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Research Article

Research on Discourse Reconstruction Effect of Animated Film Cross-Cultural Communication Based on Machine Learning

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Animated films are an important carrier of cultural dissemination, a way of conveying national culture and displaying regional culture in film and television, and an important medium for constructing national image and cultural form in the process of cross-cultural dissemination. The special film language expression of emotion in animated films also highlights its unique charm, status, and cultural communication role in the field of communication and at the same time reflects the unique value of the flash point in the ever-changing modern society. This paper starts with the related concepts of machine learning models, analyzes machine learning characteristics and model quality factors, and builds a model evaluation index system based on this and then proposes machine learning model evaluation implementation and index data processing methods. In building the corresponding evaluation experiment, the training model and animation film sentiment classification analysis need big data animation film culture data; the existing open source experimental data is very small and not suitable for the experiment of this paper. The principle of support vector machine is mainly introduced. And an improved machine learning model for animated film cultural sentiment classification is built. Experiments show that the performance of each index of the improved machine learning model is better than that of the support vector machine classifier.

1. Introduction

Animated films tell stories in an unreal narrative way. Although they are drawn from reality, their relatively flexible and free expression space enables the characters and storylines described in animation to better reflect the depth of the creator's thinking [1, 2]. Therefore, animated films have the natural advantage of cross-cultural communication. The national subject identity is a consistent method of film and television creation. The objective subject identity not only determines the overall style of the film but also affects the cultural mood created in it. Based on the special creative background and narrative logic of animated films, excellent animated film works often draw creative elements from their own national culture in the process of creation, so that the film presents aesthetic concepts and humanistic thinking based on local culture, which greatly strengthens the national culture and cultural identity. The identification of identity in the cross-cultural communication of animated films is not only to interpret the cultural forms presented in the symbols of animated films but also to include cultural symbols in imagination and reconstruction. The specific strategy is to focus on the production and association of cultural symbols and meanings in production and the expression of universal values and audience positioning in content. It should be aimed at a diverse and all-aged public [3]. In the process of internationalization, it is necessary to adhere to the unique cultural characteristics of the nation and at the same time to absorb the successful experience of Hollywood animation films. Instead, we should gradually explore effective strategies for the cross-cultural communication of animated films in constant exploration [4].

As an important carrier of cross-cultural communication, animated films are currently an important film and television expression method to present the characteristics of national culture and show the national culture and make

it an important medium for cultural output [5]. Affected by the objective differences in cultural structure, cultural misreading and understanding differences are prone to occur in the process of cross-cultural dissemination of animated films. For the cross-cultural communication of animated films, in the process of creation and expression of animated films, creators should express their self-identity in a way that follows the cultural background to enhance the cultural experience of the audience [6].

Automatic animated film culture emotion classification refers to the process of classifying, summarizing, and reasoning about subjective animated film culture with emotion [7]. For people who love watching film and television works, most of them will refer to the comment data of other viewers who have seen the work and analyze their emotional tendencies to measure the viewing value of a work. With the rapid development of computer-related technologies, the development of big data-related technologies has been greatly improved, which provides data support for the analysis and judgment of cross-cultural communication of animated films [8]. Animation film cross-cultural communication response and guidance are the fundamental purpose of animation film cross-cultural communication, which has distinct practical significance and great social value.

2. Related Work

Cross-cultural communication is a process in which a country or a culture under different cultural backgrounds and environments constantly communicates and interacts with other countries or cultures to make its own culture develop and have influence. Cross-cultural communication is not only related to the export of national cultural values and the improvement of cultural soft power but also continues to penetrate the daily life of people around the world, becoming a normal life and cultural normal. As one of the important media and cultural forms of mass cross-cultural communication, animated films have intuition and efficiency that are incomparable with other media forms. Animated films, in the form of audio-visual communication that audiences like to hear, play an important role in cultural penetration and cultural communication. The analysis of the effect of discourse reconstruction on the cross-cultural communication of animated films does not make any statistical assumptions about the data; it is only based on the estimation of the similarity or distance function of a set of clustered objects, which is called unsupervised learning in the field of machine learning [9]. In practice, some form of weak supervision is often considered to improve the performance of unsupervised clustering. Many existing semisupervised clustering algorithms are developed by introducing supervised information on the basis of traditional clustering algorithms. At present, the common prior information in semisupervised clustering is mostly manifested as constraints reflecting the similarity relationship between samples.

Liu and Li believed that animation film, as a carrier of dissemination of culture, has its own unique artistic techniques and aesthetic elements, separated from the image space-time between reality and fantasy, plus its own boundless audio-visual language and cultural connotation; these qualities can be a powerful pillar for animated films to have a strong influence around the world. Since the development of animation film, it has become the most mature type of animation. It condenses many ancient and excellent resources in animation art and is a master in narrative structure and audio-visual technology [10]. Hagendorff proposed a framework of word2vec plus convolutional neural network, which uses word2vec proposed by Google to calculate word vectors as the input of CNN, and the calculation of sentiment analysis designs a suitable CNN architecture, which uses 3 pairs of convolutional layer and pooling layer; this is the first time that word2vec and CNN have used a 7-layer architecture model to analyze sentence sentiment. The experimental results show that a properly trained convolutional neural network can outperform shallow classification algorithms with pretraining and fine-tuning. Training convolutional neural networks for natural language processing tasks outperforms other machine learning models [11]. Zhang put forward the concept of perceptron, which has an important position and significance in the research of neural networks. He first proposed the idea of self-organization and self-learning and has a very clear understanding of linearly separable problems that can be solved. The convergence algorithm and rigorous proof are given from mathematics. Many subsequent models are established under this guiding ideology or its improvement and promotion [12]. The spectral clustering algorithm proposed by Shi et al. is a method based on graph partition theory, which relaxes the problem of graph partitioning into the spectral decomposition problem of solving the matrix of the graph. The semisupervised spectral clustering algorithm uses pairwise constraints to adjust the data similarity matrix to achieve better clustering results [13]. Xu et al. believe that the role of animated films in spreading information across cultures should be considered from two aspects: the direct adjustment of the similarity matrix by pairwise constraints and the indirect way of spatially spreading the constraint information by defining a density-sensitive distance measure. For similarity adjustment, the performance of the DS-SSC algorithm is better than that of the CSC algorithm [14] that only considers the adjustment of pairwise constraint information. Wang and Zhang proposed a discriminative semisupervised clustering algorithm based on pairwise constraints. The algorithm effectively utilizes pairwise constraint information integration for data dimensionality reduction and clustering. The algorithm first uses pairwise constraints to preprocess the entire dataset, constructs a feature projection matrix according to the pairwise constraints, and then uses the pairwise constraints-based K-means algorithm to complete the clustering of the data in the projection space. The class result chooses the projected space [15]. Zhao believes that the development of the media market makes the diversification and enrichment of communication products an inevitable trend and also cultivates a group of high-quality animation film audiences. The survival of the fittest mechanism in the animation film market makes the competition increasingly fierce, which puts forward higher requirements for the quality of the

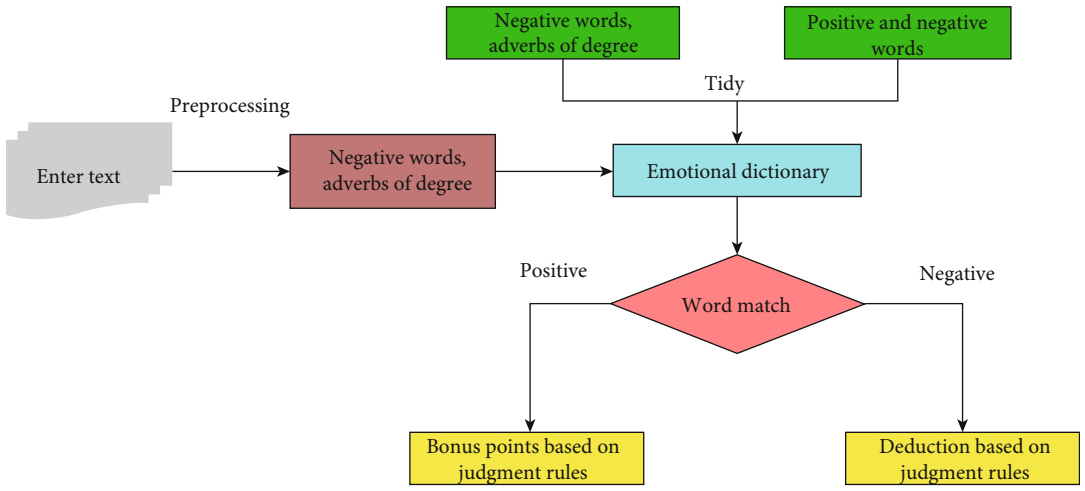

Figure 1: Flowchart of emotion classification of animation movies based on emotion dictionary.

animation film itself. With the continuous advancement of animation film shooting technology and the gradual relaxation of the environment, there should be more space for the creation of animation films with regional cultural characteristics, and local natural geography and social and cultural resources should be more fully displayed [16].

3. Machine Learning Algorithms

3.1. Analysis Process of Animation Film Cross-Cultural Communication Based on Machine Learning. The cross-cultural communication analysis of animated films based on machine learning is a process of emotional orientation analysis. The emotional classification of animated films mainly refers to the process of emotional classification, induction, and reasoning of subjective phrases with emotional colors. According to the different granularity, the emotion classification of animation movies can be divided into multiple levels such as word-level emotion classification, sentence-level emotion classification, and chapter-level emotion classification [17]. The research on emotion classification of animated movies is mainly to extract words with emotional tendencies in massive animated movies, so as to classify animated movies according to emotion. Sentiment classification of animation movies has strong practical significance, and this section will introduce two methods for emotion classification of animation movies in detail [18].

Animated movie emotion classification based on the emotion dictionary is a simple simulation of human memory and judgment processing. The emotion classification of animation movies based on the emotion dictionary mainly relies on the emotion dictionary. Using the emotion dictionary to classify animation movie emotion first needs to build the emotion dictionary. The emotion dictionary generally contains positive and negative words, negative words, and degree adverbs. Immediately afterward, words that tend to be found in animated movies are extracted. Finally, the emotional tendencies of animated films are classified based on judgment rules [19]. The classification process of animation film cross-cultural communication based on the emotion dictionary is shown in Figure 1.

The advantages of the animation movie emotion classification method based on the emotion dictionary are simple, fast, and high accuracy, but there are also some limitations; that is, it is necessary to build a specific field emotion dictionary according to the characteristics of animation movie data, and there are unregistered word change recognition, emotional divergence, and poor writing standardization; there is a lot of room for improvement.

Sentiment analysis of animated movies based on traditional machine learning has been developed for some time, and the technology has matured, but traditional machine learning requires manual construction of features, and the workload is very large. Deep learning simulates human visual features and can automatically extract features. With the improvement of computer computing power, sentiment analysis based on deep learning has begun to emerge. The word segmentation method based on understanding simulates the human brain's understanding of culture, so as to achieve the effect of identifying words in culture. The method of understanding word segmentation to deal with ambiguity is to combine syntactic and semantic information at the same time as word segmentation, which usually includes a general control part, word segmentation subsystem, and syntax and semantic subsystem. In the whole process of word segmentation, the general control part plays a coordinating role, and the word segmentation subsystem can obtain syntactic and semantic information about words, cultural sentiments, etc., so as to judge the ambiguity of word segmentation.

Assuming that all data obey a normal distribution composed of mixed data, the classification formula based on the machine learning algorithm is shown in

$$f(x|\theta) = \alpha_i f(x|\theta_i), \tag{1}$$

where $\sum_{i=1}^{L}\alpha_i = 1$ is the mixing coefficient and $\theta = \{\theta_i\}$ is the parameter. From the assumption of maximum posterior probability, the definition of optimal classification can be derived, as shown in

$$h(x) = \arg\max \sum_{j} P(c_i = k | m_i = j, x_i). \tag{2}$$

And the condition of formula (3) is satisfied:

$$P(m_i = j | x_i) = \frac{\alpha f\left(x_i | \theta_j\right)}{\sum_{i=1}^{L} \alpha f\left(x_i | \theta_j\right)}. \tag{3}$$

The first of the two terms is related to the class label, while the second term does not depend on the label of the example. Therefore, a method that can provide a large number of unlabeled examples makes the estimation of the second term more accurate than the unlabeled example. The value of s is reflected in their ability to help better estimate model parameters leading to improved learning performance [20].

3.2. Animated Movie Sentiment Cluster Analysis. Cluster analysis is to classify animated movies according to their degree of emotional similarity. Clustering is a machine learning method that does not require a priori statistical hypothesis analysis to discover the structural information hidden in the data space structure. The data should be as dissimilar as possible. Clustering analysis is an important analysis method of data mining, and the clustering algorithm is the core content of current clustering analysis research [21].

The difference between clustering and classification or prediction is that most classification methods are deductive; that is, people predetermine the mode of classifying a certain thing or the classification standard of each thing [22]. The process of classification is to compare the classified samples with the standards of each category and then assign each sample data to each category. Therefore, for classification, the process of classification is more or less subjectively understood. A typical clustering process mainly includes data preparation, feature selection and feature extraction, similarity calculation, clustering, and validity evaluation of clustering results. Let $d(x_i, y_j)$ be the distance between two sample points, which meets the requirements as Equations (4) and (5) have shown:

$$d\left(x_i, y_j\right) \geq 0, \quad x_i \neq y_j, \tag{4}$$

$$d\left(x_i, y_j\right) = d\left(x_j, y_i\right). \tag{5}$$

Euclidean clustering is shown in

$$d\left(x_i, y_j\right) = \left| \sum_{k=1}^{p} \left(x_{ik} - x_{jk}\right)^2 \right|^{1/2}. \tag{6}$$

Absolute clustering is shown in

$$d\left(x_i, y_j\right) = \sum_{k=1}^{p} \left|x_{ik} - x_{jk}\right|. \tag{7}$$

The variance-weighted distance is shown in

$$d\left(x_i, y_j\right) = \left| \sum_{k=1}^{p} \frac{\left(x_{ik} - x_{jk}\right)^2}{S_k^2} \right|^{1/2}. \tag{8}$$

According to the form of hierarchical decomposition, it can be divided into the bottom-up agglomerative algorithm and the top-down splitting algorithm. Two bottom-up agglomerative clustering algorithms start from each object as a cluster and gradually merge adjacent clusters. For a large cluster, until all objects are in a cluster or until a certain termination condition is met, the top-down splitting clustering algorithm is the opposite, starting from all objects belonging to a cluster. In each cycle, the cluster is gradually decomposed into smaller and smaller clusters, until each object forms its own cluster or satisfies a certain termination condition [23–26]. Hierarchical methods are based on the distance measurement between samples and then cluster a set of samples hierarchically according to the distance matrix. Based on the idea of the hierarchical model, the basic settings of the corresponding clustering algorithm usually include the definition of the distance between samples, the definition of the distance between classes, and the methods and steps of cluster formation.

3.3. Support Vector Machines. A support vector machine (SVM) belongs to a kind of traditional machine learning algorithm. This paper uses the support vector machine algorithm to analyze the effect of cross-cultural communication on animation films. Facing the principle of support vector and the classification of support vector machine, there is a detailed introduction.

Linearly separable SVM, also known as hard-margin SVM, is a binary classification model that refers to a linear classifier with the largest interval defined on the feature space. Linearly separable support vector machine refers to the existence of a unique optimal hyperplane and the corresponding classification decision function, which can solve the corresponding convex quadratic programming problem by maximizing the interval or equivalently solving the linearly separable dataset. The dataset is divided into two parts in the feature space, one is positive class data, and the other

is negative class data, where the separating hyperplane is shown in

$$\omega^* x + b^* = 0. \tag{9}$$

The corresponding classification decision function is shown in

$$f(x) = \text{sign}\,(x^* + b^*). \tag{10}$$

For linearly separable datasets, the support vector is the instance of the sample points in the training dataset that are closest to the separating hyperplane. The support vector is shown in Figure 2.

The linear support vector machine is also called a soft interval support vector machine. The learning problem of linear inseparable linear vector machine is transformed into a convex quadratic interval maximum problem. The linear separable support vector machine is a special case of the linear support vector machine. In reality, most of the data in the dataset in life are linearly inseparable, so the usage rate of linear support vector machines is higher.

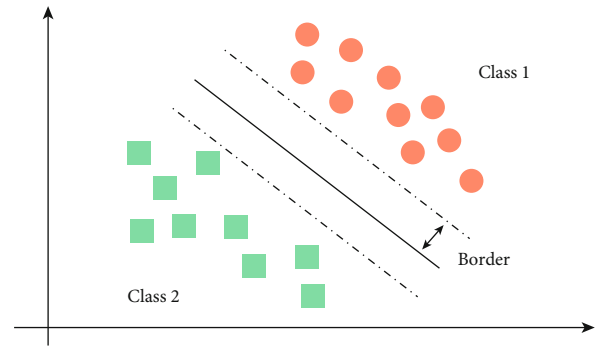

Figure 2: The principle of support vector.

4. Machine Learning-Based Cultural Sentiment Classification of Animated Films

4.1. Classification Performance Evaluation Metrics. The evaluation indicators mainly used in this paper are precision rate, recall rate, and *F*-measure value to evaluate the performance of the model. The emotional prediction results and actual results of animation movies are represented by a confusion matrix, and the corresponding model evaluation indicators can be calculated. The classification results are shown in Table 1.

From the perspective of local manifold properties, the density-based manifold search can distinguish the manifold distribution of animation film culture in the animation film culture collection, so as to improve the similarity between animation film culture points in the animation film culture local manifold. By transforming the similarity measure between local animation film culture points, the animation film culture points on the same manifold are transformed into hyperellipsoid or hypersphere shape. In this way, each manifold can be processed locally, so that the similarity matrix can be further optimized, so as to more truly reflect the characteristics of animation film culture distribution in animation film culture concentration.

4.2. Data Collection. In the task of machine learning animation film culture sentiment classification, there are currently two methods for embedding word vectors into the model: the first method, according to the specific task corpus, trains the corresponding word vector model to achieve word embedding, that is, self-learning word embedding, the word expression for a specific task is very accurate, and this method requires a huge amount of data; the second method uses an open source trained word vector model to achieve word embedding; this method uses pretrained generalization when the model is used to represent the word vector for a specific task. The implementation of the word embedding of the model in this paper adopts the second method, which is an open source trained corpus word vector.

There are two datasets in the experiment in this paper, namely, the custom text dataset and the cited text dataset. The training dataset is used to train the model, and the validation dataset is used to adjust the hyperparameter adjustment during the model training process to prepare for the optimal model. The distribution of the custom text dataset after division is shown in Table 2.

Use the trained SVM classifier to predict the test dataset, and calculate the predicted value and the true value through the classification evaluation indicators precision rate, recall rate, and F1, so as to complete the evaluation of the performance of the SVM classifier. The performance evaluations of the SVM classifier trained with the custom dataset and the SVM classifier trained with the reference dataset in this paper are shown in Table 3.

It can be seen from Table 3 that the performance of the two SVM animation film cultural sentiment classifiers is close. In the process of using the custom animation film culture dataset to train the capsule network animation film culture sentiment classification model, the changes in the loss function value and the accuracy function value in the training dataset and the validation dataset with the step value are shown in Figures 3 and 4.

The step value in Figure 3 has the same meaning as the abscissa of the experimental result of the custom dataset. It can be seen from Figure 3 that the loss function value of the training dataset and the loss function value of the verification dataset start to converge around the step value of 130. The value of the accuracy function in the training dataset and the value of the accuracy function in the validation dataset in Figure 4 also begin to converge around the step value of 140.

This section evaluates the performance of the capsule network model trained on the two datasets and compares the model evaluation results. It can be seen from the table that even if the same model has the same hyperparameters, the performance of the model is different. This is due to

Table 1: Classification results.

	Emotions that fall into category A	Emotions that do not fall into category A
The classification result is judged to belong to category A	m	n
The classification result judges that it does not belong to category A	p	q

Table 2: Distribution of custom datasets after division.

	Test dataset	Validation dataset	Training dataset
Custom dataset distribution after partitioning	4000	3500	8000
Distribution of reference datasets after partitioning	2400	2800	7800

Table 3: Performance evaluation of text sentiment classifier.

	Accuracy	Recall	F1
Custom movie culture sentiment dataset	76.55%	75.08%	75.17%
Citing the movie culture sentiment dataset	75.62%	75.47%	75.52%

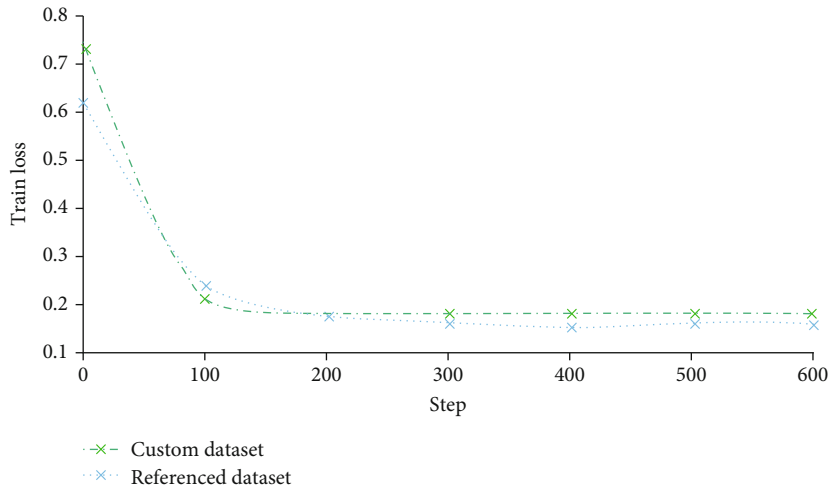

Figure 3: Loss function of experimental results.

the difference in the dataset. Since the referenced animation film culture dataset is generated by human-computer dialogue, some animation film culture data that has not been trained will have a greater impact on the model, while the content of the custom animation film culture review dataset is based on a theme. The content is relatively concentrated, so there will be some differences in the performance of the model trained on the custom dataset and the model trained on the reference dataset.

5. Experimental Results and Analysis

Since the similarity matrix is optimized before the machine learning algorithm is adopted, although the time to construct the similarity matrix is relatively increased, the similarity matrix is closer to the ideal matrix after optimization, which can greatly reduce the convergence times of the machine learning algorithm, so the overall time of the algorithm did not increase, which was also verified during the experiment.

Since the dimension of the original dataset is too high, it is necessary for the algorithm to use other dimensionality reduction methods to quickly reduce the dimension of the original dataset and then complete the comparison of the three algorithms on the higher-dimensional dataset. The dataset feature classification experiment is shown in Figure 5.

It can be seen from the experimental results in Figure 5 that the addition of pairwise constraints to construct the feature projection matrix in SCHD has a certain promotion

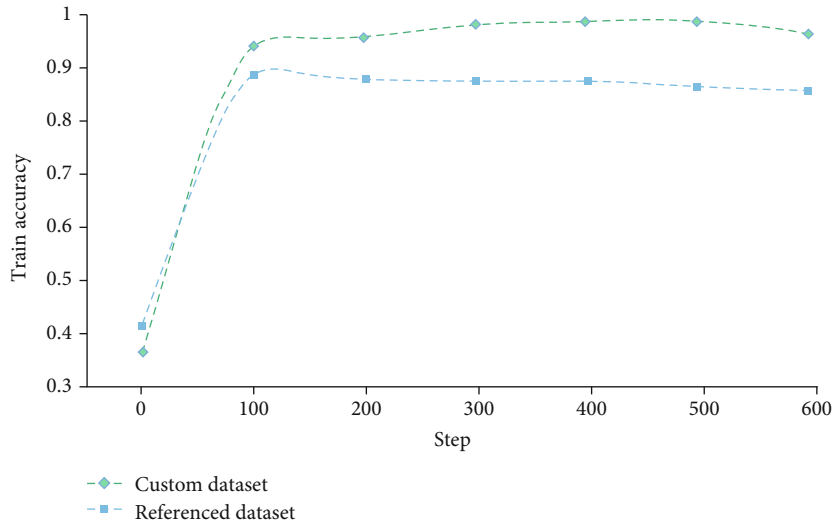

Figure 4: Experimental result accuracy function.

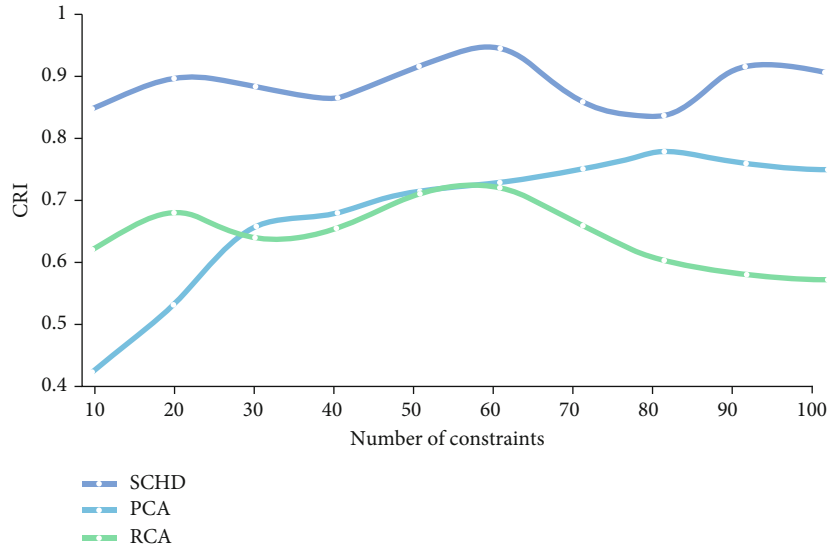

Figure 5: Comparison of three algorithm IRIS.

effect on clustering, while PCA and RCA do not make good use of the given pairwise constraints, and the execution results of the algorithm are relatively worse. Among them, RCA has the worst effect on high-dimensional data.

The glass and sonar indicators of the three algorithms are compared, and the calculation results are shown in Figures 6 and 7.

Figures 6 and 7 show the effect of choosing different numbers of pairwise constraints on the performance of the clustering algorithm. When there are few constraints, the semisupervised clustering algorithm with a continuous increase of pairwise constraints can quickly improve the accuracy of the clustering algorithm, but when the number of constraints reaches a certain level, the clustering accuracy of the algorithm does not improve even a little. The phenomenon of fluctuation is due to the existence of constraints such as violations. Compared with K-means, CSCUI constraint violation has a certain degree of fault tolerance. It only uses pairwise constraints to adjust the similarity matrix and then performs clustering on the adjusted similarity matrix, which cannot effectively eliminate the error of pairwise constraints on clustering. The guide, to a certain extent, limits the further improvement of algorithm performance. The K-means algorithm is sensitive to discrete and noisy data and is critical to the selection of the initial cluster center, because the selection of the initial cluster center directly affects the clustering results. The algorithm also requires the number of clusters to be input during clustering, which is also said to be a limitation of the clustering algorithm. For those small and dense datasets, this clustering algorithm is better.

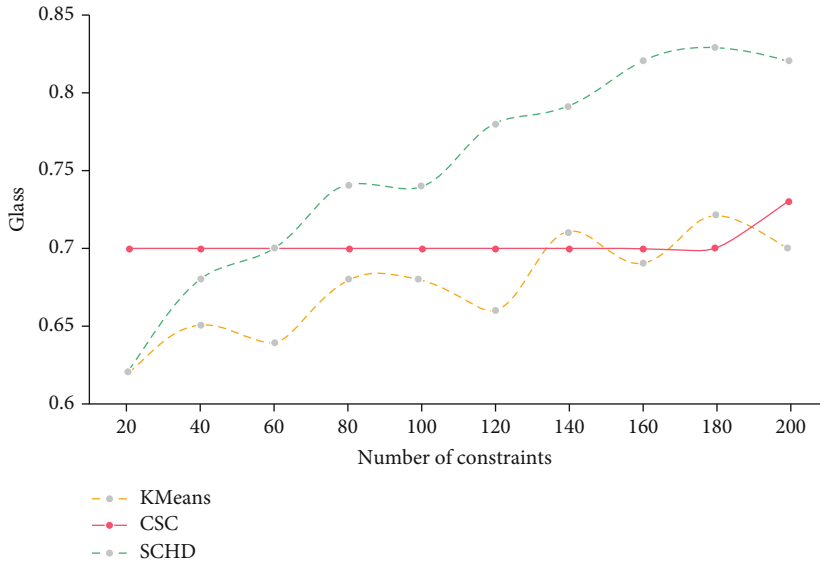

Figure 6: Comparison of glass indicators.

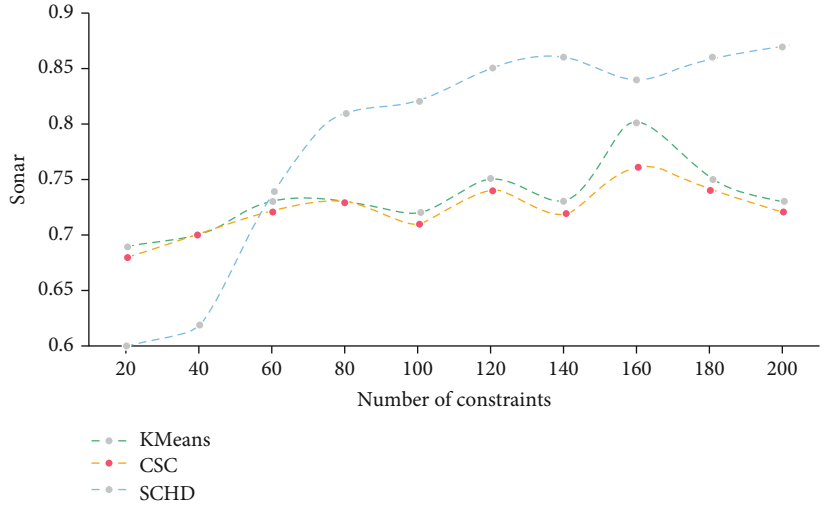

Figure 7: Comparison of sonar indicators.

6. Conclusions

The development of animated film is a classic type of narrative film created on the basis of the unremitting efforts of filmmakers of all ages. The start-up stage, with its own unique production environment and growth conditions, reflects not only the social outlook at that time but also the original ecology showing the specific cultural elements and forms in a certain social state. The emergence and development of the film medium are inseparable from the advancement of science and technology and the material guarantee of high-end equipment. Modern science and technology are the technological guarantee for film and television communication to obtain technical means that are incomparable to other traditional art forms and promote the continuous development of new films. Faces and gestures appear in front of the audience. But you cannot rely too much on high-tech to create various special effects to show specific characters and events in the movie. In order to improve the level of film and television art, film workers still need to start from the aesthetic characteristics of different film types and essentially master, use, and diversify the narrative methods and style-shaping techniques of film and television art, so as to create real film and television art that reflects the true nature of film and television and outlook of life.

This paper starts with the related concepts of machine learning models, analyzes the characteristics of machine learning and the elements of model quality, and builds a model evaluation index system accordingly. Then, the machine learning model evaluation implementation and index data processing method are proposed, which are applied to the classification of animation film culture

sentiment, and the corresponding evaluation experiments are constructed. The training model and animation film emotion classification analysis require big data animation film culture data. The experimental data is very small and not suitable for the experiments of this paper. Through the in-depth study of web crawler technology, the paper mainly introduces the principle of the support vector machine and builds an improved machine learning model for animated film cultural sentiment classification. Experiments show that the performance of each index of the improved machine learning model is better than that of the support vector machine classifier.

In terms of corpus, the emotional data of open source animation movies is very small, and the experimental data needs to be collected by yourself. The self-organized data is organized manually, and there are differences, which makes it difficult to find experimental data from other literature for comparison. Later research can conduct experiments in multiple open source datasets to increase the persuasiveness of the experimental results.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflicts of interest.

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