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Talent Evaluation System Based on Network Big Data Technology

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Abstract. This paper studies the talent evaluation system based on big data technology, which involves the big data management technology field, including the client and data processing server. After users fill in the status information with the client, the data processing server classifies users and makes all users in the same category evaluate each other. The final evaluation of a user is calculated by multiple post evaluation data processing servers based on the evaluation model established according to big data. After the user's status information changes, the processing server recommends the appropriate industry or work unit to the user according to the changed status information. The talent evaluation system based on big data technology in this paper can collect the real evaluation of users and calculate the final evaluation of users. At the same time, this paper proposes an industry recommendation method based on LSTM with attention mechanism to provide employment guidance for users. Experimental results show that the method proposed in this paper makes the results of talent assessment more widely used.

Keywords. Big data; evaluation system; data processing

1. Introduction

Talents are the basis of social progress. Talents with certain professional knowledge or skills can make very important contributions in their fields. Talents in all sectors of society can play a very important role in social progress after making due contributions in their respective posts. However, talent's abilities are different, and a unified standard is needed to measure talent level and grade all talents, which plays a very important role in talent management. However, most of the existing technologies have only made corresponding improvements in talent evaluation. However, the result of talent evaluation is to calculate a score that conforms to each talent's actual ability.[1-7] It is

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also necessary to make corresponding recommendations, management and other operations based on the score to further improve the utilization value of talent evaluation. At present, the talent recommendation platform generally uses similarity based algorithms to recommend jobs or positions. After obtaining talent information, it matches the similarity between the employer and talent information to achieve talent recommendation. In this way, we can only evaluate the ability level of talents based on the conformity between the needs of employers and talent information, but not the ability of talents themselves. This is because: human ability is an objective attribute, and the needs of different employers or different positions in the same employer are not uniform.[8-12] Therefore, the evaluation method based on the direct conformity between the employer's needs and the talent information cannot objectively reflect the talent's ability level. Therefore, it has become an urgent problem to provide an indicator and evaluation method that can be recognized by the whole corresponding field to realize the objective evaluation of talents' ability. An objective talent evaluation standard and method that can be widely applied.

This paper provides a talent evaluation system based on big data technology, which includes a client and a data processing server. The data processing server includes an evaluation acquisition module, a big data evaluation module and an industry recommendation module; The evaluation acquisition module is used to remind users to fill in the current status information. The evaluation acquisition module classifies all registered users according to the status information filled in by users according to their schools or employers. After classification, the evaluation acquisition module regularly sends evaluation reminders to the clients used by all users under each classification to remind users to evaluate the users under this classification. The evaluation acquisition module sends it to the big data evaluation module; The big data evaluation module is used to calculate the comprehensive evaluation based on multiple evaluations using the evaluation model established according to the big data. After the comprehensive evaluation is obtained, the data evaluation module queries whether there is a saved final evaluation. If there is, the big data evaluation module will average the last final evaluation and the current comprehensive evaluation, and take the calculated data as the final evaluation of this time; The industry recommendation module is used to analyze the industry or work unit suitable for the current user according to the changed status information after the user's status information changes, and push the results of this analysis to the client used by the user.

2. Functional Modules of the System

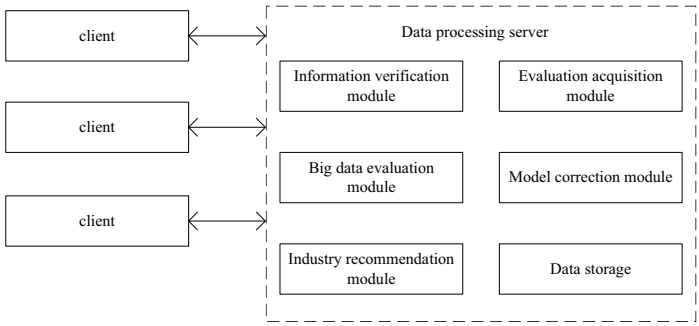

Figure 1. Function module diagram of talent evaluation system based on big data technology

With reference to Figure 1, this paper provides a talent evaluation system based on big data technology. The system includes a client and a data processing server. The client is an application program that is installed on the communication terminal used by users. Users can log in and connect to the data processing server after entering their account and password on the client.

Users need to register when using the system for the first time, and only need to fill in their basic information on the client. After filling in, the client sends the basic information to the data processing server. The information verification module of the data processing server queries whether the basic information has been registered in the data storage. If not, it feeds back an information allowing registration to the client. The client prompts the user to enter an account and password in response to the information. After the input is completed, the client sends the account and password to the data verification module. The data verification module binds the account and password with the user's basic information and stores them. The user can log in by entering the account and password when using again.

In order to avoid information being falsely used by others, authenticity verification is also required after registration. The information verification module obtains the key information in the basic information filled in by the user, such as the ID number, packs the key information and the query request information together and sends them to the server of the education department. The server responds to the query request information to query the education experience data corresponding to the key information in the database and send them to the information verification module. After receiving the education experience data, the information verification module obtains the photos, and then sends the face verification information to the client. The client responds to the information to turn on the camera of the communication terminal and remind the user to start collecting facial images. After the client finishes collecting the facial images, it sends the facial images to the information verification module. The information verification module compares the collected facial images with the photos obtained from the education experience data, Judge whether the current user is the same person as the person involved in the education experience. If the judgment result is positive, the information verification operation is completed; otherwise, the information verification module performs the next verification.

In order to prevent users from using photos of people with educational experience to provide false face images, the client will remind users to perform some head actions when collecting face images, such as shaking and nodding. If the user's actions in the video or image information collected by the client through the camera meet the requirements, it is considered that the person currently facing the camera is a real person, not a photo.

Because some people have been away from the final education experience for a long time and their faces have changed greatly, they may not pass the facial image verification. In this case, the information verification module sends the education experience verification instruction to the client, and the client responds to the instruction to remind the user to fill in the information related to the final education experience. After filling in, the client sends the information to the information verification module, the information verification module queries whether the information entered by the user exists in the obtained education experience data. If it exists, it means that the current user and the education experience party are consistent. Otherwise, it can be considered that the current user is using others' information. The information verification module deletes

the information filled in when the user registered and sends a warning message to the client.

After the information verification is completed, the evaluation acquisition module of the data processing server reminds the user to fill in the current status information, which includes the place of employment, industry, employer, hobbies, etc. The evaluation acquisition module classifies all registered users according to the status information filled in by the user according to the school or employer, and classifies users who do not work after graduation according to the school, Users who have worked are classified according to their employment units. After classification, the evaluation acquisition module regularly sends evaluation reminders to clients used by all users under each classification to remind users to evaluate all users under this classification. These comments may come from users' colleagues or leaders. Users in different roles in the same employment company may have different comments on users. Therefore, all users in the same category need to be classified again according to their positions in the employment company.

As there may be many functional departments in an employment unit, it will be a huge workload for a user to evaluate all users in the employment unit, and the evaluation may not be true when users are unfamiliar with each other. Therefore, all users under the same category need to be classified again according to the department, and only users belonging to the same subcategory after classification need to evaluate each other, This can reduce the workload of users and improve the authenticity of evaluation to a certain extent.

After getting the evaluation, the evaluation acquisition module sends it to the big data evaluation module. The big data evaluation module uses the evaluation model established according to the big data to calculate the comprehensive evaluation based on a large number of evaluations. The evaluation model uses big data to repeatedly verify and modify on the basis of the existing evaluation model, so as to obtain an evaluation model that can finally reflect the real ability of users.

After the comprehensive evaluation is calculated, the big data evaluation module sends the comprehensive evaluation to the client used by the user. The user checks whether the comprehensive evaluation conforms to his/her real situation, and if not, puts forward improvement suggestions. The client sends the improvement suggestions to the model correction module of the data processing server, and the model correction module corrects the evaluation model according to the improvement suggestions, the big data evaluation module uses the modified evaluation model to calculate the comprehensive evaluation again, and sends it to the client again until the user is satisfied with the comprehensive evaluation.

After obtaining the comprehensive evaluation, the big data evaluation module queries the data memory for the existence of the saved final evaluation. If yes, it means that the user has conducted at least one evaluation. At this time, the big data evaluation module will average the last final evaluation and the current comprehensive evaluation, and the calculated data will be used as the current final evaluation and saved in the data memory.

3. Industry Recommendation Module

The user's status information may change at any time, such as changing from one employment unit to another, and changing the place of employment or industry. The

evaluation acquisition module needs to regularly ask the user whether these status information has changed, and if so, the user needs to fill in the changed information. Each time the status information changes, the industry recommendation module of the data processor server will analyze the industry or employer that the current user is suitable for according to the changed status information, and push the results of this analysis to the client that the user uses. During specific analysis, the industry recommendation module obtains the requirements of all industries from the data memory, and then determines which industry the user meets according to the user's interests, professional background and work experience.

With the development of deep learning technology, the method of using neural network for industry recommendation has been widely used. Among them, the long short-term memory network (LSTM), as a deep learning model suitable for sequence data, has achieved good results in the field of time series prediction. In industry recommendation, the status of talents is chronological, and work units that meet current goals should be recommended in different periods. Therefore, we adopt LSTM as the basic model for industry recommendation.

As mentioned above, we collected various features of users, and we linearly transformed them to obtain the feature matrix of the unified vector space:

$$\mathbf{X} = \mathbf{W}_{\boldsymbol{u}} \cdot \boldsymbol{x} \tag{1}$$

where $\mathbf{W}_{\boldsymbol{u}}$ is the parameter weight matrix, $\boldsymbol{x}$ is the user's initial recognition feature. Then we feed the user's features into the LSTM cell:

$$\mathbf{I}_t = \sigma(\mathbf{X}_t\mathbf{W}_{xi} + \mathbf{H}_{t-1}\mathbf{W}_{hi} + \mathbf{b}_i), \tag{2}$$

$$\mathbf{F}_t = \sigma\big(\mathbf{X}_t\mathbf{W}_{xf} + \mathbf{H}_{t-1}\mathbf{W}_{hf} + \mathbf{b}_f\big), \tag{3}$$

$$\mathbf{O}_t = \sigma(\mathbf{X}_t\mathbf{W}_{xo} + \mathbf{H}_{t-1}\mathbf{W}_{ho} + \mathbf{b}_o), \tag{4}$$

$$\tilde{\mathbf{C}}_t = \tanh(\mathbf{X}_t\mathbf{W}_{xc} + \mathbf{H}_{t-1}\mathbf{W}_{hc} + \mathbf{b}_c), \tag{5}$$

$$\boldsymbol{C}_t = \mathbf{F}_t \odot \boldsymbol{C}_{t-1} + \mathbf{I}_t \odot \tilde{\mathbf{C}}_t, \tag{6}$$

$$\boldsymbol{H}_t = \mathbf{O}_t \odot \tanh \boldsymbol{C}_t, \tag{7}$$

where $\mathbf{X}_t$ is input, $\mathbf{I}_t$, $\mathbf{F}_t$, $\mathbf{O}_t$, $\tilde{\mathbf{C}}_t$ and $\boldsymbol{C}_t$ are input gate, forgetting gate, output gate, candidate memory cell and memory cell respectively. $\mathbf{W}_{*i}$ are weight parameter and $\mathbf{b}_*$ are biases. σ and *tanh* is activation function.

During the recommendation process, there may be mutual influences among various features of users, resulting in possible correlations among the hidden states used for

recommendations. Therefore, we introduce an attention mechanism to capture this association:

$$\beta(\boldsymbol{q}_t, \boldsymbol{k}_\tau) = \frac{\boldsymbol{q}_t^T \boldsymbol{k}_\tau}{\sqrt{d_k}}, \tag{8}$$

$$\alpha(\boldsymbol{q}_t, \boldsymbol{k}_\tau) = \text{softmax}\big(\beta(\boldsymbol{q}_t, \boldsymbol{k}_\tau)\big) = \frac{\exp\big(\beta(\boldsymbol{q}_t, \boldsymbol{k}_\tau)\big)}{\sum_{\tau'} \exp\big(\beta(\boldsymbol{q}_t, \boldsymbol{k}_{\tau'})\big)}, \tag{9}$$

$$\boldsymbol{H}_{att} = \sum_\tau \alpha(\boldsymbol{q}_t, \boldsymbol{k}_\tau)\boldsymbol{h}_\tau, \tag{10}$$

At this point, we obtained a new hidden state with attention, $\boldsymbol{H}_{att}$ and then obtained the predicted score $\tilde{\boldsymbol{y}}_{t+1}$ through the action of a fully connected layer:

$$\tilde{\boldsymbol{y}}_{t+1} = \text{similarity}\big(\boldsymbol{H}_{att}, \widehat{\mathbf{X}}\big) \tag{11}$$

where $similarity$ is the cosine similarity.

4. Experiment and Analysis

We implement the proposed model on a simulation dataset and demonstrate the effectiveness of the method through experiments.

We use Python and PyTorch machine learning libraries to conduct experiments, and set the model learning rate to 0.001 and the number of epochs to 5. After training, we get the fitted curve of the model, as shown in Figure 2. Our proposed LSTM-based industrial recommendation model with attention mechanism converges quickly, proving its effectiveness. Therefore, this model provides users with valuable reference information, and at the same time helps users quickly select relevant industries for resume delivery.

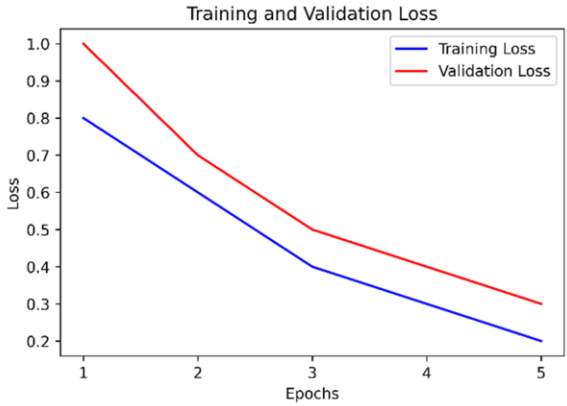

Figure 2. Fit curve

We use HR (Hit Ratio), NDCG (Normalized Discounted Cumulative Gain) and MRR (Mean Reciprocal Rank) as experimental indicators. Note that larger HR, NDCG and MRR scores indicate better recommendation performance. Table 1 shows the comparison of the prediction results of the LSTM-based industry recommendation model and the LSTM-based industry recommendation with attention mechanism, which proves that our proposed model has the best performance in industry recommendation. , and achieved acceptable prediction results.

We refined the tests by adjusting the LSTM model's hidden size parameter. According to the experimental results, increasing the hidden size improves the model's training effect while simultaneously increasing accuracy and loss function value. This is due to the fact that raising the dimension of the hidden state vector might improve the model's capacity to extract sequence information, hence increasing the model's generalization ability. As a result, the concealed layer's size must be assessed and optimized. As a result, the concealed layer's size must be assessed and optimized. According to the chart, we believe it is reasonable to set the hidden layer's dimension to 256 to ensure the accuracy and validity of the prediction.

Table 1. Performance results on Dataset

Model	Hidden Size	**HR@5**	**NDCG@5**	**HR@10**	**NDCG@10**	MRR
LSTM	16	0.1245	0.1035	0.2585	0.1932	0.1078
	32	0.1366	0.1164	0.2621	0.2084	0.1132
	64	0.1441	0.1216	0.2694	0.2199	0.1189
	128	0.1411	0.1245	0.2645	0.2168	0.1145
	256	0.1388	0.1208	0.2601	0.2145	0.1156
Att-LSTM	16	0.3142	0.2911	0.4213	0.3664	0.2837
	32	0.3269	0.3008	0.4408	0.3771	0.2911
	64	0.3378	0.3126	0.4465	0.3799	0.3013
	128	0.3320	0.3117	0.4387	0.3732	0.2987
	256	0.3301	0.2998	0.4366	0.3711	0.2955

As shown in Figure 3, we visualize the value of attention. The industry recommendation model after introducing the attention mechanism can effectively distinguish the influence of different characteristics of users, and different characteristics are given personalized weights.

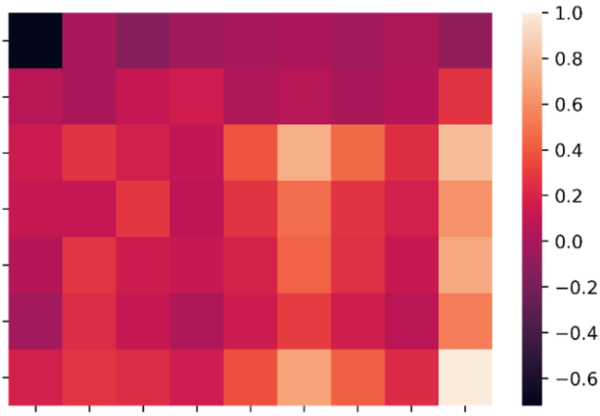

Figure 3. Attention Value Visualization

5. Conclusion

The talent evaluation system based on big data technology provided in this paper includes a client and a data processing server. After the user fills in the status information with the client, the data processing server classifies the users and makes all users under the same classification evaluate each other, so as to obtain multiple evaluations of a user. The data processing server uses the evaluation model established according to big data to calculate the final evaluation of the user, After the user's status information changes, the processing server recommends the appropriate industry or employment unit to the user according to the changed status information. The talent evaluation system based on big data technology in this paper can collect the real evaluation of users and calculate the final evaluation of users. At the same time, it can also recommend appropriate industries or employment units to users, so that the talent evaluation results can be used more widely.

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