Research on Brand Database Construction System Using Computer Statistics and Big Data

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Abstract. The clothing brand database is an important channel for designers to obtain fashion trends. The diversification of clothing types and artistic styles provides a variety of ideas for the classification of clothing brands. In the process of establishing a clothing brand database, we need to sum up a set of key phrases used to describe clothing brands in view of the single shortcomings of the existing clothing brand online classification query system. At the same time, we take the actual needs of the brand clothing industry development as the starting point, based on the SSI framework technology, to achieve a clothing customization information platform suitable for small batches and multiple brands, targeting user experience, and achieving rapid response. The test shows that the design of the brand clothing database construction platform meets the expected functional requirements. The design ideas and implementation methods of the system are effective and feasible. The design and implementation of the platform effectively opened the relevant information system modules of the clothing brand. This will have important reference value for promoting the intelligent manufacturing and business model transformation of clothing enterprises, and promoting the standardization and customization of clothing enterprises under the environment of industrialization 4.0.

Keywords: Computer statistical technology; brand clothing; system platform; database construction.

1. Introduction

The textile and apparel brand industry are experiencing the pressure of industrial upgrading and industry reshuffle. Although my country is already the world's largest garment producer, consumer and exporter, the current domestic and foreign market demand is sluggish, and the garment industry is facing opportunities for development in the future and challenges, all of this will ultimately depend on the company's sustainable development capabilities.

Domestic clothing companies and fashion designers urgently need to obtain the latest clothing information and fashion trend information from the works of well-known foreign brands and designers [1]. However, as the types of clothing have gradually increased, the style positioning of clothing

brands has become increasingly diversified. The existing major clothing portals, such as China Apparel Net, China Textile Apparel Net and other apparel brand databases based on apparel categories, cannot meet the needs of apparel designers. While establishing an online database of clothing brands, this subject has made new explorations and practices on the brand classification query system for clothing designers.

2. The significance of the research on the brand clothing big data center platform

The traditional sales model restricts the development of brand sales, and consumers lack confidence in branded clothing (especially high-end brands) purchased online, and it is difficult to distinguish between true and false [2]. Therefore, a branded clothing big data center platform based on industry standards has far-reaching significance:

(1) The rational use of various anti-counterfeiting technologies has far-reaching strategic significance in establishing a brand image and protecting the legitimate rights and interests of the business community and consumers.

(2) Maintain the perfect image of the clothes, because these anti-counterfeiting technologies do not add accessories to the clothes, but integrate the anti-counterfeiting elements into the clothes label, so that the brand clothes have their own essential characteristics, and the artistic effects of the brand clothes are obtained. The perfect embodiment.

(3) Break the traditional business model and form an Internet + ecological business model. Use data mining technology to help customers develop precise brand clothing marketing or new business. Revenue comes from the sharing of customer value-added parts.

3. Requirements for the construction of a database platform for brand clothing customization

3.1. System target design

The research goal of this subject is aimed at the trend characteristics of small batches, multiple varieties, and short cycles of domestic apparel companies, using computer technology, clothing CAD and other technologies to build a personalized customized information platform suitable for small batches and multiple varieties, targeting user experience, focusing on According to the development and design of the personalized customization module, an interactive design platform with good user experience is established for users. The personalized customization of clothing is combined with clothing sales and online fitting, so that the system is no longer just a sales platform, but a collection Sales, fitting experience, personalized customization, clothing customization information integrated platform designed to provide consumers with a personalized experience. Figure 1 shows the overall architecture of the system.

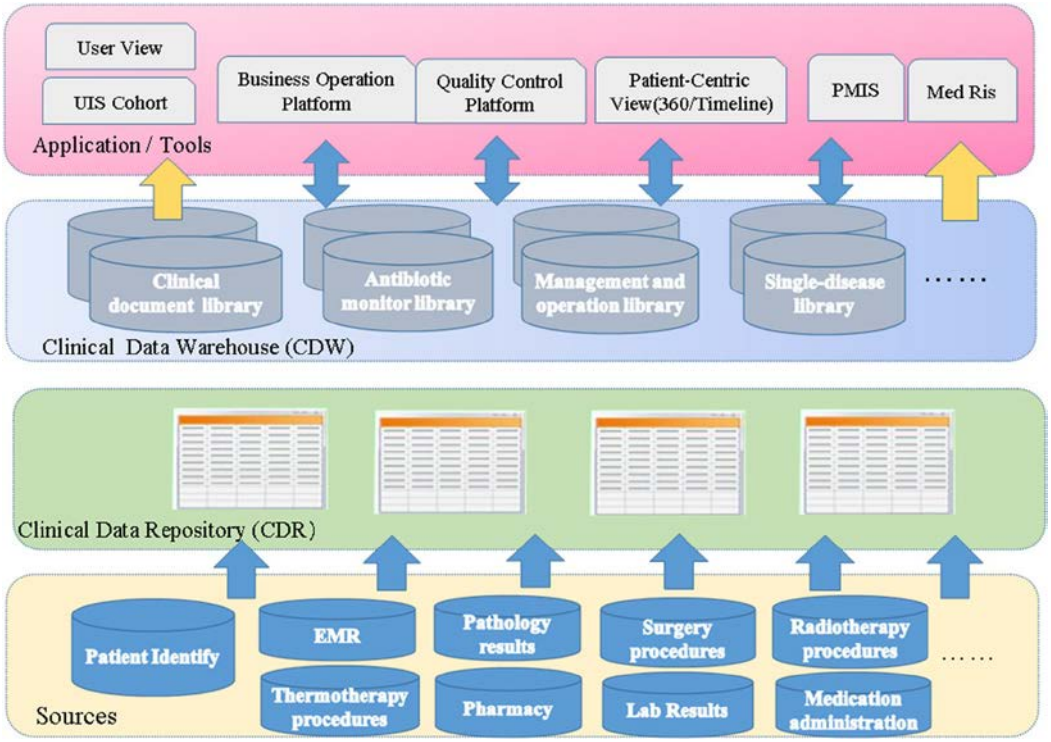

Figure 1. Overall architecture of clothing customization information integration platform

3.2. Services provided by the system

3.2.1. Service object. Aiming at mass consumers with online clothing customization needs, it solves the information management problems of clothing design, production, sales and logistics in small batches and multiple varieties of clothing companies. Through the establishment of a platform, consumers can easily choose clothing styles and view clothing details [3]. Information, design and adjustment of clothing styles, fabrics, patterns, upload or take photos for fitting, the factory can directly produce after receiving the customized style information, and match the logistics information, and deliver it to consumers in the shortest time. Fully integrate online and offline advantages and innovations, use accumulated human big data as the basis, and combine information systems (store sales management information systems, customer resources and production management systems) and O2O platforms to realize direct interaction between store terminals and O2O platforms. The company's own intelligent production and R&D center (smart factory) is connected to truly realize a new operation mode of small batch and multi-variety personalized clothing customization directly from the customer to the factory.

3.2.2. Services provided by the platform

a) Classification by style

The clothing platform divides clothing styles into suits, shirts, T-shirts, trousers, jeans, dresses, etc., and each style is subdivided according to male and female models.

b) Query clothing related information

Consumers can query detailed information about clothing, including clothing brand, style, price, discount, existing size, discount information, etc.

c) Personalized customization function

Users can choose the basic clothing styles provided by the system, make style adjustments and design fabrics and patterns to make clothing products more personalized.

d) Online fitting function

The user can take a screenshot of the camera video or select a full-body photo from the computer (mobile phone) and upload it to the fitting room, and realize the fitting effect through 3D imaging.

e) Reservation service function

Select the approximate location on the map, fill in the detailed address, select the date and time of the door, fill in the height and weight, and confirm the appointment [4]. The system can recommend the appropriate designer for the user. Or the user appoints a designer and fills in the relevant information. The appointment APP regularly synchronizes customer orders generated by the sales system, and the user obtains the detailed information of the specific order through the query function and performs the corresponding operation processing. The user order will display the content of the order in the form of a card according to its status. Click the order to view the details of the specific order.

f) Service tracking function.

Users can choose a piece of clothing to make reservations or purchases through the platform, start service, place goods orders, pay bills, customize production, deliver goods, receive goods, and track order status throughout the process.

g) Smart recommendation function

The system will calculate the results according to the user's favorites, distance, score, and priority ranking of the number of appointments, thereby recommending highly relevant fashion consultants. The listed consultants can be filtered and viewed according to certain conditions. The filtering conditions include praise (ratings), number of favorites, number of appointments, etc. The list is displayed in a card format (a single card includes the designer's big picture, the number of appointments, ratings, and comments), and the information is comprehensive and intuitive.

h) Promotion function

The system has designed a coupon function and carried out sharing and promotion activities. After sharing to the WeChat Moments via the app, click in to invite friends in the WeChat Moments. After entering the phone number of the invited friend, the invited friend will log in for the first time When you receive coupons, sharers can also receive coupons, which can effectively improve the effect of publicity and promotion.

3.3. Demand analysis

The brand clothing big data center platform based on industry standards is built based on the traditional e-commerce platform, coupled with the Internet of Things technology and cloud technology to form a brand-new big data center, its functions mainly include the following aspects:

1) Enterprise website setting management. Companies that are agents can set basic information on their website, such as region settings, corporate logo settings, personnel settings, brand applications, etc. 2) Financial management. This module is mainly to set up management of franchisees' payment and supervise the transaction process between franchisees and customers. 3) Product release management. Companies can publish their branded clothing product information here, and can put them on or off the shelves, etc. 4) Online transaction management. This module is mainly for enterprises to manage their online transactions, and to inquire about the order information of the brand and related transaction records. 5) Portal information management. This module is mainly for the organization to manage various information of the Internet of Things of Chinese brand clothing brands, as well as to identify the authenticity of the enterprise. 6) Brand promotion management. This module mainly divides brands into different levels, and reviews and publishes applications for promotion of corporate brands in need. 7) Anti-counterfeiting management. The release management of brand clothing anti-counterfeiting common sense and the technical common-sense management involved in brand based on clothing enable users to identify the authenticity of brand clothing by themselves through the understanding of these common sense, and accurately find out the authenticity of brand clothing through anti-counterfeiting queries. 8) Platform supervision and management. This module mainly deals with complaints and reports to companies and related processing. 9) Shopping management. Customers purchase branded products, including adding products to the shopping cart,

modifying the shopping quantity, shopping settlement, etc., the status of the order, and when there is a problem with the product, they can apply for return and evaluate the product. 10) Big data analysis. Mining and analyzing personnel information data (gender, age) and action data in a specific area to help brand clothing operators gain value for business development, provide technical services for consulting services, and provide data analysis services for enterprises.

4. Brand clothing customization information platform architecture and module design

4.1. Platform Architecture

This platform mainly uses the Microsoft VS2010 development platform for development, using the C# programming language [5]. The C# programming language is a language designed specifically for the .Net platform by the development team led by Anders Hejlsberg and Scott Willamette of Microsoft. It is developed from C, C++, and Java. It uses the advantages of these three languages and is event-driven. A completely object-oriented visual programming language. This platform adopts the B/S structure, which is the structure of the browser and the server, and it is an organization that optimizes the C/S structure. Under the B/S structure, the user can implement the operation interface through a normal browser, and the front end only needs to implement a very small part of the transaction logic, and the main part is implemented in the server section, as shown in Figure 2.

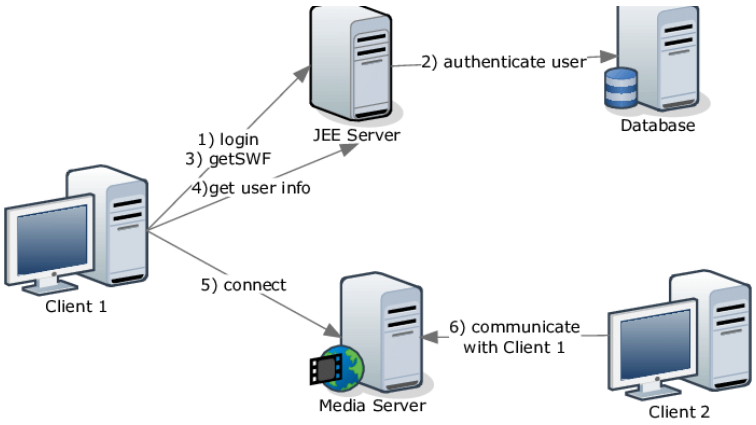

Figure 2. Schematic diagram of B/S architecture

4.1.1. Big data center layer. The big data center of the brand clothing database construction platform first collects the business system data of member companies, mainly including clothing fabric purchase and inventory data, clothing product design and production data, clothing sales and inventory data, clothing logistics data, clothing product quality data, etc.; Secondly, store and integrate the business data of brand clothing database construction; then, exchange and share the business data of brand clothing database construction; finally, analyze, mine and process the business data of brand clothing database construction, and provide various data services. The big data center is a unified multi-faceted application platform that integrates these functions [6]. The platform is based on the network and database and covers the entire clothing supply chain and product life cycle. The big data center of the apparel supply chain adopts the technical architecture of cloud computing. Cloud computing solves the problems of big data storage and operation by providing an infrastructure platform, while big data uses distributed processing and other means to support brand clothing database construction functions, mainly supporting clothing fabric collaborative procurement, clothing collaborative design and production, and clothing products Collaborative sales and inventory management, clothing product quality collaborative control and other functions. From bottom to top, the technical architecture of the big data center of the brand clothing database construction platform is:

infrastructure layer, virtualization layer, platform layer, and application layer. Figure 3 shows the architecture of the customized information platform for brand clothing.

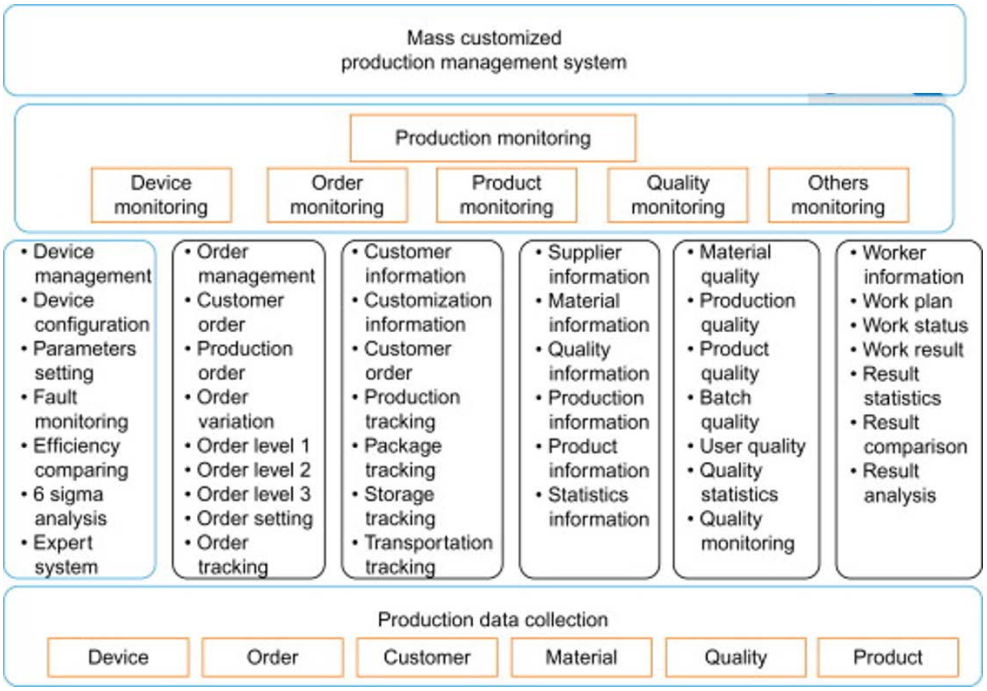

Figure 3. Brand clothing customization information platform architecture

a) Infrastructure layer

The infrastructure layer includes various hardware and software resources that support the big data management of brand clothing database construction. Among them, hardware resources include servers, network devices, storage devices, computers, and so on. Software resources include operating systems, databases, system management software, application software, etc. They provide storage, queue services and other services related to the collaborative innovation business of apparel companies [7]. The infrastructure layer encapsulates infrastructure resources into services, which can well divide and allocate infrastructure resources, and dynamically adjust according to user needs, and finally realize infrastructure resource management services.

b) Virtualization layer

The virtualization layer is to virtualize various hardware and software resources in the infrastructure layer to realize the virtualization of servers, storage devices, network devices, operating systems, databases, etc., for the big data management of the brand clothing database construction, and improve their utilization. Through virtualization, one server can be virtualized into multiple servers. Each server can run multiple operating systems, and each operating system can run multiple business systems of apparel supply chain member companies.

c) Platform layer

The platform layer realizes the data storage, data exchange, data management, user management, resource management, security management, image management and other services of the clothing supply chain business system [8]. The platform layer can customize and assemble services according to the business needs of related enterprises in the clothing supply chain. For example, it can realize the functions of clothing product collaborative design services, collaborative production, collaborative procurement, and sales services.

d) Application layer

The application layer encapsulates the business applications built by the brand clothing database into the form of Web services. According to different permissions, relevant clothing companies can register, search, and call different resource services through the service access interface to realize the operation and maintenance of various applications. The application layer can encapsulate various functions provided by the ERP system, PDM system, supply chain system, and manufacturing system of the member companies of the apparel supply chain, and realize service registration, service sharing, and service interoperability among these systems.

4.1.2. Big data mining layer. The basic process of big data mining of the brand clothing database construction platform is as follows:

a) Understand the application domain and determine data mining goals

Understand the scope of needs of real problems faced in the process of building a brand clothing database, and clarify the objects of big data mining and the results to be obtained. The construction of the brand clothing database mainly includes the collaborative innovation between clothing companies and fabric suppliers, the collaborative innovation between clothing companies and sellers, and customers. The collaborative innovation between clothing companies and fabric suppliers mainly includes: collaborative procurement, collaborative design and production, collaborative quality control, etc. Currently, the objects of big data mining are mainly business data of clothing companies and fabric suppliers, such as their procurement data, Inventory data, design data, production data, quality data, etc. The results to be obtained are mainly the portrait data of the fabric supplier, the completion rate of the fabric supplied, the on-time delivery rate, the qualified rate, the inventory consumption quantity, and other data. Control etc. The collaborative innovation between apparel companies, sellers, and customers mainly includes: collaborative design, collaborative production, collaborative sales, collaborative quality control, etc. Currently, the objects of big data mining are mainly business data of clothing companies, sellers, and customers, such as their Product design data, production data, sales data, inventory data, quality data, etc. The results to be obtained are mainly the profile data of sellers and customers, the completion rate of clothing products, the on-time delivery rate, the qualified rate, PPM (million Prediction and control of data such as one-third failure rate), inventory, etc.

b) Generate target database

In order to get the result, a complete database is needed to record the business process information of the brand clothing database construction. Each system organizes its database according to different goals, which should contain various forms of data resources of the member companies of the clothing supply chain. In order to finally get a satisfactory and correct result.

c) Cleaning and preprocessing data

Its purpose is to fill in the gaps in the data, eliminate noisy data, and then correct inconsistent data. Its purpose is to determine which data models are suitable for searching data patterns and which data mining methods can be used to match the goals of the mining process [9]. Model selection is generally based on the type of data to be mined, and the choice of data mining method depends on the form of the result, which generally refers to knowledge discovery or data prediction. For example, in the big data mining layer, neural network algorithms and exponential smoothing algorithms are used to profile fabric suppliers, clothing sellers and customers; exponential smoothing algorithms and multiple regression analysis algorithms can not only determine the completion rate of fabric arrivals and on-time Predict and control data such as delivery rate, qualified rate, inventory consumption quantity, etc., and also predict and control the arrival completion rate, on-time delivery rate, qualified rate, PPM, inventory and other data of clothing products; in addition, the In order to better meet the personalized and diversified clothing consumption needs of customers, enterprises adopt intelligent algorithms such as association rules and text analysis to accurately explore the potential needs of customers, and carry out combined sales and precision marketing to customers.

1) Data back-off method processing

The calculation steps of the regression equation imported by the backward method are as follows:

Step 1: Establish regression equations for all independent variables $x_1, x_2, x_3, \cdots, x_m$ and y, perform F test of regression coefficients on $x_1, x_2, x_3, \cdots, x_m$, respectively, and record F values as $F_1^1 + F_2^1 + F_3^1, \cdots, F_m^1$ and $F_{i_1}^1 = \min\{F_1^1 + F_2^1 + F_3^1, \cdots, F_m^1\}$

For a predetermined level a of significance, the critical value $F_a(1, n-m-1)$ can be checked. If $F_{i_1}^1 \le F_a(1, n-m-1)$, remove the corresponding variable x_{i_1} from the regression equation. Otherwise, the algorithm ends.

Step 2: Establish regression equations for the eliminated independent variable subsets $\{x_1, x_2, x_3, \cdots, x_{i_1-1}, x_{i_1+1}, \cdots, x_{im}\}$ and y, and perform F test on the regression coefficients of these $m-1$ independent variables, and mark F as $F_j^2 (j = 1, 2, \cdots, j \ne i_1)$. Remember $F_{i_2}^2 = \min\{F_1^2 + F_2^2 + F_{i_1+1}^2, \cdots, F_m^1\}$, if $F_{i_2}^2 < F_a(1.n-m)$, remove its corresponding variable x_{i_2}, otherwise the algorithm ends. By analogy, until there are no variables to be eliminated, a subset of the independent variables selected by the backward method is obtained.

In addition to the large amount of calculation caused by the introduction of all the independent variables into the regression equation 2 at the beginning of the backward method, the more serious shortcoming is that once the independent variables are eliminated, it is impossible to enter the regression equation.

2) Data processing by stepwise regression method

The stepwise regression method is a comprehensive algorithm based on the forward method and the backward method at the same time. Its specific method is to introduce the variables one by one according to the forward method, but each step after the introduction of the third variable adds the elimination of the previously introduced variables according to the backward method. In the process of selecting independent variables in this way, the independent variables will be introduced, eliminated, and then introduced and eliminated...until the independent variable cannot be eliminated, and the independent variable cannot be introduced at the same time. In the whole process, independent variables are in and out.

In the stepwise regression method, it is necessary to use two different significance levels a_{in}, a_{out} and do two F tests of regression coefficients: one is to test the regression coefficients of the independent variables when introducing variables, using a_{in} . The other is to do a F test on the regression coefficients of the independent variables when excluding variables, usually we require $a_{in} \le a_{out}$, otherwise an infinite loop may occur.

4.2. Realization of clothing brand query function

From the perspective of constituent elements, a clothing brand can generally include a variety of factors such as brand name, product category, target consumer group, product characteristics, etc. Therefore, the author sets the description of the clothing brand from the aspects of clothing category, artistic style, and consumer market target positioning [10]. Sex phrases are used as keywords for clothing brand queries. The problem that arises from this is that there is no logical affiliation between individual phrases. A brand often has multiple descriptive phrases, and it is difficult to manage them with traditional catalogue classification.

4.2.1. Planarization classification. Since TAG is built from the bottom up the classification is based on keywords, so each TAG has the characteristics of parallel and same level. The clothing brand query system established in this topic breaks up all the descriptive phrases analyzed from different perspectives and distributes them in the same directory structure, so that users can select multiple TAGs for information retrieval according to their own understanding and ideas, without being stuck.

Because of the rigid catalog-based filtering query method. The specific classification results are summarized as follows from the aspects of clothing category, artistic style, and consumer market.

(1) Artistic style. Street, classic, business, casual, cowboy, outdoor, sports, hip-hop, alternative, elegant, young, sexy, avant-garde, urban, deconstructed, concise, hippie, romantic, retro, ethnic, punk. (2) Industry and function. Men's wear, women's wear, children's wear, accessories, maternity wear, shoes, underwear, equipment, water, mountaineering, golf, skiing, large size, home textiles, swimwear, knitting, wedding dresses, dresses, bags. (3) Consumer market. Designers and luxury brands, mid-to-high-end brands, high-end custom women's clothing, ordinary ready-to-wear, popular brands, Fast Fashion.

4.2.2. User recommendation mechanism. TAG is different from keywords in information retrieval, because from the source, TAG can come from the vocabulary that appears in the title and text of the information, or from the description of the information by the author or user. This descriptive phrase can be based on the user's perception of the information. Different understanding does not need to be restricted by professional terminology. The clothing brand query system is closely linked to the website membership system. By registering, users can obtain a personalized space while also having the permission to add bookmarks for each clothing brand. In this way, TAG becomes a viable and extensible classification method. The TAG added by the user can enrich the existing types of tags, make the brand query more in line with the habits of network users, and thus more humane.

In this paper, uppercase and italic letters (such as: R) are used to denote the matrix, and lowercase letters (such as: i, j,) are used to denote the scalar. Given matrix R, R^T it represents the transpose of matrix R, R_{ij} represents one of its elements, and $R_{\cdot j}$ represents the first element of matrix R. Column j, $R_{i\cdot}$ represents the i row of matrix R. In this paper, matrix R represents a rating matrix (1-5 points), which has M users and N objects; $\hat{R}$ represents the approximation/prediction matrix of matrix R, $\hat{R} = U^T V$, $U \in C^{K \times M}$, $V \in C^{K \times N}$ generally $K << r$, O r, O represents the rank of matrix R, P $r \le \min(M, N)$, U and V respectively represent the feature matrix of the user and the recommended object, and K represents the number of features.

4.3. Introduction to PMF algorithm

Probabilistic Matrix Factorization (PMF) is a probabilistic graph model, as shown in Figure 4. It predicts the user's rating of the recommended object from the perspective of probability. In the traditional probability matrix factorization algorithm, we hope to find a low-rank matrix X to approximate the score matrix $R \in C^{m \times n}$, where $X = U^T V$ is. The conditional probability of the observed scoring data R_{ui} and the conditional probability of the feature vector U_u, V_i of the user and the recommended object all obey the Gaussian prior distribution, and the specific definition is as follows:

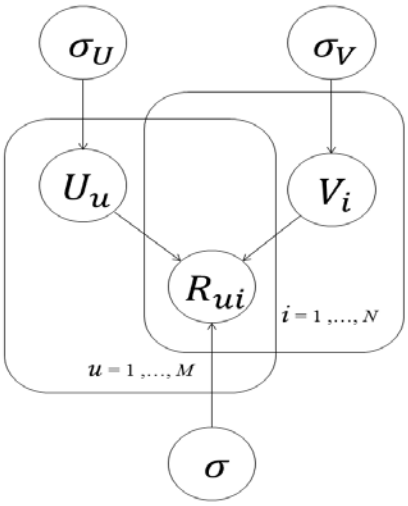

Figure 4. Probabilistic graphical model of PMF

$$p(R|U,V,\sigma^2) = \prod_{u=1}^{M}\prod_{i=1}^{N}[\mathrm{N}(R_{ui}|U_u{}^T V_i,\sigma^2)]^{I((u,i)\in D)} \tag{1}$$

$$p(U|\sigma_U{}^2) = \prod_{u=1}^{M}\mathrm{N}(U_u|0,\sigma_U{}^2 A_K) \tag{2}$$

$$p(V|\sigma_V{}^2) = \prod_{i=1}^{N}\mathrm{N}(V_i|0,\sigma_V{}^2 A_K) \tag{3}$$

Where $I(x)$ is an indicator function:

$$I(x) = \begin{cases} 1 & if\ \ x\ \ \text{is ture;} \\ 0 & \text{otherwise.} \end{cases} \tag{4}$$

Here A_K is a K dimensional identity matrix. $D=\{(u,i)\,|\,R_{ui}>0\}$. The objective function of the optimized PMF algorithm is:

$$L(U,V) = \frac{1}{2}\sum_{u}^{M}\sum_{i=1}^{N}I_{ui}(R_{ui}-g(U_u{}^T V_i))^2 + \frac{\lambda_U}{2}\|U\|^2 + \frac{\lambda_V}{2}\|V\|^2 \tag{5}$$

Among them, $\lambda_U=\sigma^2/\sigma_U{}^2$, $\lambda_V=\sigma^2/\sigma_V{}^2$, $g(x)=1/(1+e^{-x})$ where the local minimum of formula (5) can be obtained by the gradient descent method.

4.4. Fuzzy query based on TAG

There are two main reasons why designers or business users make mistakes in the spelling of clothing brands: one is that users cannot spell the English names of domestic and foreign brands accurately,

and the other is that the Chinese names of foreign brands are inconsistent due to transliteration. This type of spelling error can easily affect search results. The author's solution is to establish a fuzzy query function based on TAG. When each piece of brand information is entered into the database, the spelling of the easily misspelled name will be implicitly marked in the brand information as TAG, so that users can find the desired brand when the brand name cannot be accurately spelled out.

5. Conclusion

The small-batch and multi-variety clothing customization information platform created in this paper is based on the SSI framework technology to realize a clothing customization information platform that is suitable for small-batch multi-variety, aims at user experience, and achieves rapid response. The platform is based on the B/S model and uses SSI hierarchical programming to achieve the functional requirements of the platform. It mainly optimizes the process flow and supporting production lines, upgrades and transforms the information system, and integrates the online clothing purchase and customization system, the surface accessories management system, and the production order Eight system modules including production scheduling system, intelligent pattern synthesis system, process automatic matching system, production process intelligent identification system, production order progress analysis system and warehousing intelligent sorting system are effectively opened up and connected organically to create human clothing sizes and trends The development and design of online clothing purchase, customized clothing, production and distribution modules, aiming at a good user interaction experience, and discussing the possibility of virtual fitting and three-dimensional body measurement.

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