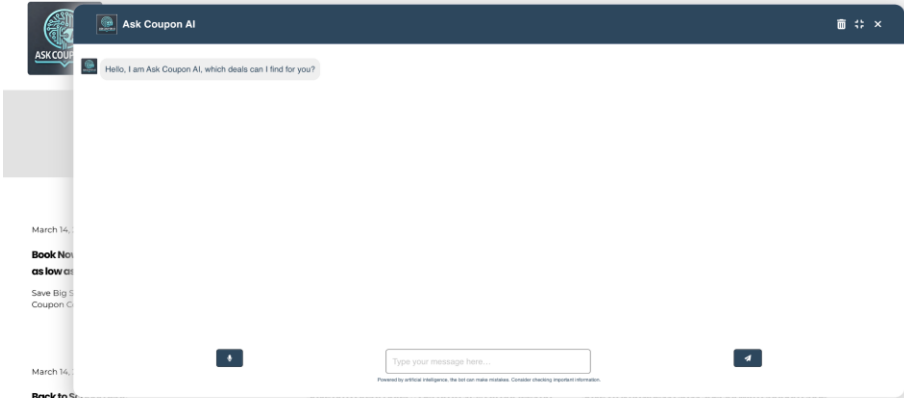


Figure 3: Empty 'Ask Coupon AI' chatbot, which supports text and voice



Figure 4: 'Ask Coupon AI' chatbot in action

Built into the CMS website, 'Ask Coupon AI' has many advanced features to make the user's search for a coupon deal as seamless and personalized as possible. The system is powered by generative AI, offering tailored coupon recommendations via an engaging chatbot interface in real-time. The provided screenshots—Figure 1, Figure 2, and Figure 3—illustrate various aspects of the user experience on the platform.

1. Results

The home page contains personalized deals concerning the user's preference for travel. All the deals on the home page are filtered based on the user's preference for travel. This personalization makes the deals relevant to the user, increasing his satisfaction. All the deals are easily browsable to the user due to the cleanliness of the layout. It incorporates live data feeds, hence keeping deals updated. Thus, offers are presented to the end-user with the most recent ones. The empty screenshot of the 'Ask Coupon AI' chatbot shall depict that it is ready to help you. The Chatbot interface offers text and voice-based input to support different user preferences. This chatbot's high visibility and ease of accessibility will motivate users to use it for coupon-related queries. This live state of the 'Ask Coupon AI' chatbot can be seen, which will display real-time coupon recommendations with the following features:

AI-Powered Recommendations: The chatbot comprehends user queries with the power of generative AI, responding with relevant coupon deals, as captured by the response to a user's query on travel deals.

Expiry Date Awareness: The chatbot smartly tells the user when each deal is valid, aiding in wise decision-making.

Rich Information: Each recommended deal includes detailed information, such as the store name, coupon code, and expiry date, for added transparency and trust.

2. Discussion

Embedding generative AI into the 'Ask Coupon AI' chatbot improves the experience significantly in terms of customized and timely recommendations. Relevant deals can be found quickly, saving users time and effort that would otherwise have to be spent manually going through various available deals. This makes the system efficient in storing and managing coupon data using Pinecone. Real-time updates ensure that users get the latest deals, making the platform more reliable and satisfactory for its users. The chatbot's interactivity, along with the home page populated with content on a very personalized level, helps to keep users engaged and retained. It also incentivizes repeat visitors for future deals by providing customized recommendations and making them easier to use. Building in finer-grained data about user preferences and behavior could further drive more personalized recommendations. The platform can be opened to many more customers if the chatbot supports different languages. More extended sources of data for coupon deals could give users other options.

CONCLUSION

'Ask Coupon AI' is the next step in personalized marketing with generative AI. It solves conventional problems associated with coupon deal distribution with dynamic, customized recommendations that raise customer satisfaction and engagement. Its robust AI algorithm drives a personalized home page to make sure all of its users see relevant deals based on their interests and preferences, which will increase redemption rates and strengthen the user experience. It stands apart by an additional feature—providing real-time updates and further engaging the users through natural language processing. Pinecone is used for proper data management to scale and be reliable, ensuring the latest deals are always available to the user. Users' Preferences are catered to in a diversified way by its chatbot interactive interface with text and voice support to engage the end-user. This is an innovative process in which coupon generation and management are mechanized while learning from customer behavior to make better recommendations. The solution's real-time adaptability to customer behavior and market trends guarantees relevant and attractive deals. Such further developments may include more granular personalization, multi-language support, and more significant data sources—all of which would continue to increase the reach and efficiency of this platform. All in all, Ask Coupon AI demonstrates how generative AI can turn conventional marketing strategies on its head by providing frictionless user experiences that are highly tailored, driving customer loyalty and business success.

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