

ScentAI Demo Technical Report

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Abstract. The ScentAI Demo is an innovative AI tool designed for the fragrance design market, aimed at addressing the efficiency issues faced by designers during the fragrance development process. The primary pain point in the market is that traditional fragrance design relies heavily on manual experience and trial-and-error, which is not only time-consuming and labor-intensive but also struggles to keep up with the rapidly changing consumer demands.

The core capability of this tool lies in providing a one-stop fragrance design solution, including ingredient suggestions, scent combinations, emotional connections, and packaging design. By analyzing consumer reviews and market trends, ScentAI can generate personalized perfume formulas and packaging designs that align with the target market. Additionally, it predicts consumers' emotional responses to fragrances, thereby assisting designers and brands in quickly adapting to market dynamics and enhancing product competitiveness.

1 Introduction

With the rapid development of artificial intelligence technology, AIGC (Artificial Intelligence Generated Content) has become an undeniable force in the field of content creation. From text and images to music and videos, the application of AIGC technology is gradually changing the way we produce and consume content. It not only improves the efficiency of content creation and reduces costs but also stimulates unprecedented creativity and forms of expression, bringing users a brand-new experience.

Against this backdrop, we have developed ScentAI, an AIGC tool focused on the field of perfume design. Our original intention is to utilize the powerful capabilities of artificial intelligence to help designers, brands, and consumers better explore and create this special product. Perfume is not just a daily necessity; it is also an art form, an expression of emotion, and a heritage of culture. Through ScentAI, we hope to combine data and creativity to bring revolutionary changes to perfume design.

In the perfume industry, designers often need to spend a lot of time and energy researching market trends, consumer preferences, raw material characteristics, etc., to create perfumes that are both market-oriented and uniquely charming. The birth of ScentAI is precisely to solve this problem. By collecting and analyzing a large amount of perfume data, combined with advanced AI algorithms, we provide designers with an intelligent design assistant. It not only

offers suggestions on fragrance notes, ingredients, packaging design, but also generates perfume design schemes that meet specific needs based on consumer emotional responses and usage scenarios.

2 Scope and limitations of this technical report

The scope of this technical report primarily focuses on introducing the core functionalities and application areas of the ScentAI Demo, as well as how it enhances the efficiency and innovation of the perfume design process through artificial intelligence technology. The report elaborates in detail on the technical architecture employed by the tool, including Retriever-Answer-Generator (RAG) technology, the Base model of Large Language Models (LLM), the BCE embedding model, the Milvus vector database, and the Stable diffusion image generation model. Additionally, the report covers aspects such as data acquisition, processing, embedding, LLM question-answering, image understanding, front-end interface design, and user interaction processes. The limitations of the report are reflected in the following aspects:

1. **Data Dependency:** The performance of the ScentAI Demo largely depends on the quality and diversity of its training data. Biases or insufficiencies in the training data may affect the accuracy and relevance of the final generated perfume design suggestions.
2. **User Experience:** Although the ScentAI Demo offers an intuitive user interface and interaction process, there may still be a learning curve for non-professional users. Moreover, the user's understanding and acceptance of AI-generated results may also impact the actual application effectiveness of the tool.
3. **Innovation Constraints:** While the ScentAI Demo can provide perfume design suggestions based on existing data and trends, it may be somewhat limited by existing perfume knowledge and market data, which could restrict its potential in completely novel and original designs.
4. **Technical Integration:** The technical integration and model collaboration mentioned in the report are theoretically feasible, but may encounter issues with technical compatibility and integration difficulty in practical operations.
5. **Market Adaptability:** The design and features of the ScentAI Demo may need to be adjusted according to the specific needs of different regions and markets to ensure its effectiveness and applicability on a global scale.
6. **Legal and Ethical Considerations:** In the field of perfume design, intellectual property and copyright protection are important considerations. The ScentAI Demo must ensure that it does not infringe on existing intellectual property when generating new designs.
7. **Industry-Specific Processes:** Each perfume company has its own design processes and methods. The ScentAI Demo needs to be integrated with these processes and collaborate with perfume RD personnel to ensure that the technical solutions can adapt to industry-specific needs and challenges.

In summary, while the ScentAI Demo shows great potential in the field of perfume design, the aforementioned limitations must be considered in practical applications. We hope to move forward with our clients and address and refine these issues in subsequent research and development and optimization processes.

3 Framework Construction Logic

Front-end Design

The front-end adopts a left-right structured interface layout, with the left side serving as the main interactive area where users can participate in questionnaire surveys. The questionnaire content revolves around key dimensions such as the type of product to be designed, the intended user audience, the desired fragrance sensation, and notes, in order to collect users' personalized needs and preferences. These questionnaires not only include standardized multiple-choice questions but also provide open-ended questions, allowing users to describe their needs in detail, thus achieving a high degree of customization.

Back-end Logic

The back-end is responsible for processing the data collected from the front-end and interacting with the core model of ScentAI. Firstly, the back-end receives the user's request, then calls the embedding model and vector database to obtain the top-k relevant content, and subsequently invokes the corresponding LLM or drawing model for appropriate processing. The processing results include fragrance note suggestions, fragrance ingredient analysis, recommendations for similar perfumes on the market, generation of fragrance imagination images, spice selection for perfume design, fragrance descriptions, and claim suggestions, etc.

Tool Interaction Form

Initially, ScentAI primarily collects user needs through questionnaire surveys. This form is simple and intuitive, easy for users to understand and operate. Users provide information about the expected product by answering a series of questions, such as fragrance note preferences, usage occasions, target audience, etc. The results of the questionnaire will be directly used to guide subsequent product design suggestions.

Chat Chat Correction

Later on, ScentAI will introduce the form of chat correction, allowing users to interact more deeply with the system. Users can converse with the system in natural language, providing feedback and corrections to the preliminary generated answers. This form is more flexible and can adjust the direction and details of product design according to the user's real-time feedback.

User Experience

The design of the entire framework aims to provide a seamless user experience. After users complete the questionnaire on the front-end, the back-end immediately begins processing the data and generates preliminary product design suggestions in conjunction with the core model of ScentAI. These suggestions will be visually presented on the right side of the front-end interface, including the triangular chart of fragrance notes, the list of fragrance ingredients, images

and descriptions of similar perfumes, as well as the designed spices and fragrance claims, etc. Users can refine and optimize these suggestions through the chat function, ultimately obtaining a fully customized perfume design plan.

By combining the interaction forms of questionnaire surveys and chat corrections, the ScentAI framework not only provides accurate product design suggestions but also adjusts in real-time based on user feedback, ensuring that the final results meet the user’s expectations and needs.

4 Data Processing Logic

Data processing logic is one of the core components, involving how to efficiently and accurately process and analyze the large amount of collected perfume data to provide precise perfume design suggestions for users. Here is a detailed description of the data processing logic.

4.1 Data Collection and Preprocessing

Firstly, basic perfume information is obtained through automated tools from various channels, including e-commerce platforms, social media, professional perfume websites, ingredient websites, etc., to collect basic perfume information, user reviews, and perfume images. These data will be stored in a well-designed database table structure for subsequent processing and analysis.

During the preprocessing stage, it is necessary to clean and format the collected raw data. This includes removing irrelevant information, correcting erroneous data, and unifying data formats. Here, a fine-tuned advertisement filtering model is required. At the same time, for user review data, an LLM (Scent-13B-Chat) is used for content analysis to extract some custom dimensions, such as key information about fragrance sensations, emotions, scenes, imagery, and the emotional aspects of fragrance consumption.

4.2 Data Storage

Data storage is the foundation of building the entire system. We have chosen MySQL as the primary database system to ensure data stability and efficient management. The table structure design for the data storage part is referenced in 1.

5 Model Processing Logic

The ScentAI Demo version adopts the advanced Retrieval Augmented Generation (RAG) [2] architecture, which combines retrieval and generation techniques to offer a more precise question answering service. With regards to the model, the system uses professional field data collected by DataTouch of 10 Million Tokens and uses the LLama-13B model [1] as the pretraining base model. The

```

1 CREATE TABLE `FragranceProduct` (
2   `id` int(11) NOT NULL AUTO_INCREMENT COMMENT '商品id',
3   `name` varchar(255) DEFAULT NULL COMMENT '商品名称',
4   `english_name` varchar(255) DEFAULT NULL COMMENT '商品英文名称',
5   `brand` varchar(255) DEFAULT NULL COMMENT '品牌',
6   `alias` varchar(255) DEFAULT NULL COMMENT '别名',
7   `specs` varchar(255) DEFAULT NULL COMMENT '规格',
8   `category` varchar(255) DEFAULT NULL COMMENT '类别',
9   `price` float DEFAULT NULL COMMENT '价格',
10  `fragrance_degree` varchar(255) DEFAULT NULL COMMENT '香味浓度',
11  `gender` varchar(255) DEFAULT NULL COMMENT '适用性别',
12  `tone` varchar(255) DEFAULT NULL COMMENT '香调',
13  `btone` varchar(255) DEFAULT NULL COMMENT '前调',
14  `mtone` varchar(255) DEFAULT NULL COMMENT '中调',
15  `atone` varchar(255) DEFAULT NULL COMMENT '后调',
16  `fragrance` varchar(255) DEFAULT NULL COMMENT '香味',
17  `scene` varchar(255) DEFAULT NULL COMMENT '场景',
18  `vision` varchar(255) DEFAULT NULL COMMENT '香味画面',
19  `sentiment` varchar(1000) DEFAULT NULL COMMENT '香味情绪',
20  `feeling` varchar(1000) DEFAULT NULL COMMENT '香味感受',
21  `distinct_smell` varchar(255) DEFAULT NULL COMMENT '明显的气味',
22  `url` varchar(255) DEFAULT NULL COMMENT '网页url',
23  `shop_url` varchar(255) DEFAULT NULL COMMENT '店铺url',
24  `features` varchar(255) DEFAULT NULL COMMENT '特点',
25  `introduce` text DEFAULT NULL COMMENT '简介',
26  `image` varchar(255) DEFAULT NULL COMMENT '商品图片地址',
27  `official_description` text DEFAULT NULL COMMENT '官方描述',
28  `targetAudience` varchar(500) DEFAULT NULL COMMENT '目标人群',
29  `suitableAudience` varchar(500) DEFAULT NULL COMMENT '适合肤质',
30  `ingredient_list` text DEFAULT NULL COMMENT '成分列表',
31  `regulation_number` varchar(255) DEFAULT NULL COMMENT '国家药监局备案号',
32  `product_series` varchar(255) DEFAULT NULL COMMENT '商品系列',
33  `product_level` varchar(255) DEFAULT NULL COMMENT '商品级别',
34  `product_category` varchar(255) DEFAULT NULL COMMENT '所属分类',
35  `product_efficacy` varchar(255) DEFAULT NULL COMMENT '所属功效',
36  `texture` varchar(255) DEFAULT NULL COMMENT '质地',
37  `launch_time` datetime DEFAULT NULL COMMENT '上市时间',
38  `suitability_for_skin` varchar(255) DEFAULT NULL COMMENT '适合肤质',
39  `product_status` varchar(255) DEFAULT NULL COMMENT '上市状态',
40  `source_of_launch` varchar(255) DEFAULT NULL COMMENT '上市来源',
41  `fragrance_creator` varchar(255) DEFAULT NULL COMMENT '调香师',
42  `promotional_keywords` varchar(255) DEFAULT NULL COMMENT '商品标题关键词',
43  `jd_keywords` varchar(255) DEFAULT NULL COMMENT '天猫关键词',
44  `taobao_keywords` varchar(255) DEFAULT NULL COMMENT '淘宝关键词',
45  `xiaohongshu_keywords` varchar(255) DEFAULT NULL COMMENT '小红书关键词',
46  `douyin_keywords` varchar(255) DEFAULT NULL COMMENT '抖音关键词',
47  `created_at` datetime DEFAULT CURRENT_TIMESTAMP COMMENT '创建时间',
48  `updated_at` datetime DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP COMMENT '更新时间',
49  PRIMARY KEY (`id`))

```

Fig. 1. Table Design

final model's perplexity lies around 6.707, guaranteeing that the model has broad knowledge coverage and deep language understanding abilities. Moreover, through Lora fine-tuning [6] specifically for 5000 professional field instructions, the resulting Scent-13B-Chat model becomes adaptable to the application scenarios of the scent field, further enhancing its depth of knowledge and accuracy in specific fields. Following the instruction fine-tuning, the model's loss settles around 0.06, refer to Figure 2.

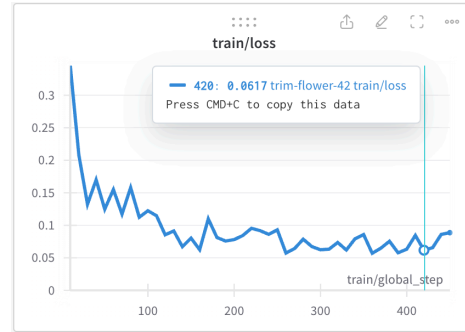


Fig. 2. instruction Finetune Loss

To perform efficient similarity retrieval, the system uses the most advanced BCE embedding model [3] for vectorizing knowledge and uses the Milvus vector

database for storage; it employs cosine similarity for rapid and accurate similarity retrieval. Regarding image processing, the integrated ram-plus model [7] offers powerful image recognition capabilities, capable of extracting key information from the images and assisting the generation model to provide a more comprehensive answer. In terms of image generation, we use the latest Stable diffusion [4] diffusion model and apply LCM [?] for rapid generation of related images. These combined technologies enable the ScentAI Demo not only to handle text information but also to understand and analyze image content, providing comprehensive product design suggestions for users.

6 Conclusion

The ScentAI Demo version is an intelligent perfume design assistant system that integrates the RAG architecture and the LLM model. Through large-scale data pre-training and fine-tuning in the professional field, it achieves precise analysis and suggestions on perfume ingredients, tones, and consumer emotions. The system utilizes efficient vector retrieval and image recognition technologies, providing users with comprehensive support from ingredient selection to package design. Simultaneously, it enhances visual presentation through the image generation model, making the design process more intuitive and efficient. ScentAI not only demonstrates powerful data processing capabilities but also reflects the potential to drive innovation and meet personalized demands in the perfume industry.

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