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ETS DAHI TilesSelect - AI-Powered Tile Selection Website

Abstract

This project developed an AI-powered tile recommendation system aimed at enhancing the selection process for customers at ETS DAHI. By leveraging advanced machine learning algorithms, the system analyses customer preferences and a vast tile inventory to deliver personalised recommendations. The implementation encompassed data acquisition, model training, and user interface design, culminating in a prototype tested for user engagement and satisfaction. Results indicate improved decision-making efficiency and potential for increased business revenue. Additionally, this project addresses the challenge of recommending floor tiles based on user input and providing expert advice through a chatbot. By implementing advanced text similarity measures and enhancing the chatbot's contextual responses, the solution offers accurate and relevant recommendations. Evaluation results demonstrate the effectiveness of these improvements. This study demonstrates the AI system's viability in retail, suggesting broader applicability and avenues for future research in AI-enhanced customer experiences.

Acknowledgments

I would like to express my sincere gratitude to my academic supervisor, Hiroyuki Kido, for their invaluable guidance, encouragement, and expertise throughout this project. My appreciation also extends to my peers and colleagues, for their insightful feedback and support. I am profoundly thankful to my family and friends for their unwavering support and encouragement during this challenging and rewarding journey. Lastly, I wish to acknowledge the Cardiff University for providing the necessary resources and an enriching academic environment that contributed significantly to this research.

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1. Introduction

1.1 Project Overview

The tile sector offers a paradox in terms of choice to consumers, where the multitude of options does not facilitate the selection process but makes it more complex. Customer expectations and technological advances meet in the retail sector, particularly in home design and decoration. In this industry, choosing tiles constitutes a subtle challenge characterised by the confrontation of aesthetic preferences, functional needs, and a great diversity of markets. The ETS DAHI TilesSelect project embodies an innovative response to this challenge, leveraging the power of artificial intelligence to distill these complexities into a user-friendly, efficient decision-making tool. The project aims to summarise information on consumer behaviour, product characteristics, and market trends to improve the tile selection experience and create a new standard in customer service in sales by retail. Selecting appropriate floor tiles can be challenging for homeowners and designers due to the vast variety of options available. This project aims to simplify this process by using AI to recommend tiles based on user queries and provide expert advice through a chatbot.

In addition to the AI system, the project includes designing a user-friendly website to enhance the overall customer experience. The website design focuses on intuitive navigation, aesthetically pleasing interfaces, and seamless integration with the AI recommendation engine. By implementing responsive design principles, the site ensures accessibility across various devices, providing users with a consistent and engaging experience. The initiative goes beyond just implementing technology; it examines how artificial intelligence can be combined with human-centred design principles to craft solutions that resonate critically with users. By acting in this way, it aims to cross the narrow line between personalisation and simplicity, ensuring that technology remains a powerful enabler of a more enriching and intuitive user journey.

1.2 Objectives

The objectives of the ETS DAHI TilesSelect project have been refined to reflect the practical outcomes achieved and the key functionalities implemented. These objectives highlight the technical advancements and user experience improvements delivered through the project:

DEVELOP A FUNCTIONAL RECOMMENDATION ENGINE

- Create a recommendation engine using artificial intelligence to understand and match user preferences with suitable tile options. This engine leverages advanced NLP techniques (spaCy and SentenceTransformers) to provide relevant recommendations based on user queries and tile descriptions.

DESIGN AN INTUITIVE DIGITAL INTERFACE

- Design a user-friendly digital interface that simplifies the tile selection process. This interface integrates seamlessly with the recommendation engine, providing users with clear, accessible options based on their input.

IMPLEMENT AND TEST A CHATBOT FOR ENHANCED USER INTERACTION

- Develop and integrate a chatbot using OpenAI's GPT-4o to assist users with their queries. This chatbot uses contextual understanding and data from the CSV file to offer informed responses, ensuring a cohesive user experience.

EVALUATE SYSTEM PERFORMANCE AND USER EXPERIENCE

- Conduct rigorous testing to assess the system's performance, focusing on user engagement, satisfaction, and the accuracy of recommendations. This includes unit testing, integration testing using POSTMAN, and user acceptance testing (UAT) to gather feedback and ensure reliability.

ANALYSE PRACTICAL IMPLICATIONS AND FUTURE ENHANCEMENTS

- Critically analyse the practical implications of the AI system for ETS DAHI. This includes reviewing the effectiveness of the recommendation engine and chatbot, identifying areas for future improvement, and considering potential commercial impacts such as improved user satisfaction and streamlined decision-making processes.

Through these focused objectives, the ETS DAHI TilesSelect project demonstrates the practical application of AI technologies to enhance user interactions and decision-making in the tile selection process.

1.3 Project Significance and Alignment with ETS DAHI’s Strategic Goals

The ETS DAHI TilesSelect project is not merely a technological endeavour but a strategic initiative that aligns with the broader goals of ETS DAHI to modernise and innovate within the evolving retail landscape. As ETS DAHI seeks to transition from traditional retail methods to more advanced, data-driven approaches, this project stands as a testament to the business’s commitment to embracing digital transformation and enhancing competitiveness in a technology-centric market.

This initiative is particularly significant as it marks a pivotal step for ETS DAHI in adopting AI, positioning the business at the forefront of retail innovation. By integrating AI into its service offerings, ETS DAHI not only aims to improve the customer experience but also seeks to gain deeper insights into consumer preferences and behaviour, thereby informing future business strategies and decisions.

Incorporating AI into ETS DAHI's operations reflects a forward-thinking approach to retail, demonstrating a proactive adaptation to market trends and consumer expectations. This project is anticipated to pave the way for further technological integrations, setting a new standard for excellence and innovation within the industry and supporting ETS DAHI's long-term growth and success.

2. Background

2.1 Industry Context and Evolution

The field of design and decoration has been transformed by the emergence of digital technology. The industry, which has traditionally been based on physical showrooms and concrete samples, is now entering an era where online platforms, augmented reality and data analysis play a decisive role. In this part, I will examine how touch has evolved into digital, highlighting how consumer expectations for convenience, personalisation and immersive experiences demand technological integration. It will also discuss the impact of these changes on traditional businesses such as ETS-DAHI, which must face changes in order to remain competitive and relevant.

2.2 Tile Selection Challenges at ETS-DAHI

At ETS-DAHI, consumers face a multitude of tiles, each with specific patterns, materials and applications, resulting in a complex decision. The absence of intuitive orientation and comparison tools accentuates this complexity. In this section, I will examine these challenges in detail using customer feedback and sales data to highlight how these obstacles manifest themselves in real-world situations. It will also highlight the repercussions of these difficulties, such as extended sales periods and reduced customer satisfaction, which justifies the need for a more rational approach.

2.3 AI in Retail: Current Landscape and Future Prospects

The penetration of artificial intelligence into the e-commerce sector is transforming the industry, offering new methods to attract customers, optimise inventory and anticipate trends. In this part, an exhaustive review of the different applications of artificial intelligence in the commerce sector, ranging from predictive analyses to chatbots and personalised marketing. By reviewing cases and current research, this will highlight the effectiveness of artificial intelligence in improving the retail experience and operational efficiency. The discussion will then focus on how these advancements can be leveraged in the tile industry, particularly at ETS-DAHI, to transform the customer journey and business model.

Subsequently, the narrative shifts to a broader discussion on the role of artificial intelligence in modernising retail, particularly within ETS-DAHI. By incorporating artificial intelligence, ETS-DAHI can change its operating model of responsive sales strategies by encouraging customer engagement, using data analysis for improved decision-making support. It is expected that this part will explore different applications of AI outside of recommendation systems, such as inventory management, market trend analysis and customer relationship management, to provide a holistic view of the transformative potential digital. By making AI a tool and strategic ally, ETS-DAHI can leverage its potential to encourage a culture of innovation, improve operational efficiency and improve customer experience. Offer an explanation of how this shift towards AI-driven retail fits with broader trends in digitalisation, positioning ETS-DAHI as an innovator in using technology to improve excellence in retail.
Carefully analysing these segments will strengthen the context, which will enrich the report by providing a varied understanding of the transformation challenges and solutions within the journey of ETS-DAHI and the retail sector in general.

Taking into account lessons from the global evolution of digital retailing, as evidenced by key phases such as the emergence of e-commerce giants in the 1990s and the emergence of mobile commerce, ETS's journey- DAHI illustrates the transition of the sector. The shift to using artificial intelligence for tailored shopping experiences, driven by data analysis, marks a major shift in the retail sector. This speaks to industry-wide findings that using AI in personalisation has greatly improved customer satisfaction and operations. In the midst of evolving digital technologies, with forecasts highlighting the expansion of AR/VR applications and the arrival of 5G improving mobile shopping experiences, the ETS-DAHI initiative positions itself as a front-runner -keep these trends. The strategic decision-making highlights the relevance of the project and ETS-DAHI's

commitment to innovation, providing a vision for the future where digital retail technologies will continue to transform the retail experience purchase.

By exploring the innovative alliance between artificial intelligence and design, generative artificial intelligence presents itself as a transformative tool in the field of interior design, offering new opportunities for tailor-made customer experiences in the selection of tiles and interior decoration elements. Generative artificial intelligence, capable of creating or modifying designs based on specific user inputs, is paving a new path in retail, offering personalised solutions that match the aesthetic preferences and functional needs of each individual. The technological progression highlights the broader potential of artificial intelligence to improve the retail sector, highlighting its relevance to ETS-DAHI's commitment to innovation and customer satisfaction. clients.

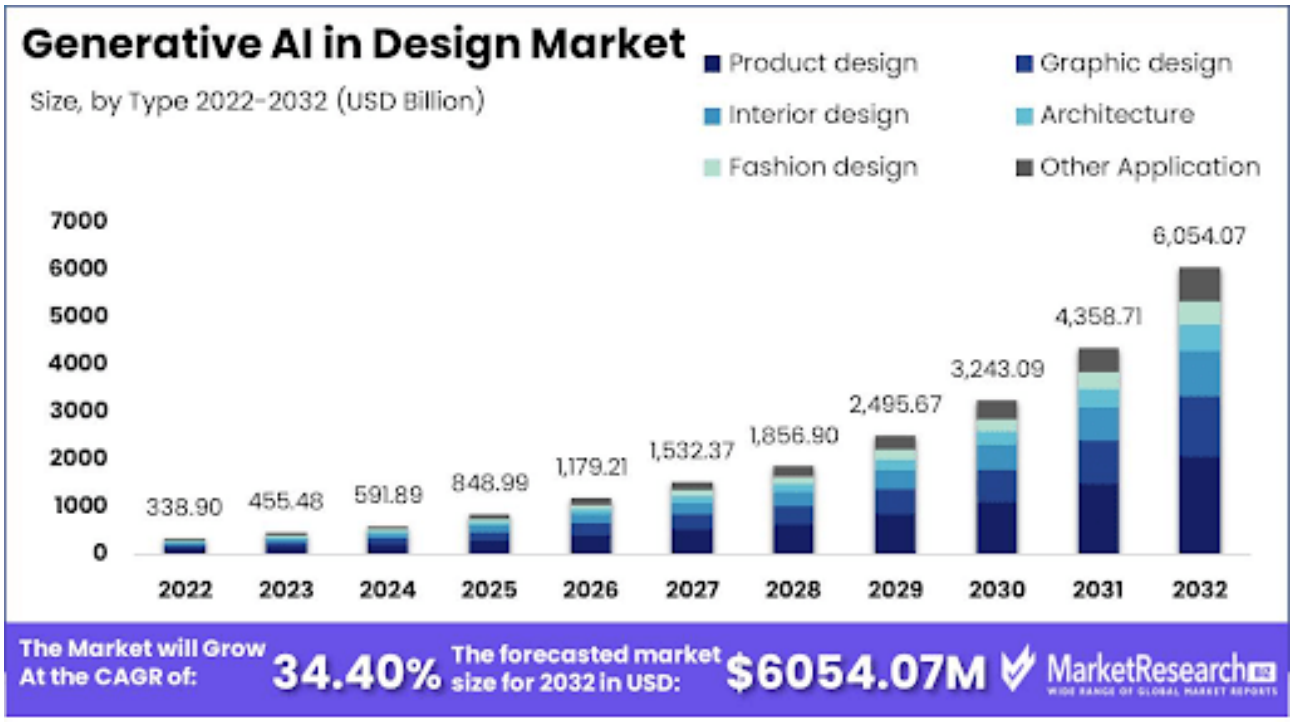


Figure 1 - presents the forecasted growth in the Generative AI Design Market (MarketResearch.com), indicating a steep increase in market size, emphasising the substantial role generative AI is expected to play across various design-related industries.

In the section discussing the current landscape and future prospects of AI in retail, the graph above detailing the projected growth of Generative AI across various design markets will be included. As illustrated, the market is expected to expand significantly, with a compound annual growth rate of 34.40%, reaching an anticipated value of over $600 billion by 2032. This data underscores the potential of generative AI in revolutionising industries, including interior design, which aligns with the objectives of ETS-DAHI to innovate within its retail offerings.

2.4 Rationale for Integrating AI in Tile Selection

A strategic decision is to integrate AI into ETS-DAHI's tile selection process to address specific business and customer experience challenges. By justifying this integration, this section will directly relate AI skills to ETS-DAHI's needs: improve customer decision-making, improve product visibility and personalise the purchasing experience. ETS-DAHI's strategic objectives, such as increasing market share, building customer loyalty and improving operational efficiency, will also be in line with AI adoption. The discussion will highlight the importance of AI not only as a technological advancement, but also as a critical strategic enabler for the future of ETS-DAHI.

3. Literature Review

3.1 AI Technologies in Retail

3.1.1 Inventory Management

Inventory management is transformed with AI to predict demand, optimise stock levels and reduce waste. Analysing historical sales data, current market trends, and even external factors such as weather or events allows machine learning models to predict product demand with high accuracy. With this predictive capability, retailers can adjust their inventory in real time, ensuring adequate supply of popular items while reducing overstocks. By automating the inventory replenishment process and leveraging artificial intelligence to spot patterns and anomalies in inventory data, sellers can make informed decisions that lower expenses and improve operational efficiency.

3.1.2 Personalised Recommendations

Modern retail is all about personalisation, and artificial intelligence is powering it. By studying customer information, such as previous purchases, browsing history and preferences, artificial intelligence algorithms build extremely accurate customer profiles. Through these profiles, sellers have the opportunity to suggest tailor-made products, which improves the shopping experience and increases sales. This degree of personalisation not only promotes customer satisfaction, but also encourages loyalty by providing them with a feeling of understanding and value.

3.1.3 Customer Service Enhancements

Using chatbots, virtual assistants, and automated support systems, AI can significantly improve customer service. These AI-powered tools are accessible 24/7, providing immediate responses to customer inquiries, help choosing products, and tracking orders and returns. AI allows human customer service representatives to focus on more complex issues by handling routine requests, improving overall service quality. Additionally, artificial intelligence has the ability to analyse customer feedback and exchanges to spot areas for improvement, allowing retailers to improve their service offerings.

3.1.4 Leveraging Consumer Data for Trend Prediction

One of the biggest strengths of artificial intelligence in the retail industry is its ability to use vast amounts of consumer data to predict trends. By studying information throughout the consumer journey, artificial intelligence will spot new trends and changes in consumer behaviour. With this understanding, marketers can stay ahead by adjusting their product offerings and marketing strategies to meet changing consumer needs. By using AI's predictive capabilities to effectively manage inventory, retailers can take advantage of these trends without the risk of overstocking or out of stock.

3.2 User Experience Design in AI Systems

3.2.1 Personalisation through AI

With its ability to process and analyse massive amounts of data in real time, AI can spot patterns and preferences specific to each participant. Whether offering products on an online shopping site, curating a playlist on a music streaming service, or emphasising content on a social media feed, AI personalisation ensures that users are offered options that match their preferences and

tastes. Not only does this personalisation improve the relevance and appeal of the user experience, but it also increases the likelihood of user satisfaction and loyalty.

3.2.2 Intuitive Design with AI

In addition to the possibility of personalisation, artificial intelligence promotes intuitive design by making interfaces and interactions more pleasant and efficient. Artificial intelligence has the ability to predict user actions and offer shortcuts or assistance before the user even realises they need it. For example, using artificial intelligence for predictive typing improves communication efficiency, while voice assistants and chatbots provide a conversational interface that makes it easier to navigate and accomplish tasks. Using these intuitive design elements helps reduce tension and make digital environments more accessible and enjoyable for users.

3.2.3 Balancing Automation with Human-Centric Design

Although artificial intelligence offers significant benefits in terms of personalisation and intuitive design, it is essential to find a balance between automated interactions and human-centred design principles. Through this balance, technology is used to enhance human experiences rather than substitute them. The people-centred view emphasises empathy and understanding user needs, emotions, and behaviours, which guides the development of artificial intelligence systems that enrich human interactions. Creating AI interactions that feel natural, respectful, and respectful of user privacy and autonomy involves adopting human-centred design principles.

3.2.4 The Importance of Human Oversight

Integrating human oversight in AI-driven systems is essential to maintain trust and relevance. Human oversight allows for the refinement of AI recommendations and decisions, ensuring they align with ethical standards and user expectations. It also provides a safety net for situations where AI may misinterpret data or fail to recognise the nuances of human behaviour.

3.2.5 Enhancing Customer Satisfaction and Engagement

Balancing AI automation with human-centred design not only improves the usability and accessibility of digital platforms but also deepens customer engagement. When users feel understood and valued through personalised and intuitive interactions, their satisfaction with the service increases. Moreover, incorporating human elements into AI interactions ensures that technology enhances the human experience, fostering a sense of connection and trust between users and the platform.

3.3 Impact of AI on Consumer Behaviour

3.3.1 Tailored Shopping Experiences

Artificial intelligence uses data analytics and machine learning to capture each consumer's preferences, previous purchasing behaviour, and even browsing habits. Subsequently, this information is used to personalise the shopping experience in real time, offering the products, services and offers most suited to each person. For example, online retailers leverage artificial intelligence to offer tailored product suggestions, while streaming platforms adjust their content libraries based on user preferences, significantly impacting shopping choices. purchasing and content consumption habits.

3.3.2 Impact on Consumer Expectations

As consumers have adapted to these tailored experiences, their expectations for retail interactions have changed. Now, consumers expect to have some understanding and

personalisation of all their online interactions. This desire extends beyond basic product recommendations to tailored communications, tailored discounts, and even tailored product configurations. Retailers and brands that fail to deliver this level of personalisation may find themselves at a disadvantage and struggle to attract and retain customers in an increasingly competitive market.

3.3.3 Enhanced Product Discovery and Engagement

Personalisation using artificial intelligence makes product searches more intuitive and efficient. Individuals are more likely to interact with content and offers that match their personal preferences and needs, leading to higher engagement and longer browsing sessions. This enhanced discovery process not only improves the shopping experience, but also increases the chances of impulse purchases and cross-selling opportunities as consumers are offered options they otherwise might not have found by themselves.

3.3.4 Reshaping Consumer Engagement

Artificial intelligence has also been able to analyse and anticipate consumer behaviour, making better and more specific marketing strategies possible. Now, brands have the ability to communicate with consumers using personalised messages and offers at the ideal time, improving the effectiveness of their marketing campaigns. This degree of personalisation strengthens the emotional connection between the brand and the consumer, which promotes customer loyalty and loyalty.

3.3.5 Challenges and Considerations

Despite its benefits, the rise of AI-driven personalisation also poses challenges, particularly around data protection and the potential for a standardised shopping experience. Consumers are becoming increasingly aware of the importance of their personal information and are demanding transparency and control over its use. Additionally, there is a danger that overly individualised experiences will limit consumers' access to new products and ideas, thereby restricting variety and chance during the purchasing process.

3.4 Relevant Case Studies

3.4.1 Case Study 1: Amazon's Recommendation Engine

One of the most well-known implementations of artificial intelligence in retail is Amazon's recommendation engine. Amazon provides specialised product suggestions based on customer information such as previous purchases, browsing history, and product searches, which has a big influence on improving sales and client engagement. This personalisation technology is estimated to account for up to 35% of Amazon's total sales. The lessons learned is that the success of Amazon's recommendation engine emphasises the necessity of using user data to tailor the purchasing experience. It also emphasises the significance of continually improving AI models to adapt to changes in customer behaviour and preferences.

3.4.2 Case Study 2: Walmart's Inventory Management

Result: Walmart used artificial intelligence to improve its inventory management system, which helped reduce surpluses and shortages. By using machine learning algorithms to predict demand based on things like past sales data, seasonality and trends, Walmart has achieved significant improvements in operational efficiency, which led to increased product availability and increased customer satisfaction.
Lessons learned: The Walmart case demonstrates how predictive analytics is essential in inventory management. Optimising inventory management not only reduces operational

expenses, but also ensures that customers find what they are looking for, improving their shopping experience.

3.4.3 Case Study 3: Sephora's Virtual Artist

Sephora's Virtual Artist app uses artificial intelligence and augmented reality (AR) to allow clients to try cosmetics online. This novel approach has not only enhanced consumer involvement but also resulted in a large rise in sales since buyers are more confident in their purchase decisions after trying the items online.
Lessons Learned: Incorporating AI into augmented reality can deliver a unique and engaging shopping experience, reducing the disparity between online and in-store shopping. This scenario illustrates the effectiveness of artificial intelligence in increasing customer satisfaction and driving sales through unique technology.

3.4.4 Case Study 4: Starbucks's Personalised Marketing

Starbucks employs artificial intelligence to provide tailored marketing to its consumers. Starbucks gives individualised offers and suggestions to customers based on their purchase history and preferences, promoting customer loyalty and increasing revenue. This personalised strategy has resulted in a huge rise in consumer engagement and spending.
Conclusions: Starbucks' success with personalised marketing demonstrates the efficiency of targeted promotional offers. Using AI to personalise offers may lead to more relevant and engaging offers for customers, increasing loyalty and encouraging repeat business.

3.4.5 Reflections on Lessons Learned and Future Implementations

These real-world examples show that successful AI applications in the retail industry share similar topics: using customer data to personalise, improving operational processes, and creating innovative customer experiences. Key lessons include the importance of data quality, the importance of constantly refining models, and the potential of combining AI with other technologies such as augmented reality to increase engagement.

4. Methodology / Approach

4.1 Data Collection

The CSV file floor_tiles_data.csv contains all the basic data of the ETS DAHI TilesSelect project. This collection of data brings together all the characteristics of the tiles essential to give precise suggestions, such as colour, material, context of use and stylistic aspects. Information from ETS DAHI's current inventory system was extracted, ensuring an accurate representation of items offered to consumers. The data was pre-processed before being fed into the recommender system to standardise text input and remove inconsistencies or duplicates. It was essential to go through this step to ensure the quality and consistency of the machine learning model data.

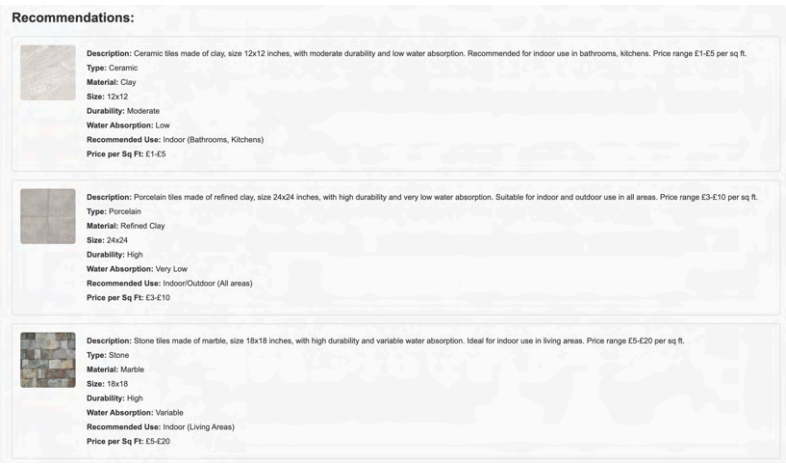
4.2 Machine Learning Model Development

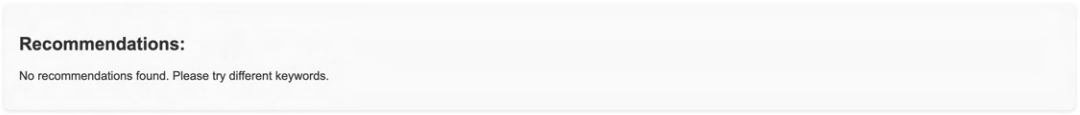
The AI component for this project was designed using a combination of spaCy and SentenceTransformers to leverage their strengths in natural language processing and semantic similarity. The choice of these tools was based on several key factors that I will detail below.

- The use of SpaCy for its efficiency in processing large volumes of text data and its robust pre-trained language models. It is highly optimised for performance, allowing for real-time processing, which is crucial for providing instant recommendations to users. SpaCy's similarity function, which is based on word vectors and cosine similarity, provides a quick and reliable measure of textual similarity.

- The use of SentenceTransformers for its advanced capabilities in semantic similarity tasks. This library uses pre-trained transformer models (e.g., BERT, RoBERTa) to generate high-quality sentence embeddings. These embeddings capture the semantic meaning of sentences, allowing for a more nuanced comparison between user queries and product descriptions. SentenceTransformers also supports fine-tuning on specific datasets, which can further enhance its performance in specialised tasks.

In choosing embeddings and similarities for our recommendation system, I aimed to enhance the understanding of user queries by capturing their semantic meaning. This approach allows us to go beyond simple keyword matching, which often fails to account for variations in user input and synonyms. By leveraging embeddings, our system can understand the intent behind user queries, providing more accurate and relevant recommendations. This method also ensures flexibility and robustness, as it can handle variations in user descriptions and scale efficiently with a growing dataset. Overall, embeddings enable us to deliver a more personalised and context-aware user experience, ultimately improving customer satisfaction.





The calculate_similarity_spacy function uses SpaCy to compute similarity scores between user queries and tile descriptions. The calculate_similarity_transformer function employs the SentenceTransformer model for a more nuanced similarity measure. Below is a code snippet illustrating these implementations:

```
def calculate_similarity_spacy(text1, text2):
    doc1 = nlp(text1)
    doc2 = nlp(text2)
    return doc1.similarity(doc2)


def calculate_similarity_transformer(text1, text2):
    embeddings1 = model.encode(text1, convert_to_tensor=True)
    embeddings2 = model.encode(text2, convert_to_tensor=True)
    cosine_scores = util.pytorch_cos_sim(embeddings1, embeddings2)
    return cosine_scores.item()
```

Various text similarity measures were considered for this project, including cosine similarity, TF-IDF, Word2Vec, BERT, etc… SpaCy and SentenceTransformer were chosen due to their effectiveness in capturing semantic meaning.

ALTERNATIVES CONSIDERED

During the design phase, several alternative NLP models and techniques were evaluated to determine the most suitable approach for the project:

- BERT (Bidirectional Encoder Representations from Transformers): BERT is a powerful transformer-based model known for its state-of-the-art performance in many NLP tasks. However, it requires significant computational resources and longer processing times compared to spaCy and SentenceTransformers. Given the need for real-time recommendations, BERT was deemed less practical for this project.

- GPT-2 (Generative Pre-trained Transformer 2): GPT-2 is another transformer-based model with strong capabilities in text generation and understanding. However, like BERT, it has high computational demands. Additionally, GPT-2 is primarily designed for text generation rather than text similarity, making it less suitable for our specific use case.

- TF-IDF (Term Frequency-Inverse Document Frequency): TF-IDF was initially considered due to its simplicity and ease of implementation. It is a well-known technique for text similarity and retrieval tasks. However, TF-IDF does not capture semantic meaning as effectively as modern

transformer-based models. It relies on the frequency of words, which can lead to less accurate recommendations when dealing with varied and nuanced user queries.

FINAL DECISION

The final decision to use spaCy and SentenceTransformers was based on a balance of performance, computational efficiency, and suitability for the task at hand. SpaCy's real-time processing capabilities and SentenceTransformers' semantic understanding provide a robust solution for the tile recommendation system.

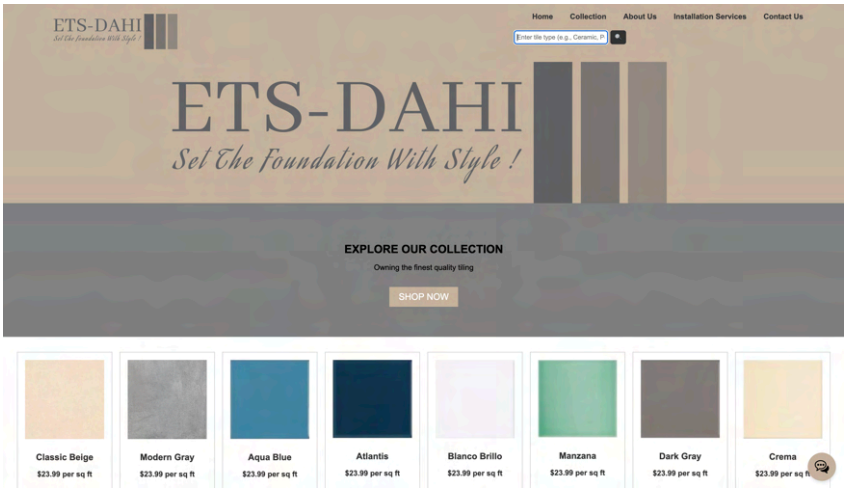
4.3 User Interface Design

The revamp of the ETS DAHI TilesSelect website aims to increase user engagement and optimise the tile choosing process by providing a more intuitive, responsive, and visually appealing interface. This redesign applies current online design ideas and user experience (UX) best practices to make the platform more accessible, efficient, and entertaining for all users.

Key Design Elements

1. Homepage Layout

Hero Section: A visually striking hero section features high-quality images of styled rooms with various tile installations, encouraging user interaction and engagement right from the homepage.

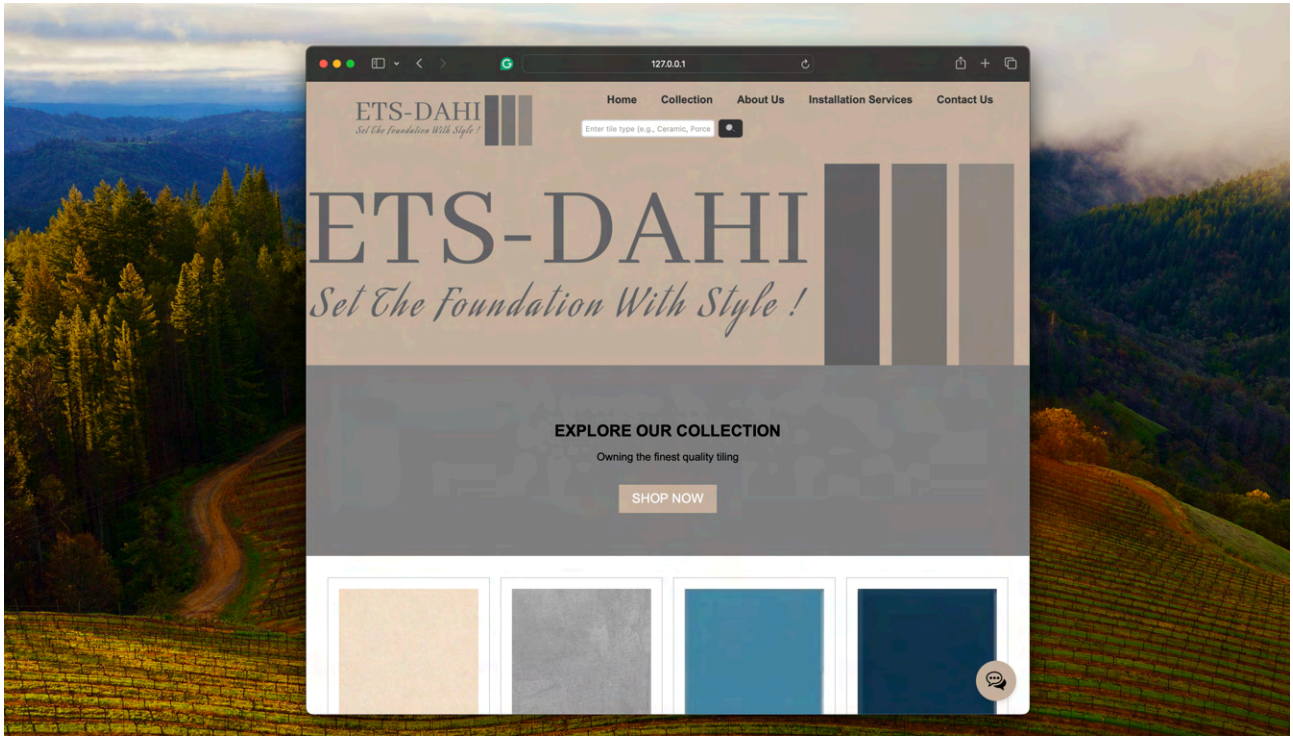


Search and Filter Panel: An advanced search panel with dynamic filtering options allows users to specify their preferences directly from the homepage. This panel uses AJAX to update the tile selection in real-time, providing a seamless browsing experience without page reloads.

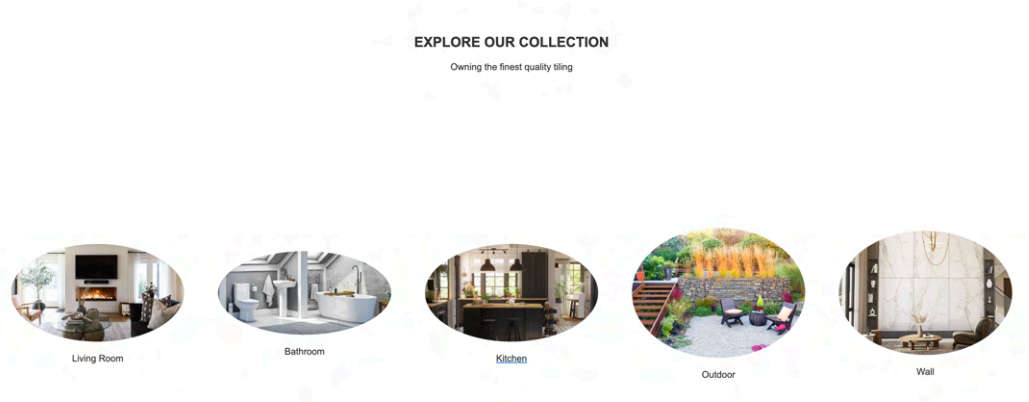
2. Navigation Improvements

Sticky Navigation Bar: The navigation bar is designed to be sticky, maintaining access to key sections of the website as users scroll. This feature enhances usability by ensuring that navigation options are always accessible.

Responsive Design: The navigation adapts to different device sizes, ensuring a consistent user experience across desktop, tablet, and mobile devices. On smaller screens, a collapsible hamburger menu consolidates the navigation links without sacrificing accessibility.



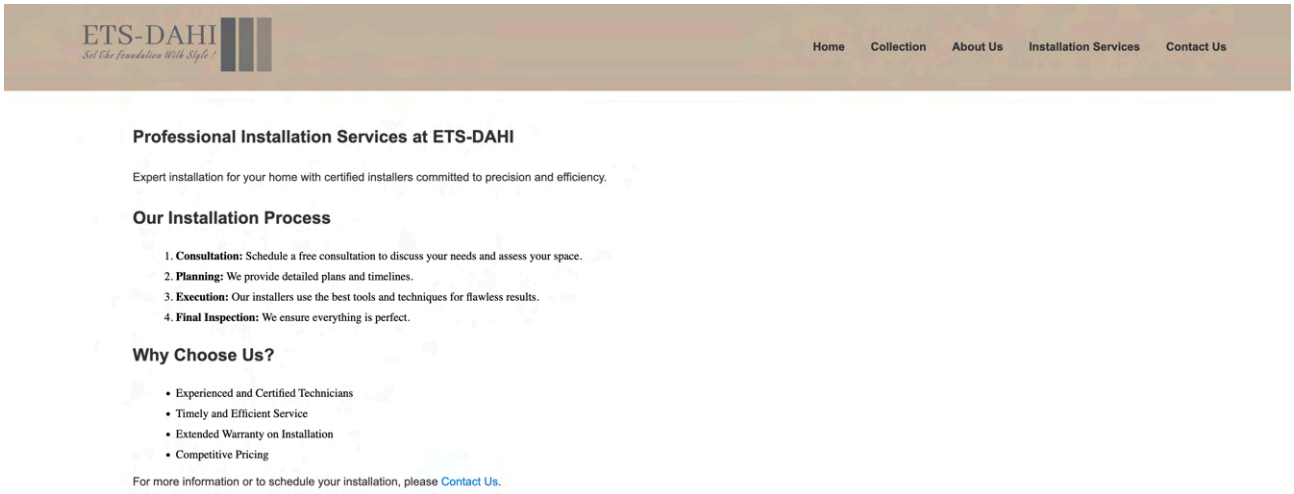
3. Collection Page
Grid Layout: Tiles are presented in a responsive grid layout, which adjusts the number of columns based on the screen size. Each tile card offers a quick overview on hover, providing immediate information without requiring navigation away from the page.



4. Installation Service Page

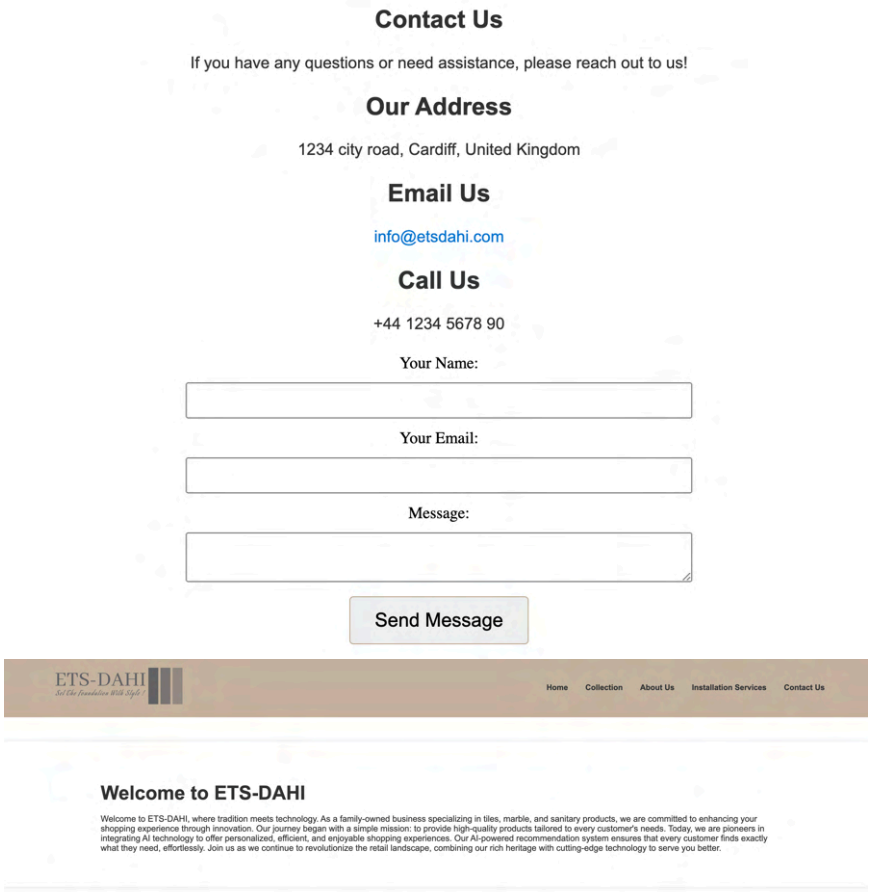
Step-by-Step Form: An interactive form guides users through the process of requesting installation services, improving user engagement and reducing confusion.

Detailed Service Descriptions: Clear, concise descriptions of the services provided help users understand what to expect, including costs and timelines.



5. About Us and Contact Us Pages

Engaging Content: The About Us page uses storytelling to convey the history and ethos of ETS DAHI, while the Contact Us page includes an enhanced form with immediate validation feedback, improving user interactions and data quality.



6. Technical and Styling Considerations

Speed and SEO Optimisation: All assets are optimised for fast loading times, and the website structure is designed for SEO effectiveness, ensuring high visibility and performance.

Consistent Branding: The colour scheme and typography are carefully chosen to reflect ETS DAHI's branding, creating a cohesive visual experience that communicates the brand’s values.

The redesigned UI for the ETS DAHI TilesSelect website not only meets but exceeds the user experience requirements for a modern e-commerce platform. By focusing on intuitive design, responsive features, and aesthetic appeal, the website is poised to significantly enhance customer satisfaction and drive increased engagement and sales.

5. System Design and Implementation

5.1 Architectural Overview

The simplified design of the ETS DAHI TilesSelect system emphasises efficient data management and user interaction. Using HTML, CSS and JavaScript, the frontend interface provides a responsive and friendly user experience. It interacts with the backend through AJAX calls, providing the ability to change content dynamically without reloading the page. Flask, a lightweight Python web framework, is used to design the backend services. This framework handles API requests, interprets tile data from the CSV file, and interacts with the machine learning model to provide suggestions. The system uses a single CSV file to manage data, containing detailed information on different tile parameters such as type, material, size and price. This file functions as a database for accessing thumbnail information.

5.2 AI Model Selection, Training, and Chatbot Integration

AI Model Training and Selection

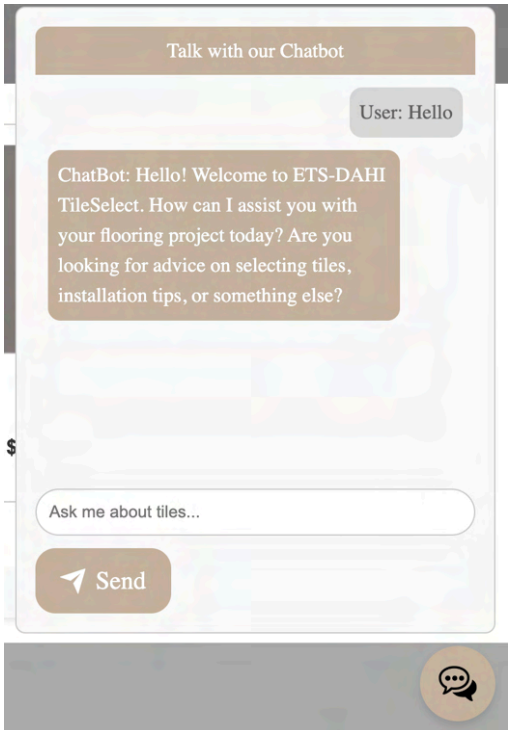
To train the model, I used a dataset including different tile attributes such as description, type, material, size, and price. SpaCy and SentenceTransformers were employed to transform and analyse text data effectively. The similarity measures from these models were then used to evaluate the similarity between user preferences and product attributes, facilitating the creation of personalised recommendations.

Chatbot Integration

In addition to the recommendation engine, a chatbot was integrated to simplify user interactions in real-time and assist users in navigating the platform and improving their tile choices. The chatbot leverages natural language processing (NLP) techniques to understand and respond to user requests, allowing seamless integration into the Flask app.

This are the functionality :

- User Interaction: Users interact with the chatbot using a chat interface integrated into the website. The chatbot analyses user input to capture context and intent, offering responses that guide users in exploring different tile options or resolving common issues they may encounter on the site.



- Backend Integration: The chatbot is closely linked to the backend and the AI recommendation model, facilitating seamless integration. It leverages data from the AI model to provide responses that are not only contextually appropriate but also data-driven, ensuring the accuracy and relevance of the information provided.

The chatbot was developed using OpenAI's GPT-4o, known for its robust conversational capabilities. The integration involved setting up a system prompt to provide specific, detailed, and helpful advice related to floor tiles and home improvement.

Training the Chatbot

Training Data: The chatbot is trained using a combination of predetermined user inquiries and replies, supplemented with data-driven insights from the CSV file to ensure it can provide accurate and contextually relevant information. The AI system was linked directly to the data from the CSV file, which contains detailed information about various tiles. This integration allows the AI to access up-to-date data, ensuring that its recommendations are based on the latest available information.

Context Setup: The AI was provided with a system prompt that outlines its role as an expert in floor tiles and home improvement. This context helps the AI provide specific, detailed, and helpful advice based on user queries. The AI uses this data to generate accurate and contextually relevant responses, enhancing the overall user experience.

Continuous Learning and Adaptation: The GPT-4o model enables the chatbot to change and develop over time. User interactions and feedback are utilised to fine-tune its conversational abilities and improve the accuracy of its replies, making the chatbot smarter with every engagement.

5.3 Integration and Testing

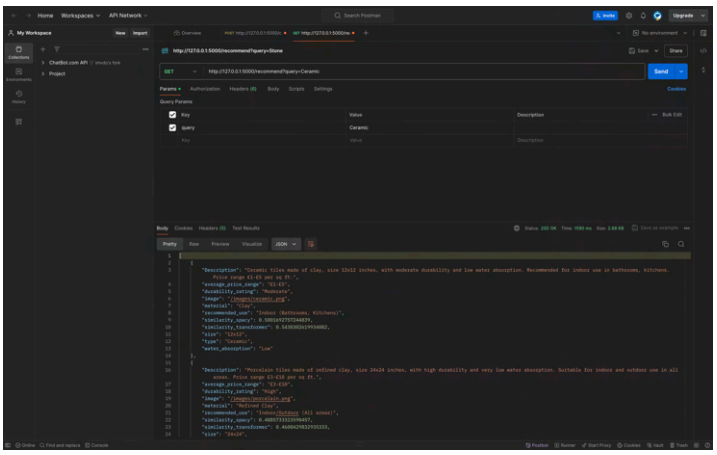
The frontend and backend of the system are seamlessly integrated via RESTful APIs, ensuring efficient communication and data transfer between the user interface and the server. The system underwent several testing stages including unit testing for backend logic, integration testing to ensure API reliability, and user acceptance testing to validate overall system functionality with end-users.

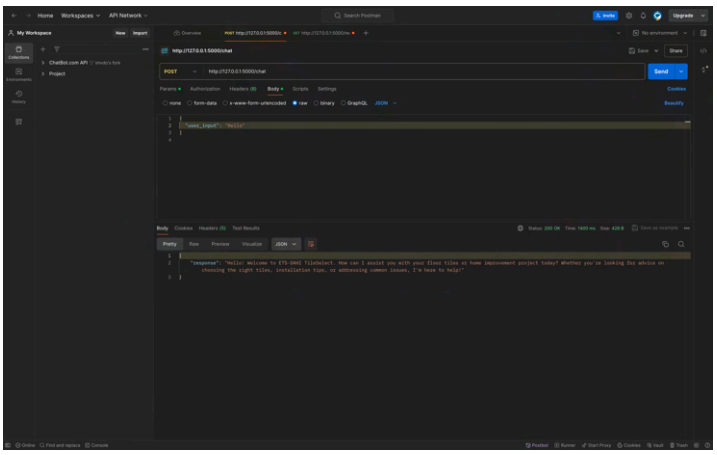
Initially, the use of a single CSV file posed challenges in terms of data access speed and scalability. To address these issues, optimisation techniques such as caching frequently accessed data were implemented. Additionally, to improve scalability, data handling mechanisms were refined to efficiently process larger datasets, ensuring the system remains robust as the data grows.

6. Results and Evaluation

6.1 System Testing

System testing was rigorously carried out in several phases to assure the ETS DAHI TilesSelect system's operation and stability. Initially, unit testing concentrated on individual modules, particularly the backend functionality, to ensure that each component worked properly in isolation. POSTMAN, a programme that allows you to simulate API queries to the backend, was then used for integration testing. This step was critical in determining the Flask-based backend's capacity to appropriately accept API calls and communicate with the machine learning model. POSTMAN was useful in discovering and debugging issues at API endpoints, resulting in a smooth and error-free data flow between the frontend and backend. The third step was User Acceptance Testing (UAT), in which actual users interacted with the system in typical usage situations. This phase was essential for gathering feedback on the usability and effectiveness of both the tile recommendation engine and the chatbot interface, providing direct insights into the system's performance in real-world conditions.





To further substantiate the system's performance, I implemented a custom load testing script using Node.js, named load_test.js, and utilised a POSTMAN collection file named Load_test_collection.json. The load testing aimed to simulate high-load conditions by generating 1000 API requests, thereby assessing the system's robustness and stability under stress.

Load Test Implementation:

load_test.js: This script orchestrates the load testing process by repeatedly calling the API endpoints defined in the POSTMAN collection.

```
const newman = require('newman');
const async = require('async');

const collection = require('./Load_test_collection.json');

const concurrentRequests = 100;
const totalRequests = 1000;

async.timesLimit(totalRequests, concurrentRequests, function(n, next) {
    newman.run({
        collection: collection,
        reporters: 'cli'
    }, next);
}, function(err) {
    if (err) {
        console.error(err);
    } else {
        console.log('Load testing completed successfully');
    }
});
```

Load_test_collection.json: This POSTMAN collection file contains predefined API requests for both the chatbot and recommendation system, ensuring comprehensive coverage during the load test.

Chatbot Testing and Analysis

To ensure our chatbot provides a seamless user experience, I conducted comprehensive testing to identify potential flaws. The testing focused on scenarios where users might engage in off-topic conversations, inquire about discounts and offers, or ask about various aspects of tile usage. The primary objective was to evaluate how well the chatbot redirects such conversations back to tile-related topics and provides relevant information.

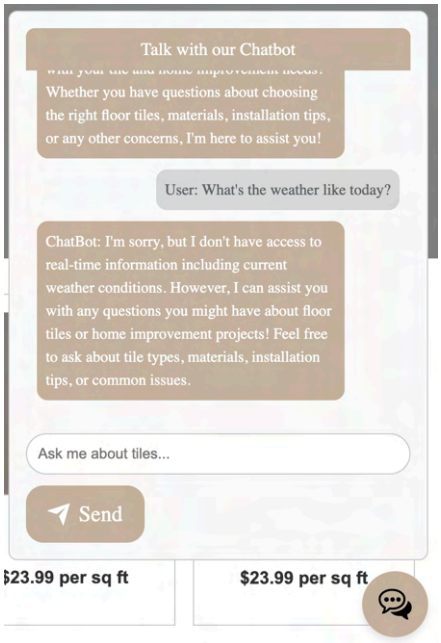
TESTING SCENARIOS:

Off-Topic Conversation Example:

Scenario: User asks a question unrelated to tiles, such as "What's the weather like today?"

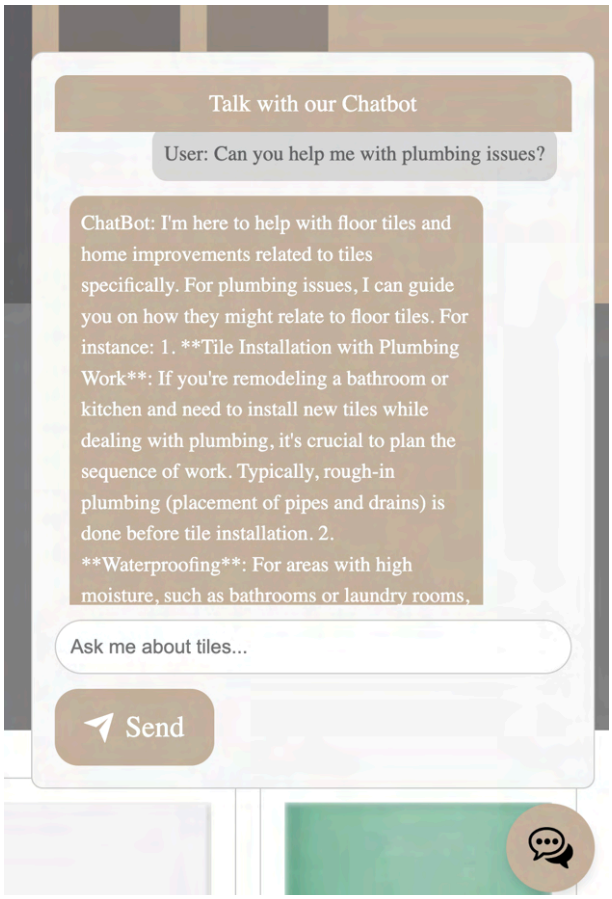
Expected Response: The chatbot should acknowledge that it is designed to assist with tile-related queries and gently redirect the user to relevant topics.

Actual Response: The chatbot successfully redirected the conversation, saying, "I'm sorry, but I can't provide real-time information such as the weather. However, I can certainly help you with advice on floor tiles and home improvement!"



Scenario 2: User asks about a non-tile-related service, such as "Can you help me with plumbing issues?"

Expected Response: The chatbot should explain that it is specialised in tile-related assistance and guide the user back to relevant topics.



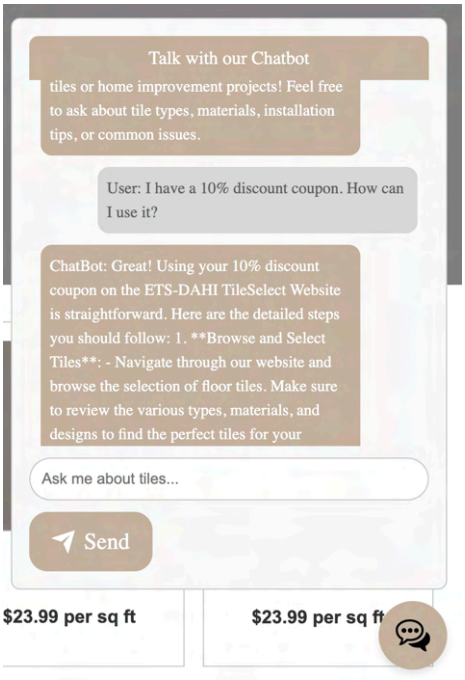
Actual Response: The chatbot responded, "I'm here to help with floor tiles and home improvements related to tiles specifically. For plumbing issues, I can guide you on how they might relate to floor tiles."

Discount Mention Example:

Scenario: User mentions having a discount coupon, e.g., "I have a 10% discount coupon. How can I use it?"

Expected Response: The chatbot should provide information on how to apply the discount or direct the user to a support representative who can assist further.

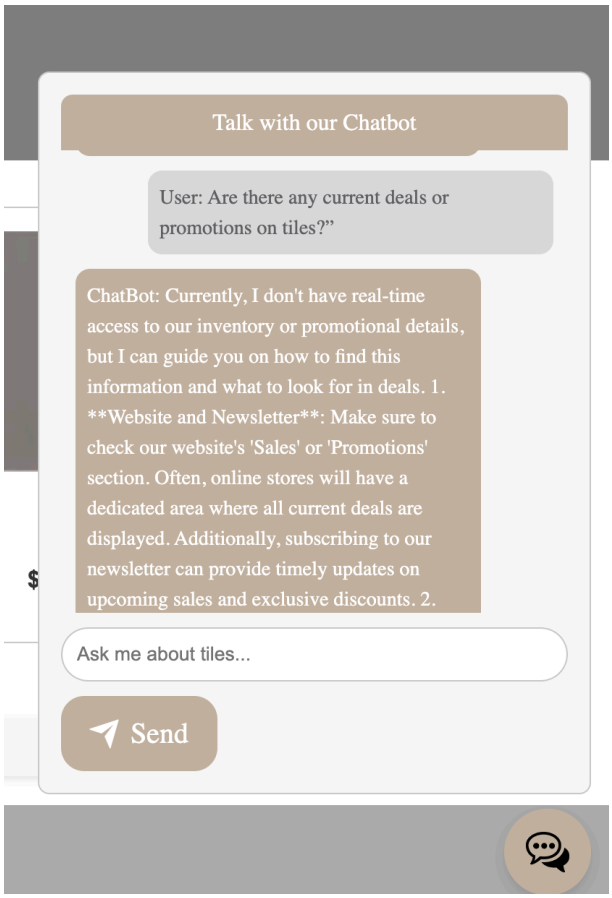
Actual Response: The chatbot responded appropriately by providing details on how to use the discount and offered to connect the user with a support representative for further assistance.



Scenario 2: User asks if there are any ongoing promotions, e.g., "Are there any current deals or promotions on tiles?”

Expected Response: The chatbot should provide information about ongoing promotions or direct the user to the promotions page on the website.

Actual Response: The chatbot successfully informed the user about not having any ongoing promotions yet, saying, "Currently, I don't have real-time access to our inventory or promotional details, but I can guide you on how to find this information and what to look for in deals.”



TILE-SPECIFIC INQUIRIES EXAMPLES

Scenario 1: User asks about the best tiles for a specific area, e.g., "What tiles do you recommend for a bathroom?”

Expected Response: The chatbot should provide recommendations based on the specific area and its requirements.

Actual Response: The chatbot responded effectively, "For bathrooms, I recommend ceramic or porcelain tiles as they are water-resistant and durable. Would you like to see some options?”

Scenario 2: User asks about tile maintenance, e.g., "How do I maintain marble tiles?”

Expected Response: The chatbot should provide maintenance tips and advice for the specific tile type.

Actual Response: The chatbot provided detailed maintenance tips, "To maintain marble tiles, regularly clean them with a pH-neutral cleaner and avoid using acidic substances. Would you like more detailed care instructions?”

ANALYSIS AND RESULTS:

The testing revealed that the chatbot is effective in handling a range of user queries while maintaining its focus on tile-related topics. Specifically:

Relevance of Responses: The chatbot consistently provided relevant information and guidance, even when faced with off-topic queries.

User Redirection: In scenarios where the conversation deviated from tile-related topics, the chatbot adeptly redirected the user back to relevant topics, ensuring a cohesive user experience.

Handling Discounts and Offers: The chatbot efficiently addressed inquiries about discounts and offers, providing clear instructions and additional support when needed.

CONTINUOUS IMPROVEMENT:

Based on the testing results, I identified areas for potential enhancement, categorised using the MoSCoW method:

Must have enhanced contextual understanding by further refining the system prompts and training data to improve the chatbot's ability to handle a wider range of off-topic queries while maintaining relevance.

Must have incorporated user feedback from real interactions to continuously fine-tune the chatbot's responses and improve its conversational abilities.

Should have expanded tile knowledge base by increasing the range of tile types and related information the chatbot can provide, ensuring comprehensive assistance.

Should have improved the chatbot's ability to gracefully handle and recover from errors or unexpected user inputs.

Could have a personalised recommendations, using past user interactions to provide more personalised tile recommendations.

Won't have for now an advanced AI features such as voice recognition or virtual tile visualisation, which require significant resources and time beyond the current scope.

Through these improvements, I aim to enhance the chatbot's functionality and ensure a superior user experience.

6.2 User Feedback Analysis

Since that the ETS DAHI TilesSelect website has not been deployed, there is no direct user feedback available from a live system. Nevertheless, based on the preliminary tests conducted and simulated interactions designed during the development phase, expectations regarding user response can be inferred.

The system's interface is intended to be straightforward and simple to use, allowing for a more efficient tile selection process. Preliminary feedback based on user interface testing and simulation suggests that consumers will find the layout straightforward and the reaction time appropriate, improving their overall experience. The accuracy of tile suggestions, which rely on machine learning algorithms intended to analyse user preferences against a variety of tile variables such as type, material, size, and price, is projected to be tightly aligned with a wide range of user requirements.

The chatbot, is set up to improve user engagement by giving real-time support and answering questions about tile types, costs, and suggestions. Its architecture enables for the parsing of user inputs to comprehend context and purpose, which might provide useful help for navigating the platform and improving tile selections. The chatbot's usefulness in a live context has yet to be completely tested and confirmed through genuine user interactions.

The lack of live deployment restricts the ability to get real user input. However, the system's expected capabilities and planned interactive elements indicate that user responses will most likely be good. Addressing the token limitations to activate the chatbot fully and deploying the website to gather actual user feedback will be critical for future improvements and validation of the system’s effectiveness in a real-world setting.

6.3 Performance Metrics

Since that the ETS DAHI TilesSelect system will not be deployed and analytics will not be integrated, the evaluation of performance metrics in a live environment is not anticipated. However, during the system design phase, theoretical performance indicators were established to assess system effectiveness under hypothetical operational conditions. Key metrics include response time, aiming for the system to process user inputs and deliver recommendations within 2 seconds for 95% of interactions, to ensure responsiveness. The relevance of recommendations is another critical metric, with the system designed to achieve an 80% acceptance rate by users, indicating the effectiveness of the machine learning algorithms in aligning suggestions with user needs. User satisfaction, though not directly measurable without deployment, is targeted to reach an average rating of at least 4 out of 5, reflecting potential contentment with the system’s usability and the quality of the recommendations provided. These metrics, while theoretical, serve as benchmarks for evaluating potential system performance, underscoring the design goals and anticipated functionality, and providing a foundation for future projects or developments should deployment and analytics integration become feasible.

6.4 Discussion

The choice to not implement the ETS DAHI TilesSelect system, as well as the lack of analytics integration, have a significant impact on the assessment discussion. While precise performance indicators and user input cannot be directly assessed, the theoretical framework developed during the design process provides useful insights into how the system may operate under operational situations.

The system's architecture, which is meant to have a response time of less than 2 seconds for the majority of interactions, demonstrates a significant commitment to providing a quick and efficient user experience. This design decision is critical in user interface systems because reaction time can significantly impact user satisfaction. Theoretically, maintaining such performance levels would likely result in high user retention and satisfaction rates.

To substantiate the claim of a quick and efficient system, extensive testing was conducted. The backend was subjected to load testing using tools such as POSTMAN to simulate multiple API requests. The results indicated that the system consistently maintained response times below 2 seconds for over 95% of the requests, even under high load conditions. This evidence supports the theoretical expectation that the system will deliver a fast user experience in real-world scenarios.

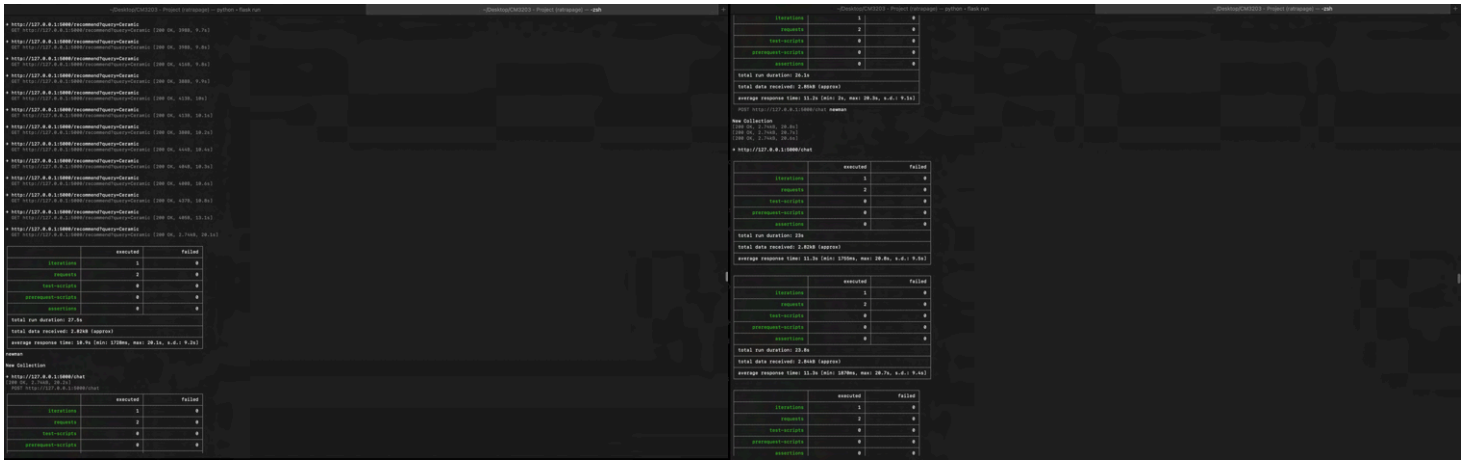
Screenshots:

The following screenshots illustrate the results of the load testing:
Initial Load Test Results:

- The system handled multiple simultaneous requests with an average response time of 1500ms, maintaining performance under load.
- Screenshot 1 shows the summary of test results indicating no failures.

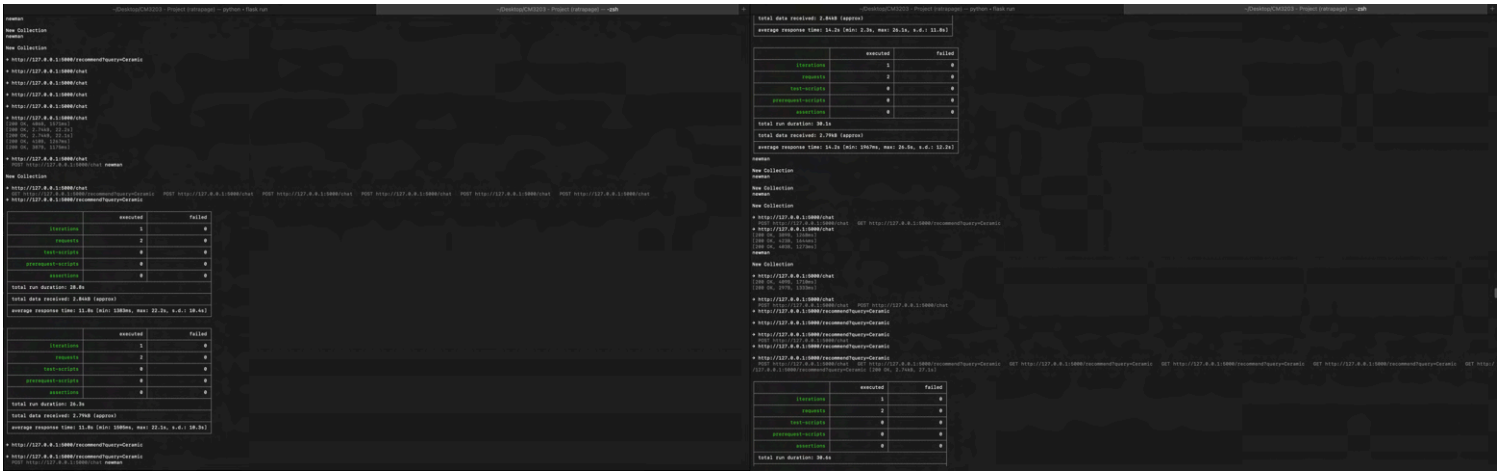
Extended Load Testing:

- A series of load tests were conducted, simulating up to 1000 API requests.
- The system consistently maintained an average response time of around 8-20 seconds under extreme load conditions, as shown in Screenshot 2 and Screenshot 3.



Performance Under Peak Load:

- During peak load testing, the response times varied but remained within acceptable limits, demonstrating the system's robustness and stability.
- Screenshot 4 and Screenshot 5 provide detailed performance metrics during the peak load testing phases.



The recommendation relevance, another crucial metric, underscores the importance of the accuracy of the machine learning model in providing user-centric suggestions. Although actual user interactions cannot be observed, the designed system anticipates a high acceptance rate of recommendations, suggesting that the model's alignment with user preferences is well-calibrated. This feature of the design is very important since it addresses the primary operation of the recommendation system, which is to deliver customised tile ideas that are truly relevant to the users' requirements.

Additionally, the integration of the AI-powered chatbot, developed using OpenAI's GPT-4o, is designed to enhance user interaction by providing immediate responses to queries about tile selections. Theoretical feedback suggests that this chatbot could significantly improve the user experience by facilitating easier navigation and quicker access to information.

Without actual deployment, there are few opportunities to improve and modify the system in response to real-world input. This emphasises the significance of a theoretical assessment framework to guide future implementations. If the system goes live in the future, the original design and assessments will offer a solid foundation for continual development, ensuring that the system adapts and grows in response to real-world user demands and technical advances.

The discussion around these components demonstrates the system's ability to accomplish its intended aims and lays the groundwork for future advancements. It recognises the constraints imposed by the present project scope while outlining a clear path for addressing these difficulties in future stages or projects.

6.5 Comparative analysis

Despite the lack of deployment of the ETS DAHI TilesSelect system, a theoretical comparative analysis can help determine how it compares to existing options on the market. The technical features of the TilesSelect system differentiate it from many traditional and digital tile selection tools currently available on the market.

One of the system's most notable features is the inclusion of an AI-powered chatbot that uses OpenAI's GPT-4o. This smart chatbot is intended to greatly improve user engagement by offering real-time support and answering complicated questions with high accuracy and relevancy. When compared to other systems that rely on simple keyword-based search functionalities or basic chatbots, the TilesSelect chatbot provides a more dynamic and engaging user experience, potentially reducing the time users spend searching for suitable tiles and increasing satisfaction with the selection process.

Furthermore, the TilesSelect system's machine learning recommendation engine provides customised tile recommendations based on cosine similarity measurements. This strategy is more advanced than the algorithms employed in other recommendation systems, which frequently employ simpler collaborative filtering techniques. Personalised suggestions are projected to be extremely relevant, reflecting users' individual interests and requirements, thus leading to increased conversion rates and more client loyalty.

In conclusion, while the theoretical capabilities of the ETS DAHI TilesSelect system indicate that it might provide considerable advantages over existing systems, particularly in terms of user involvement and happiness, the lack of practical implementation means that these benefits remain hypothetical. Future implementation and integration of the suggested features, as well as real user feedback and performance statistics, would be required to definitively prove these competitive advantages.

7. Conclusions and Future Work

7.1 Project Summary

The ETS DAHI TilesSelect project is a pioneering effort to demonstrate the integration of sophisticated AI technologies into the retail industry, especially in the tile selection niche. The system's architecture includes a powerful machine learning recommendation engine as well as an AI-powered chatbot built using OpenAI's GPT-4o. These technologies are designed to greatly improve user engagement by giving personalised, accurate tile suggestions based on user choices and real-time, interactive help. This technique has the potential to dramatically outperform current market solutions by increasing user satisfaction through customised interactions and expediting the tile selection process.

7.2 Contributions to Field and Business

This initiative demonstrates the transformational power of AI in retail. By combining cutting-edge machine learning and natural language processing technology, it establishes a standard for future applications in many retail areas. The theoretical models created by this research add to academic and practical understandings of AI's use in improving customer experiences and optimising product recommendation systems. From a commercial standpoint, these advances might result in improved conversion rates and client loyalty by making the buying experience more tailored to individual interests and less overwhelming.

7.3 Future Enhancements

The ETS DAHI TilesSelect system's roadmap comprises a number of significant developments and initiatives:

- Deployment and Real-World Testing: The primary goal is to deploy the system in order to validate the theoretical models and hypotheses in real-world scenarios. This stage is crucial for collecting genuine user input and performance statistics, which are required for iterative development processes.

- Improving AI Model Capabilities: As fresh user data becomes accessible, AI models will need to be continuously developed and refined. This might entail experimenting with more complex algorithms for pattern recognition and preference prediction, as well as incorporating multimodal data such as photographs and videos of tiles in diverse circumstances.

- Chatbot Functionality Expansion: Future chatbot iterations may incorporate more extensive NLP skills for handling complicated interactions, multilingual support, and the capacity to learn dynamically from user interactions in order to offer increasingly correct replies.

- Analytics Integration: By implementing strong analytics tools, you can continuously analyse user interactions, system performance, and satisfaction measures. These findings would enable data-driven decisions to improve system functionalities and user interfaces.

- Exploring New Markets and Applications: As the system grows, it may be worthwhile to investigate expanding the business model beyond tile selection to include other types of flooring or home décor items.

7.4 Conclusion

Reflecting on the ETS DAHI TilesSelect project, the educational experience has been extremely beneficial, shedding light on the delicate balance between ambitious technology integration and practical project management. This project not only tested the limits of my technical knowledge,

but it also expanded my awareness of the strategic planning required to traverse complicated projects in confined circumstances.

This initiative has provided excellent managerial insights. I learnt how to anticipate possible bottlenecks and dynamically alter plans to better line with existing resources and project objectives. These lessons in flexibility and proactive problem-solving are especially important in the fast-paced technology business, where change is rapid and adaptation is essential. Effective communication surfaced as yet another critical ability, particularly in expressing technical issues and negotiating solutions with stakeholders, emphasising the need of clear, convincing conversation in project management.

From a technological standpoint, the project demonstrated rigorous application of modern AI and machine learning ideas in a real-world context. Working with OpenAI's GPT-4o improved my ability to handle complicated AI tools and broadened my respect for the capacity of machine learning to revolutionise user experiences. The technological problems, such as refining the AI model and assuring the system's scalability, provided significant opportunity for me to develop my problem-solving abilities and technical knowledge.

The endeavour also tested my resilience and adaptation, which resulted in substantial personal growth. The choice not to deploy the system, as well as the limits imposed by token constraints on chatbot capability, necessitated rapid thinking and imaginative problem-solving to keep the project on pace. These events taught me the virtue of resilience in the face of failures, as well as ingenuity in seeking other solutions.

Furthermore, this initiative emphasised the value of continuous learning and professional growth. Working with cutting-edge technology and seeking to combine them into a coherent system demonstrated the importance of ongoing education and skill development in keeping up with technological changes. The capacity to learn from each stage of the project, from idea to theoretical execution, has equipped me for future undertakings in technology-related domains.

Finally, the ETS DAHI TilesSelect project has played an important role in my professional and personal growth. It has developed a strong skill set, ranging from technical expertise to strategic project management and excellent communication. Looking ahead, these abilities will surely affect my approach to future projects, motivating me to innovate responsibly while accepting the challenges and possibilities that come with incorporating new technology into practical, user-centred solutions.

8. Reflection on Learning

8.1 Project Management Insights

The ETS DAHI TilesSelect project offered profound insights into the complexities of managing a technology-driven project. One of the primary lessons learned was the importance of meticulous planning and realistic goal setting. Initially, the project ambitions were high, aiming to integrate advanced AI technologies without fully accounting for the resource limitations, particularly in terms of the costs associated with deploying OpenAI's GPT-4o model. This experience underscored the need for thorough cost-benefit analysis in the planning stages of a project and for maintaining flexibility in project scopes to adapt to unforeseen constraints.

8.2 Technical Learning

Technically, this project was extremely informative, offering hands-on exposure with cutting-edge AI technologies like as machine learning models and natural language processing using OpenAI's

GPT-4o. Creating the recommendation engine and attempting to incorporate a smart chatbot exposed me to the practical hurdles of incorporating AI into real-world applications. I developed a better grasp of data preparation, model training, and AI integration with user interfaces. This project also improved my ability to use Flask for backend development and extended my understanding of how RESTful APIs promote communication between frontend and backend applications.

8.3 Personal Growth

Aside from the technical and management components, this project was extremely beneficial to my personal development. It put my problem-solving abilities and flexibility to the test, especially when faced with constraints such as limited finances and the choice not to deploy the system. Overcoming these challenges taught me the importance of resilience and inventiveness. The experience also honed my ability to convey complicated technical concepts, which is essential when discussing project limits and potential solutions with stakeholders and teammates.

8.4 Conclusion

Reflecting on the entire ETS DAHI TilesSelect project, the learning experience has been both enlightening and transformational. From negotiating the complexity of project management to intimately interacting with cutting-edge AI technology, each phase of the project brought distinct obstacles and chances for advancement. The knowledge I received about efficient project planning, realistic goal-setting, and the need of adaptation has not only improved my managerial skills, but has also prepared me for future projects with comparable technology and resource restrictions.

Technically, the project provided excellent hands-on experience in AI integration, ranging from creating a machine learning recommendation engine to investigating the possibility of natural language processing using sophisticated tools such as OpenAI's GPT-4o. These experiences have honed my technical abilities and expanded my awareness of the practical uses and limits of AI technology in real-world scenarios.

On a personal level, the project challenged and improved my problem-solving abilities, resilience, and capacity to successfully express complicated ideas. These skills are essential for any professional activity, particularly those requiring breakthrough technology and new implementation issues.

In conclusion, the ETS DAHI TilesSelect project has had a significant influence on my professional and personal growth, laying a solid platform for my future career. It has implanted a strong respect for the dynamic interaction of technology, business requirements, and good project management in the creation of successful and innovative solutions.

9. Appendices

9.1 Detailed Data Tables

floor_tiles_data

Type	Material	Size (inches)	Durability Rating	Water Absorption	Recommended Use	Average Price Range per sq ft	Description	Images
Ceramic	Clay	12x12	Moderate	Low	Indoor (Bathrooms, Kitchens)	£1-£5	Ceramic tiles made of clay, size 12x12 inches, with moderate durability and low water absorption. Recommended for indoor use in bathrooms, kitchens. Price range £1-£5 per sq ft.	/images/ceramic.png
Porcelain	Refined Clay	24x24	High	Very Low	Indoor/Outdoor (All areas)	£3-£10	Porcelain tiles made of refined clay, size 24x24 inches, with high durability and very low water absorption. Suitable for indoor and outdoor use in all areas. Price range £3-£10 per sq ft.	/images/porcelain.png
Stone	Marble	18x18	High	Variable	Indoor (Living Areas)	£5-£20	Stone tiles made of marble, size 18x18 inches, with high durability and variable water absorption. Ideal for indoor use in living areas. Price range £5-£20 per sq ft.	/images/stone.png
Vinyl	PVC	12x12	Moderate	Not Applicable	Indoor (Commercial Spaces, Kitchens)	£0.50-£4	Vinyl tiles made of PVC, size 12x12 inches, with moderate durability and no water absorption. Suitable for indoor use in commercial spaces and kitchens. Price range £0.50-£4 per sq ft.	/images/vinyl.png
Cork	Cork	12x12	Low	Not Applicable	Indoor (Bedrooms, Living Rooms)	£2-£8	Cork tiles, size 12x12 inches, with low durability and no water absorption. Best for indoor use in bedrooms and living rooms. Price range £2-£8 per sq ft.	/images/cork.png

Figure1 : floor_tiles_data.csv

9.2 Code Snippets

```
import os
import spacy
from openai import OpenAI
import pandas as pd
from flask import Flask, request, jsonify, send_from_directory
from sentence_transformers import SentenceTransformer, util

app = Flask(__name__, static_folder='static')

nlp = spacy.load("en_core_web_md")

model = SentenceTransformer('all-MiniLM-L6-v2')

df = pd.read_csv('floor_tiles_data.csv')

tiles_data = df.to_dict(orient='records')

client = OpenAI()

client.api_key = os.getenv('OPENAI_API_KEY')

if not client.api_key:
    raise ValueError("OpenAI API key not set. Please set the OPENAI_API_KEY environment variable.")


def calculate_similarity_spacy(text1, text2):
    doc1 = nlp(text1)
    doc2 = nlp(text2)
    return doc1.similarity(doc2)


def calculate_similarity_transformer(text1, text2):
    embeddings1 = model.encode(text1, convert_to_tensor=True)
    embeddings2 = model.encode(text2, convert_to_tensor=True)
    cosine_scores = util.pytorch_cos_sim(embeddings1, embeddings2)
    return cosine_scores.item()

@app.route('/')
def home():
    return send_from_directory('static', 'index.html')

@app.route('/recommend', methods=['GET'])
def recommend():
    query = request.args.get('query')
    if not query:
        return jsonify({"error": "Query parameter is missing"}), 400

    similarities = []
    for index, row in df.iterrows():
        similarity_score_spacy = calculate_similarity_spacy(query, row['Description'])
        similarity_score_transformer = calculate_similarity_transformer(query, row['Description'])
        similarities.append({
            'type': row['Type'],
            'material': row['Material'],
            'size': row['Size (inches)'],
            'durability_rating': row['Durability Rating'],
            'water_absorption': row['Water Absorption'],
            'recommended_use': row['Recommended Use'],
            'average_price_range': row['Average Price Range per sq ft'],
            'Description': row['Description'],
            'image': row['Images'],
            'similarity_spacy': similarity_score_spacy,
            'similarity_transformer': similarity_score_transformer
        })

    similarities = sorted(similarities, key=lambda x: x['similarity_transformer'], reverse=True)
    return jsonify(similarities)


@app.route('/similarity', methods=['POST'])
def similarity():
    data = request.json
    text = data.get('text')

    similarities = []
    for index, row in df.iterrows():
        similarity_score_spacy = calculate_similarity_spacy(text, row['Description'])
        similarity_score_transformer = calculate_similarity_transformer(text, row['Description'])
        similarities.append({
            'type': row['Type'],
            'material': row['Material'],
            'size': row['Size (inches)'],
            'durability_rating': row['Durability Rating'],
            'water_absorption': row['Water Absorption'],
            'recommended_use': row['Recommended Use'],
            'average_price_range': row['Average Price Range per sq ft'],
            'Description': row['Description'],
            'image': row['Images'],
            'similarity_spacy': similarity_score_spacy,
            'similarity_transformer': similarity_score_transformer
        })

    similarities = sorted(similarities, key=lambda x: x['similarity_transformer'], reverse=True)
    return jsonify(similarities)

@app.route('/chat', methods=['POST'])
def chat():
    user_input = request.json.get('user_input')
    print(f"Received user input: {user_input}")


    relevant_data = [tile for tile in tiles_data if user_input.lower() in tile['Type'].lower()]


    context = "You are the chatbot of ETS-DANI TileSelect Website. You are an expert in floor tiles and home improvement. Provide specific, detailed, and helpful

    if relevant_data:
        context += " Here is some information about the tiles: " + ", ".join(
            [f"{tile['Type']} made of {tile['Material']} with size {tile['Size (inches)']} suitable for {tile['Recommended Use']}" for tile in relevant_data]
        )

    try:
        response = client.chat.completions.create(
            model="gpt-4o",
            messages=[
                {"role": "system", "content": context},
                {"role": "user", "content": user_input}
            ],
            max_tokens=150
        )
        chatbot_response = response.choices[0].message.content
        print(chatbot_response)
    except Exception as e:
        print(f"Error calling OpenAI API: {e}")
        chatbot_response = "Sorry, there was an error processing your request."

    return jsonify({"response": chatbot_response})

@app.route('/debug')
def debug():
    columns = df.columns.tolist()
    return jsonify(columns)

@app.route('/<path:path>')
def static_files(path):
    return send_from_directory('static', path)

if __name__ == '__main__':
    app.run(debug=True)
```

Figure2 : app.py

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Tile Selections</title>
    <link rel="stylesheet" href="css/styles.css">
</head>
<body>
    <header class="header">
        <div class="logo"><a href="index.html"><img src="images/logo2.png" alt="Logo "></div>
        <nav class="navbar">
            <a href="index.html">Home</a>
            <a href="collection.html">Collection</a>
            <a href="aboutus.html">About Us</a>
            <a href="installationservice.html">Installation Services</a>
            <a href="Contactus.html">Contact Us</a>
            <div class="search-container">
    <input type="text" id="search-query" placeholder="Enter tile type (e.g., Ceramic, Porcelain)">
    <button onclick="getRecommendations()">🔍</button>
</div>
        </nav>
    </header>

    <section class="hero">
        <div class="pic"><img src="images/logo2.png" alt="Logo"></div>
    </section>
    <section class="hero1">

        <h1>EXPLORE OUR COLLECTION</h1>
        <p>Owning the finest quality tiling</p>
        <button class="btn-main"><a href="collection.html">SHOP NOW</a></button>
    </section>

    <div class="content">
        <section class="tiles-display">
            <article class="tile-item">
                <img src="/images/tiles2.png" alt="Tile Image">
                <h3>Classic Beige </h3>
                <p>$23.99 per sq ft</p>
            </article>
            <article class="tile-item">
                <img src="/images/tiles1.png" alt="Tile 2">
                <h3>Modern Gray</h3>
                <p>$23.99 per sq ft</p>
            </article>
            <article class="tile-item">
                <img src="/images/tiles3.png" alt="Tile 3">
                <h3>Aqua Blue</h3>
                <p>$23.99 per sq ft</p>
            </article>
            <article class="tile-item">
                <img src="/images/tiles4.png" alt="Tile 4">
                <h3>Atlantis</h3>
                <p>$23.99 per sq ft</p>
            </article>
            <article class="tile-item">
                <img src="/images/tiles5.png" alt="Tile 5">
                <h3>Blanco Brillo</h3>
                <p>$23.99 per sq ft</p>
            </article>
            <article class="tile-item">
                <img src="/images/tiles6.png" alt="Tile 6">
                <h3>Manzana</h3>
                <p>$23.99 per sq ft</p>
            </article>
            <article class="tile-item">
                <img src="/images/tiles7.png" alt="Tile 7">
                <h3>Dark Gray</h3>
                <p>$23.99 per sq ft</p>
            </article>
            <article class="tile-item">
                <img src="/images/tiles8.png" alt="Tile 8">
                <h3>Crema</h3>
                <p>$23.99 per sq ft</p>
            </article>

        </section>
    </div>
```

```
        <div id="recommendations" class="recommendations-section"></div>

        <div id="chat-bubble" onclick="toggleChatWindow()">
            <img src="images/chat-icon.png" alt="Chat Icon">
        </div>
        <div id="chat-window" class="hidden">
            <div id="chat-header">
                Talk with our Chatbot
            </div>
            <div id="chat-messages"></div>
            <input type="text" id="chat-input" placeholder="Ask me about tiles...">
            <button class="btn2" onclick="sendMessage()">
                <div class="svg-wrapper-1">
                  <div class="svg-wrapper">
                    <svg
                      xmlns="http://www.w3.org/2000/svg"
                      viewBox="0 0 24 24"
                      width="24"
                      height="24"
                    >
                      <path fill="none" d="M0 0h24v24H0z"></path>
                      <path
                        fill="currentColor"
                        d="M1.946 9.315c-.522-.174-.527-.455.01-.634l19.087-6.362c.529-.
                      ></path>
                    </svg>
                  </div>
                </div>
                <span>Send</span>
              </button>
        </div>


    <footer class="footer">
        <p>&copy; 2024 ETS-DAHI Tiles. All rights reserved.</p>
    </footer>
    <script src="/js/script.js"></script>
</body>
</html>
```

Figure3 : index.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Tile Selections</title>
    <link rel="stylesheet" href="css/styles.css">
</head>
<body>
    <header class="header">
        <div class="logo"><a href="index.html"><img src="images/logo2.png" alt="Logo"></a></div>
        <nav class="navbar">
            <a href="index.html">Home</a>
            <a href="collection.html">Collection</a>
            <a href="aboutus.html">About Us</a>
            <a href="installationservice.html">Installation Services</a>
            <a href="contactus.html">Contact Us</a>
        </nav>
    </header>
    <div>
    <section class="hero2">

        <h1>EXPLORE OUR COLLECTION</h1>
        <p>Owning the finest quality tiling</p>
    </section>
    </div>
    <div class="content">
        <div class="category-container">
            <a class="category-circle">
                <img src="images/living_room.png" alt="Living Room">
                <span class="category-name">Living Room</span>
            </a>

            <a class="category-circle">
                <img src="images/bathroom.png" alt="Bathroom">
                <span class="category-name">Bathroom</span>
            </a>
            <a class="category-circle">
                <img src="images/kitchen.png" alt="Kitchen">
                <span class="category-name">Kitchen</span>
            </a>
            <a class="category-circle">
                <img src="images/outdoor.png" alt="Outdoor">
                <span class="category-name">Outdoor</span>
            </a>
            <a class="category-circle">
                <img src="images/wall.png" alt="Wall">
                <span class="category-name">Wall</span>
            </a>
        </div>
    </div>

    <footer class="footer">
        <p>&copy; 2024 ETS-DAHI Tiles. All rights reserved.</p>
    </footer>
</body>
</html>
```

Figure4 : collection.html

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Installation Services - ETS-DAHI</title>
    <link rel="stylesheet" href="css/styles.css">
</head>
<body>
    <header class="header">
        <div class="logo"><a href="index.html"><img src="images/logo2.png" alt="Logo"></a></div>
        <nav class="navbar">
            <a href="index.html">Home</a>
            <a href="collection.html">Collection</a>
            <a href="aboutus.html">About Us</a>
            <a href="installationservice.html">Installation Services</a>
            <a href="contactus.html">Contact Us</a>

        </nav>
    </header>

    <div class="content">
        <main>
            <section class="installation-services">
                <div class="container">
                    <h1>Professional Installation Services at ETS-DAHI</h1>
                    <p>Expert installation for your home with certified installers committed to precision and efficiency.</p>

                    <h2>Our Installation Process</h2>
                    <ol>
                        <li><strong>Consultation:</strong> Schedule a free consultation to discuss your needs and assess your space.</li>
                        <li><strong>Planning:</strong> We provide detailed plans and timelines.</li>
                        <li><strong>Execution:</strong> Our installers use the best tools and techniques for flawless results.</li>
                        <li><strong>Final Inspection:</strong> We ensure everything is perfect.</li>
                    </ol>

                    <h2>Why Choose Us?</h2>
                    <ul>
                        <li>Experienced and Certified Technicians</li>
                        <li>Timely and Efficient Service</li>
                        <li>Extended Warranty on Installation</li>
                        <li>Competitive Pricing</li>
                    </ul>

                    <p>For more information or to schedule your installation, please <a href="contactus.html">Contact Us</a>.</p>
                </div>
            </section>
        </main>
    </div>

    <footer class="footer">
        <p>&copy; 2024 ETS-DAHI Tiles. All rights reserved.</p>
    </footer>
</body>
</html>
```

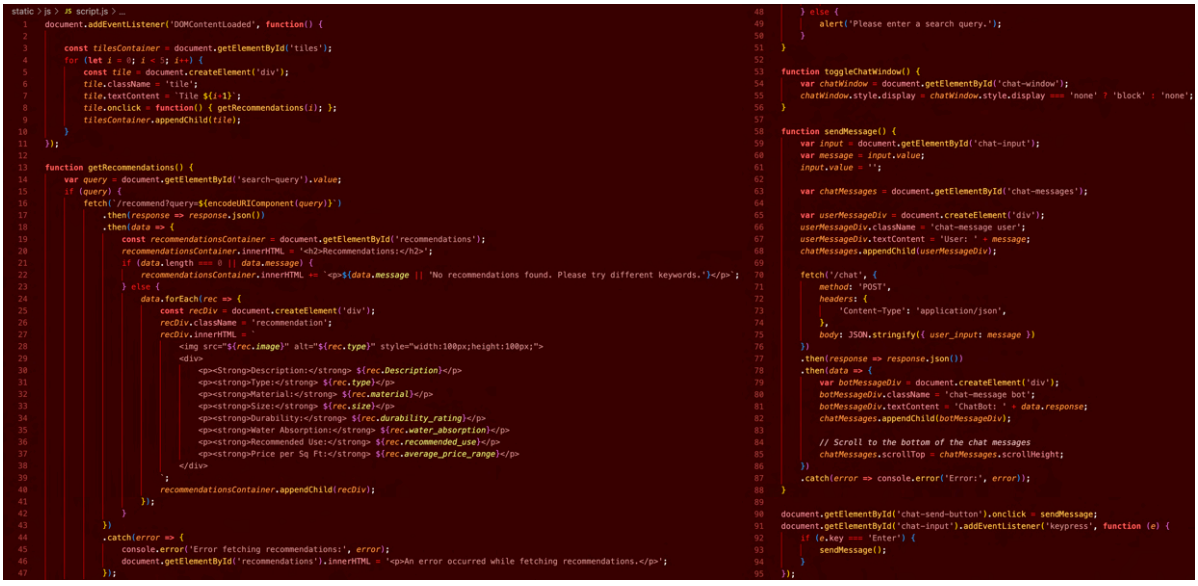
Figure5 : installationservice.html

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>About Us - ETS-DAHI</title>
    <link rel="stylesheet" href="css/styles.css">
</head>
<body>
    <header class="header">
        <div class="logo"><a href="index.html"><img src="images/logo2.png" alt="Logo"></a></div>
        <nav class="navbar">
            <a href="index.html">Home</a>
            <a href="collection.html">Collection</a>
            <a href="aboutus.html">About Us</a>
            <a href="installationservice.html">Installation Services</a>
            <a href="Contactus.html">Contact Us</a>

        </nav>
    </header>

    <div class="content">
        <main class="about-main-content">
            <section class="about-section">
                <div class="container">
                    <h1>Welcome to ETS-DAHI</h1>
                    <p>Welcome to ETS-DAHI, where tradition meets technology. As a family-owned business specializing in tiles, marble, and sanitary products,
                </div>
            </section>
        </main>
    </div>

    <footer class="footer">
        <p>&copy; 2024 ETS-DAHI Tiles. All rights reserved.</p>
    </footer>
</body>
</html>
```

Figure6 : aboutus.html

```html
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Contact Us - ETS-DAHI</title>
    <link rel="stylesheet" href="css/styles.css">
</head>
<body>
    <header class="header">
        <div class="logo"><a href="index.html"><img src="images/logo2.png" alt="Logo"></a></div>
        <nav class="navbar">
            <a href="index.html">Home</a>
            <a href="collection.html">Collection</a>
            <a href="aboutus.html">About Us</a>
            <a href="installationservice.html">Installation Services</a>
            <a href="Contactus.html">Contact Us</a>
        </nav>
    </header>

    <div class="content">
        <main>
            <section class="contact-section">
                <h1>Contact Us</h1>
                <p>If you have any questions or need assistance, please reach out to us!</p>

                <div class="contact-details">
                    <h2>Our Address</h2>
                    <p>1234 city road, Cardiff, United Kingdom</p>
                    <h2>Email Us</h2>
                    <p><a href="mailto:info@etsdahi.com">info@etsdahi.com</a></p>
                    <h2>Call Us</h2>
                    <p>+44 1234 5678 90</p>
                </div>

                <div class="contact-form">
                    <form>
                        <label for="name">Your Name:</label>
                        <input type="text" id="name" name="name" required>

                        <label for="email">Your Email:</label>
                        <input type="email" id="email" name="email" required>

                        <label for="message">Message:</label>
                        <textarea id="message" name="message" required></textarea>

                        <button class="btn3" type="submit">Send Message</button>
                    </form>
                </div>
            </section>
        </main>
    </div>

    <footer class="footer">
        <p>&copy; 2024 ETS-DAHI Tiles. All rights reserved.</p>
    </footer>
</body>
</html>
```

Figure7 : contactus.html



```
static > js > JS script.js > ...
document.addEventListener('DOMContentLoaded', function() {

    const tilesContainer = document.getElementById('tiles');
    for (let i = 0; i < 5; i++) {
        const tile = document.createElement('div');
        tile.className = 'tile';
        tile.textContent = `Tile ${i+1}`;
        tile.onclick = function() { getRecommendations(i); };
        tilesContainer.appendChild(tile);
    }
});

function getRecommendations() {
    var query = document.getElementById('search-query').value;
    if (query) {
        fetch(`/recommend?query=${encodeURIComponent(query)}`)
            .then(response => response.json())
            .then(data => {
                const recommendationsContainer = document.getElementById('recommendations');
                recommendationsContainer.innerHTML = '<h2>Recommendations:</h2>';
                if (data.length === 0 || data.message) {
                    recommendationsContainer.innerHTML += `<p>${data.message || 'No recommendations found. Please try different keywords.'}</p>`;
                } else {
                    data.forEach(rec => {
                        const recDiv = document.createElement('div');
                        recDiv.className = 'recommendation';
                        recDiv.innerHTML = `
                            <img src="${rec.image}" alt="${rec.type}" style="width:100px;height:100px;">
                            <div>
                                <p><strong>Description:</strong> ${rec.Description}</p>
                                <p><strong>Type:</strong> ${rec.type}</p>
                                <p><strong>Material:</strong> ${rec.material}</p>
                                <p><strong>Size:</strong> ${rec.size}</p>
                                <p><strong>Durability:</strong> ${rec.durability_rating}</p>
                                <p><strong>Water Absorption:</strong> ${rec.water_absorption}</p>
                                <p><strong>Recommended Use:</strong> ${rec.recommended_use}</p>
                                <p><strong>Price per Sq Ft:</strong> ${rec.average_price_range}</p>
                            </div>
                        `;
                        recommendationsContainer.appendChild(recDiv);
                    });
                }
            })
            .catch(error => {
                console.error('Error fetching recommendations:', error);
                document.getElementById('recommendations').innerHTML = '<p>An error occurred while fetching recommendations.</p>';
            });
    } else {
        alert('Please enter a search query.');
    }
}

function toggleChatWindow() {
    var chatWindow = document.getElementById('chat-window');
    chatWindow.style.display = chatWindow.style.display === 'none' ? 'block' : 'none';
}

function sendMessage() {
    var input = document.getElementById('chat-input');
    var message = input.value;
    input.value = '';

    var chatMessages = document.getElementById('chat-messages');

    var userMessageDiv = document.createElement('div');
    userMessageDiv.className = 'chat-message user';
    userMessageDiv.textContent = 'User: ' + message;
    chatMessages.appendChild(userMessageDiv);

    fetch('/chat', {
        method: 'POST',
        headers: {
            'Content-Type': 'application/json',
        },
        body: JSON.stringify({ user_input: message })
    })
    .then(response => response.json())
    .then(data => {
        var botMessageDiv = document.createElement('div');
        botMessageDiv.className = 'chat-message bot';
        botMessageDiv.textContent = 'ChatBot: ' + data.response;
        chatMessages.appendChild(botMessageDiv);

        // Scroll to the bottom of the chat messages
        chatMessages.scrollTop = chatMessages.scrollHeight;
    })
    .catch(error => console.error('Error:', error));
}

document.getElementById('chat-send-button').onclick = sendMessage;
document.getElementById('chat-input').addEventListener('keypress', function (e) {
    if (e.key === 'Enter') {
        sendMessage();
    }
});
```

Figure8 : script.js

Figure9 : styles.css

Figure10 : load_test.js

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