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Computer-Aided Design AND APPLICATIONS

Research on the Construction of New Media Social Culture Based on Long Short-term Memory

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Abstract. The maturity and popularization of computer-aided technology is a prerequisite for the construction of new media social culture, but the purpose of the construction of new media social culture is not to realize the application and popularization of computer-aided technology. This paper attempts to analyze the cultural characteristics of new media from the perspective of humanities, and carry out the research on the social and cultural construction of new media based on computer-aided DL(Deep learning) technology, so as to grasp the pulse of the current social and cultural development of new media and explore a road of social and cultural construction of new media suitable for the characteristics of the times. Therefore, based on LSTM (long short-term memory) in DL and attention mechanism, this paper proposes a hierarchical attention network to realize text classification. At the same time, two levels of attention mechanism are introduced to obtain the best representation of the text. The results show that the micro-average F1 value of this model on English data set is 0.769, which is 3.532% higher than that of LSTM model, and has a certain improvement compared with that without introducing topic information. The effectiveness of two models, which combine attention mechanism and conditional coding, to introduce topic target information is verified.

Keywords: Computer-Aided; Deep Learning; New Media; Social Culture.
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1 INTRODUCTION

Media is an important perspective for us to observe and study media. The formation of media culture does not only depend on the media institutions or organizations themselves. At present, there is no uniform definition. The new media referred to in this paper is a communication mode

and organization based on digital foundation, non-linear communication, which can realize interaction and has the characteristics of interconnected communication. It mainly includes network media, mobile phone media, part of digital TV and mobile TV, etc. The re-discussion of visual culture, the rapid development of global technology video, and the emergence of a large number of new media arts in the digital age are all related to the development of images. Images have become the main media controlling information transmission in post-modern society. The premise and foundation of improving the national cultural soft power, spreading contemporary China values, displaying the unique charm of Chinese culture and shaping the national image is to form the cultural consensus of Socialism with Chinese characteristics [1].

In recent years, the social culture of new media has received extensive attention from the media. Most of the studies on this topic are analyzed and discussed from the micro and macro perspectives. It is believed that multimedia (including new media) seems to support a socio-cultural model, that is, a whole culture, which allows users to differentiate, but will lead to the integration of cognitive models and accommodate various cultural expressions [2]. New media technology not only promotes the construction of new cultural platforms, but also creates new media, which is not only the integration of old media, but also the transcendence of old media [3]. "The main feature of new media art is the use of advanced technical language in art works, including online virtual art created through computers, the Internet and video, image art, and multimedia interactive devices and actions" [4]. As many fans who attach importance to enjoyment pursue full media and full digital sound and image effects, the diversified consumer needs that increasingly show their individuality will certainly build a new market space [5].

Computer aided translation technology can greatly improve translation efficiency and reduce translation costs, so it is gradually favored by people. Pan and Qin [6] analyzed the computer aided translation technology of this era. The application value of parallel corpora in translation teaching and translation practice has been widely recognized, and the demand for the construction of parallel corpora is growing. With the development of corpus technology, corpus, as a new research paradigm, has entered the field of translation teaching and practice. This paper probes into the application of parallel corpora in the current translation teaching, including the self built bilingual parallel corpora, translation teaching applications and translation teaching contents. It aims to promote the reform of translation teaching to meet the needs of regional social and economic development. Human beings are increasingly exposed to artificial intelligence (A1) and machine learning (M) systems. Human centered AI is a perspective of AI and AI. The design of algorithms must realize that they are part of a larger system composed of human beings. Riedl [7] put forward an argument that human centered AI can be divided into two aspects: (a) understanding human AI systems from a socio-cultural perspective, and (b) artificial systems that help humans defeat humans. We further demonstrated the issues of social responsibility, such as fairness, accountability, interpretability and transparency. Sintawati [8] aims to explain how M serves as an example of constructivist communication and language learning. In the process of collecting articles as the main source, Google Scholar Baidu Scholar, Science Direct and Mendeley search platforms were used. In the future, we should not meet the needs of today's learners. The combination of asynchronous communication and synchronous communication is the main suggestion for the next research. Wang [9] conducted computer aided interaction research on visual communication technology and art in new media scenes. And then describes the role of digital technology in digital media art creation, namely, the main visual expression, auditory expression and audio-visual integration, as well as the role of digital technology in promoting digital media art practice related fields. Finally, he focused on the future development, elaborated the potential possibility of digital technology in the future period, and the development trend of digital technology for future digital media art practice. The introduction of experiential teaching in the course of computer aided graphic design is mainly to enable students to design products with rich connotation and individuality based on the computer aided graphic design technology and practice. In the experiential teaching, Zhang [10] closely combines the classroom teaching of design performance technology with the teaching of design theory knowledge, and pays attention

to cultivating and improving students' practical innovation ability and personalized design level. So as to achieve the goal of training high-quality composite material design talents.

The deduction of contemporary open digital art relies more on vision than ever before to recognize and create the external world. New media art has become the main way of communication under the background of computer-aided technology. New media social culture is a unique cultural phenomenon in modern society with mass media as its carrier and media expression as its basic representation, and it is an important way of cultural existence in modern society. In this process, besides the role of the media itself and its audience in the formation and development of media culture, some other factors also play a role. Such as technology, such as the power of social development. Examining culture from the perspective of media culture is a dynamic vertical process. Modern mass media culture has a profound influence on human beings all the time, affecting the innovation, accumulation and inheritance of human culture. This paper attempts to analyze the cultural characteristics of new media from the perspective of humanities, analyze its inherent cultural transmission laws in various cultural expressions, and through careful reflection and criticism, grasp the pulse of the current social and cultural development of new media, and explore a road of social and cultural construction of new media that is suitable for the characteristics of the times.

2 RESEARCH METHOD

2.1 Conditions for Cultural Construction of New Media Society

Traditional media is being challenged in all directions. Although they still follow the previous news production, publishing rules and business operation mode, they have begun to try or step into the track of transformation. As a new media form, converged media has not yet formed a new media social and cultural framework from the inside out, and the inheritance of the excellent culture of traditional media and the absorption of innovative culture of emerging media have not been realized under a unified standard, scale and mode. The combination and presentation of the content in the form of integration will change from the past, and its value capacity and value transmission will also be different from the past. The framework of traditional culture is dismembered on the Internet, the essence of traditional culture is misread on the Internet, and the presentation of traditional culture on the Internet has become fragmented. But from the trend, the element of capital will be paid more and more attention. Whether paid or free, we need to pay attention to the influence of capital on news product production.

As a medium or carrier, the "newness" essential characteristics and attributes of new media transmit computer-aided information among people, and at the same time, they also transmit their own personalized factors and compound ideas. It is a communication form that provides information and services to users through computer-aided technology, computer networks, wireless communication networks, satellites and other channels, as well as terminals such as computers, mobile phones and digital televisions. At present, new media mainly include network media, mobile phone media, network TV and other media forms. Its new media types are roughly as follows: Figure 1:

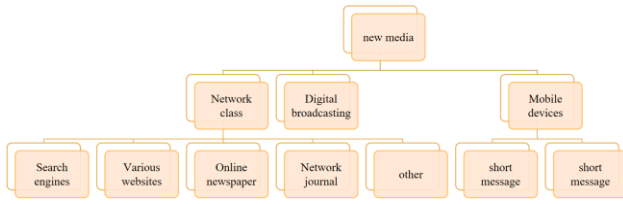

Figure 1: New media type.

The maturity and popularization of computer-aided technology is a prerequisite for the construction of new media social culture, but the purpose of the construction of new media social culture is not to realize the application and popularization of computer-aided technology. In this process, the new media social culture built on the basis of mature technology can't be separated from the perfection and promotion of many realistic conditions, such as media environment, cultural industry development status, policy support, etc. The evolutionary law of survival of the fittest is also applicable to the media environment, and the social environment influences the changing direction of the media environment at any time. Promote new media participants to be more efficient in content production, and surpass traditional editors in content creation to make it richer and more exciting. Therefore, the timely adjustment of the media environment not only resists the erosion of foreign bad culture, but also accelerates the construction of new media social culture.

New media art has always been on the edge, ignored by mainstream art circles, and has existed as a branch of contemporary art for a long time, which is undoubtedly experimental and challenging for contemporary art. The real issue of new media art is not to create another science toys, but how to humanize the rapidly developing technology and electronic media, and how to find a balance between keeping the artistic form updated and the artistic ideal high. In the normal course of activities, the requirement of sales takes precedence over all other considerations. Producers of popular cultural products may be as concerned about aesthetic values and human reality as others in private, but as producers, they must first consider commercial profits. New media art can be integrated with different industries, different links and products within industries, which can not only form new industrial departments, but also integrate with traditional industrial departments.

2.2 The Forecast of News Dissemination in the New Media Social Culture

The three characteristics of news products, team creativity, comprehensive production and multiple forms, put forward new requirements for media organizations and journalists. Therefore, the creative demand in the process of product production is more reflected in team creativity, and the collective thinking ability determines the creative level of the product. Under the new media ecology, the media literacy that the media audience should have needs to be improved. The new media social culture, which maintains the relationship between the media and its audience, also needs to be strengthened at the audience level. From the perspective of the cultural construction of the new media society, although this kind of culture is transitional, it is creating and providing a kind of game for the society through the spread of the media industry to the public.

Matrix decomposition is one of the most basic collaborative filtering algorithms, which is easy to implement and has good scalability, so it is popular in recommendation systems. The goal is to decompose the user-project scoring matrix into the form of multiplying the user factor matrix and the project factor matrix, and to fit the scoring matrix by using the low-dimensional matrix product.

Suppose that the user's rating on the item is determined by the inner product of the user feature vector U_i and the item feature vector V_j :

$$\hat{r}_{ij} \approx U_i^T V_j \tag{1}$$

Word vectors can be obtained by random initialization or pre-training models such as Glove. Therefore, the text vector matrix $D \in R^{l \times k}$ can be expressed as:

$$D = \left[\cdots w_{i-1}, w_i, w_{i+1} \right] \tag{2}$$

Besides different feature combinations can improve the position classification effect, constructing different classifier combinations can also improve the position classification performance and

generalization ability of the model. The linear combination of base classifiers is adopted to improve the model performance, as shown in formula (3):

$$p(C|x)=\sum_{i=1}^{m} w_i \cdot p_i(C|x) \tag{3}$$

$p_i(C|x)$ is the probability that the text x is predicted to be a field class C in the i th classifier. w_i is the weight of the i -th base classifier in the linear model and the classifier. $p(C|x)$ is the probability of text x in position category C.

Attention mechanism was first put forward and applied in the field of visual images, mainly to give more attention to the image areas that need to be focused on, while giving lower attention to the surrounding images, and adjusting the focus of attention over time. Because the deep neural network is generally end-to-end learning, it lacks interpretability. Data is input from the input end and results are obtained at the output end. All operations in the middle, including back propagation, adjustment of network weights and parameters, are included in the neural network. The interpretability of the model can be improved by combining the attention mechanism.

$$\lambda(t)=V(t)+\sum_{t_j<t} \mu_j \phi(t-t_j) \tag{4}$$

Where $V(t)$ represents the external basic strength of the event, μ_j represents the number of potential users that may be affected by the j -th forwarding event, and the function $\phi(\cdot)$ represents a time decay function.

The method proposed in this paper considers the time of target message release as the benchmark, and proposes a prediction method based on spatio-temporal attention mechanism. Firstly, the given cascade graph is represented as a set of cascade paths, and each cascade path obtained not only contains the information of who is the message disseminator. According to the message early cascade diagram, we can obtain the forwarding situation in a continuous period of time after the information is published and the corresponding forwarding time sequence. By obtaining the message set that occurred in a short period of time before the target message was published, we can calculate the influence of the messages in this set on the target message. The main model framework is shown in Figure 2.

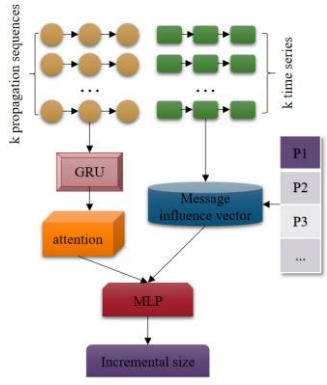

Figure 2: Prediction model based on spatiotemporal attention mechanism.

A group of propagation paths containing several messages is obtained by random walk, and the length of each propagation path is L, and each group contains K propagation paths. For the random walk process, firstly, the starting node of each propagation path is calculated by formula (5):

$$P(u)=\frac{\deg_c(u)+\alpha}{\sum_{s\in V_C}(\deg_c(s)+\alpha)} \tag{5}$$

Where α is the smoothing parameter, $\deg_c(u)$ represents the degree of node u in the graph, and V_C represents the set of nodes in cascade g_t^i.

For a certain word t_k, an L-level bi-directional language model can be represented by $2L+1$ vectors as shown in formula (6):

$$R_k=\left\{X^{LM},h_k^{\rightarrow LM_j},h_k^{\leftarrow LM_j}\middle|j=1,2,\cdots,L\right\}=\left\{h_k^{LM_j}\middle|j=1,2,\cdots,L\right\} \tag{6}$$

Two-way language model representation is context-dependent, and the representation of each word depends on the whole context in which it is used. Two-way language model algorithm has depth, and word representation combines all layers of deep pre-training neural network.

K propagation paths obtained by random walk are combined into an effective representation containing cascade structure and timing information by attention mechanism:

$$S^{'}=\sum_{k=1}^{K}\alpha_k s_k \tag{7}$$

Where α_k represents the degree of attention to the k-th propagation sequence.

When U,V is fixed as a constant, the loss function (8) can be understood as the following square error equation with L_2 regular term:

$$\varepsilon(W)=\frac{\lambda_U}{2}\sum_{i}^{m}\left\|U_j-H_i\right\|^2+\frac{\lambda_W}{2}\sum_{k}^{|w_k|}\left\|W_k\right\|^2+constant \tag{8}$$

Back propagation algorithm is used to optimize parameter W. Update U,V,W alternately.

2.3 Research on Emotional Classification of Cultural Information

Among the combined forces of various factors that promote the emergence and development of new media art in China, the development of local social life and the resulting changes in the content and expression of people's aesthetic feelings are decisive, while foreign new media art is the catalyst and frame of reference for the emergence and development of new media art in China. Capitalist modernity affirms technological progress, while aesthetic modernity criticizes technology. Therefore, the essence of western new media art is to hold a modern self-critical attitude. The technical standards of new media art production are complicated, and the open and unified input and output format has not been established in the world. Most new media artists or new media art institutions in various countries are fighting for each other, and cutting-edge technologies are difficult to share with each other. Most of the research and development are from scratch, which makes the creation of new media art in China at a disadvantage in terms of technical starting point.

The existing Doc2Vec can directly represent the text as an n-dimensional vector, but the effect is not good. Therefore, based on LSTM (long short-term memory) in computer-aided DL and attention mechanism, this paper proposes a hierarchical attention network to realize text

classification. At the same time, two levels of attention mechanism are introduced to obtain the best representation of the text. The model structure is shown in Figure 3.

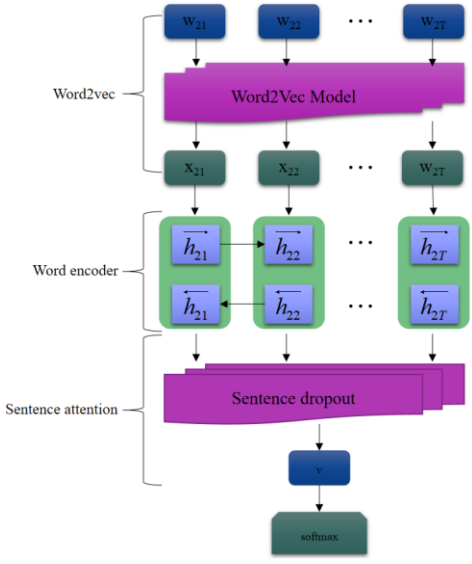

Figure 3: Classification model structure of text.

The words in the text are not only influenced by the preceding words, but also by the following words. Therefore, it is necessary to use bidirectional LSTM to code the word sequence, convert the words into word vectors through Word2Vec model, and then input them into Bi-LSTM model to output the corresponding state.

Assuming that there are L sentences in the text, each sentence s_i has T_i words, and w_{it} represents the t word of the i th sentence, this model can convert documents into vectors, and then classify them.

$$x_{it} = model_{w2v}(w_{it}), t \in [1, T] \tag{9}$$

$$\overrightarrow{h_{it}} = \overrightarrow{LSTM}(x_{it}), t \in [1, T] \tag{10}$$

$$\overleftarrow{h_{it}} = \overleftarrow{LSTM}(x_{it}), t \in [1, T] \tag{11}$$

$$h_{it} = \left[\overrightarrow{h_{it}}, \overleftarrow{h_{it}}\right] \tag{12}$$

LSTM is very similar to GRU (Gate Recurrent Unit). Compared with LSTM, GRU can achieve a considerable effect, and compared with its easier calculation, it is easier to train, which can greatly improve the training efficiency of classification model.

GRU is composed of multiple repeated Cell structures, and provides input data stream for logic unit through the combination of input h_{t-1} at the previous time and input x_t at the current time. The calculation for resetting the door is:

$$r_t = \sigma(W_r * [h_{t-1}, x_t] + b_r) \tag{13}$$

The updated gating is calculated as:

$$z_t = \sigma\left(W_z * \left[h_{t-1}, x_t\right] + b_z\right) \tag{14}$$

Update the value range $z_t \in [0,1]$ of the gate, and the value representing the state it represents at this time can be ignored or kept intact. $z_t = 0$, do not update; $z_t = 1$, update.

By combining the coding information q_m of the topic object with the hidden state h_i based on the bidirectional LSTM model of the text information of the network, the attention degree of the topic object to each word is calculated respectively. After calculating the weight of each word, the original hidden state points are multiplied by the weight of attention to form the hidden state based on attention, and the hidden states with different attention are combined. The specific calculation formula is as follows.

$$e_i = att\left(h_i, q\right) = W_n^t\left(\tanh\left(W_{ah}h_i + W_{aq}q_m + b_a\right)\right) + b_m \tag{15}$$

$$a_i = \frac{\exp\left(e_i\right)}{\sum_N^{n=1}\exp\left(e_n\right)} \tag{16}$$

The whole connection layer is a Softmax normalization function, and the output value is a real value normalized to 0-1, which represents the probability of the model classification to a certain position.

3 ANALYSIS AND DISCUSSION OF RESULTS

In this section, the validity of the model is verified by the experiment of deep memory network in the position analysis data set. In the experiment, the data set is analyzed from the standpoint of Chinese and English, and the training set and test set divided by the data set are used to train and test the model respectively. The English data set comes from the SemEval2016 position analysis task. The English data set is divided into training set and testing set according to the proportion of about 70% and 30%. Both training set and testing set contain three different position texts of all five topics, covering a comprehensive range. The training set and test set of NLPCC2016 Chinese data set are divided into 75% and 25% respectively. The training set and test set cover five topics and three different positions completely.

In the process of experiment, the virtual environment created by Python's open source environment Anaconda3 is used for experiment. The experimental tool is PyCharm editor, and tenforflow1.14 framework is used for code writing. The operating system is Windows10.

In this section, firstly, a comparative experiment is conducted between LSTM and bi-directional BiLSTM to study the text processing ability of experimental BiLSTM and verify the feasibility of BiLSTM instead of LSTM. The experimental data of BiLSTM model performance in the experimental environment are shown in Table 1 and Figure 4.

Topic	P_{FAVOR}	R_{FAVOR}	F_{FAVOR}	$P_{AGAINST}$	$R_{AGAINST}$	$F_{AGAINST}$	F_{AVG}
1	0.522	0.293	0.365	0.384	0.633	0.795	0.665
2	0.652	0.328	0.613	0.325	0.723	0.72	0.559
3	0.516	0.237	0.332	0.407	0.721	0.822	0.475
4	0.617	0.346	0.455	0.401	0.788	0.649	0.704
5	0.517	0.611	0.52	0.473	0.787	0.724	0.747
6	0.715	0.526	0.381	0.417	0.77	0.638	0.632

Average	0.59	0.39	0.444	0.401	0.737	0.725	0.63

Table 1: BiLSTM performance of various topics.

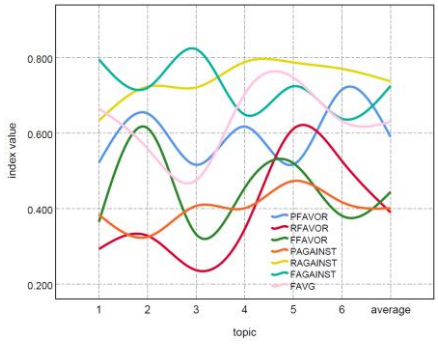

Figure 4: BiLSTM performance curve of each topic.

Based on LSTM, a comparative experiment of word segmentation tools pkuseg and jieba is carried out. In order to compare the data more conveniently, the data are summarized, and the results are shown in Figure 5.

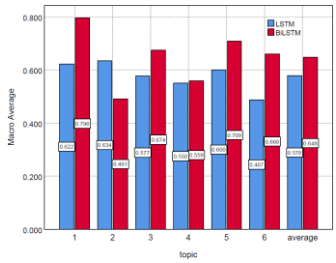

Figure 5: Comparison of experimental results.

The performance of BiLSTM model is slightly better than that of LSTM, with 17.4%, 9.7% and 10.9% improvement on topic 1, topic 3 and topic 5, respectively, and the overall evaluation index is improved by 7%. Generally speaking, BiLSTM is superior to one-way LSTM in dealing with social network texts. In this experiment, BiLSTM is used instead of LSTM.

In order to verify the effectiveness of the deep memory network model, this paper introduces the comparison experiment between this method and other methods. The performance of subtopics in SemEval data set is shown in Table 2 and Figure 6, and the performance of subtopics is based on $F_{AVERAGE}$.

Sub topic	*Our*	*LSTM*	*CNN*	*Ref [12]*
1	0.551	0.603	0.555	0.558
2	0.602	0.568	0.513	0.594

3	0.744	0.449	0.504	0.647
4	0.656	0.447	0.576	0.699
5	0.595	0.423	0.567	0.469
6	0.849	0.511	0.69	0.709

Table 2: Subtopic performance.

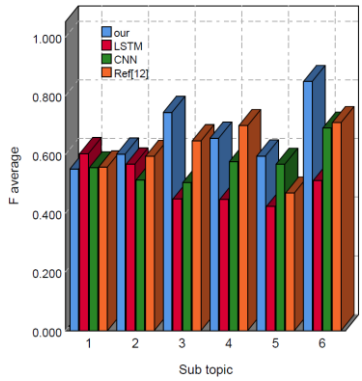

Figure 6: Statistical chart of sub-topic performance.

In this paper, the model shows a balanced performance, and has achieved a high $F_{AVERAGE}$ value in all sub-topics. In addition, on this data set, the accuracy of this model in judging the "support" position is higher than that of the other three models, which proves that this model also has good recognition ability for a few data sets.

The prediction effect of the model and comparison method proposed in this paper will be demonstrated, and the experimental results of NLPCC2016 data are shown in Table 3. In the experimental process, different observation time windows are set to conduct experiments, and the spread range of the news after its publication for a period of time is predicted by observing the news spread in the time windows.

The MSLE (Mean Squared Log-Tran Formed Error) method is used as the evaluation index. The smaller the MSLE value, the better the experimental effect. 1h, 2h and 3h represent the data observation time windows of 1h, 2h and 3h, respectively.

Model	*1h*	*2h*	*3h*
LSTM	0.45	0.349	0.412
CNN	0.385	0.464	0.432
Ref[12]	0.44	0.292	0.301
our	0.298	0.253	0.284

Table 3: Data experiment results.

The experiment shows that the TSAT model proposed in this paper is superior to LSTM method and CNN method, which shows the advantages of DL method. Because our proposed method learns the

cascading structure information, integrates the finer-grained time information, and also considers the influence of other messages in social networks on the spread of target messages, the prediction effect has been improved to some extent.

The micro-average F1 values of the overall "for" and "against" positions of each model on the English data set are shown in Figure 7.

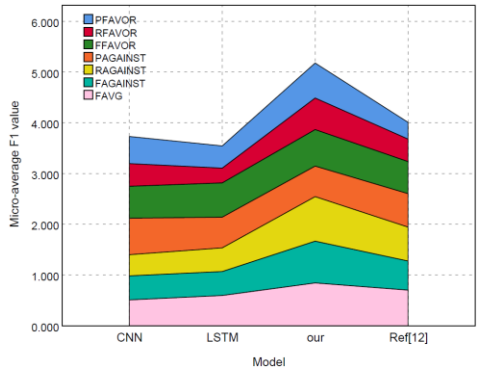

Figure 7: Overall performance comparison of models.

In this paper, the micro-average F1 value of the model on the English data set is 0.769, which is 3.532% higher than that of the LSTM model, and has a certain improvement compared with that of not introducing topic target information. It shows that the performance of the two methods of introducing topic target information is higher than that of the original model on both Chinese and English data sets. Generally speaking, the comparative experiments verify the effectiveness of the two models of introducing topic target information, which combine attention mechanism and conditional coding.

Contemporary world culture is increasingly showing diversified forms. If we want to find our own position in this multi-culture and form our own unique and distinctive style, we can't avoid facing various cultures, because only by comparing and interacting with these cultural forms can we find our own position. As far as culture is concerned, if we regard our own culture as the cultural subject, then there must be cultural objects relative to our own culture, which is undeniable. In today's highly developed economy and communication, there are many channels for understanding a culture. For example, you can read translated books, ask overseas returnees to tell about it, go abroad through the Internet, or even go abroad for inspection. However, if you want to build a new culture in China, you must rely on the mass media. Here, what kind of information environment the mass media provides us, that is, how to reproduce the "other" culture through media, becomes the key to our cultural trend.

4 CONCLUSION

New media social culture is a unique cultural phenomenon in modern society with mass media as its carrier and media expression as its basic representation, and it is an important way of cultural existence in modern society. In the process of digitalization, the activities, materials and other things of human society can be digitized or bit-shaped through special processing, which leads to structural changes in the existing mode of human society. This paper studies the social and cultural construction of new media based on computer-aided DL technology. Based on LSTM in DL and attention mechanism, this paper proposes a hierarchical attention network to realize text classification. The validity of the model is verified by the experiment of deep memory network in the position analysis data set. In this paper, the micro-average F1 value of the model on the

English data set is 0.769, which is 3.532% higher than that of the LSTM model, and has a certain improvement compared with that of not introducing topic target information.

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