

Analysis and Improvement of the Effect of Listening Anxiety on College English Teaching Based on Neural Network

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Abstract

Listening is an important form of language input, especially for students. Language learning should be mainly based on auditory input, so listening plays a very important role in the process of language learning. Listening is one of the language skills most likely to cause anxiety in foreign language learners. In order to better analyze the impact of listening anxiety on the effect of college English teaching, we propose an analysis and improvement method based on a neural network model. The goal of this paper is to utilize a neural network model for analyzing the various factors that influence psychological anxiety of college students and to formulate targeted and directional countermeasures for the causes of this problem. We propose a neural network-based model for the English listening anxiety classification and recognition. Based on this method, we expect to effectively reduce the anxiety of college students in college English listening learning, so as to improve the quality of English listening teaching. Specifically, firstly, we design a questionnaire to collect data on students, such as anxiety level, reasons, difficulty of listening materials, classroom atmosphere, emotion. Secondly, we utilize the text material obtained from the questionnaire as training data for the model, and we design a text processing and transformation method. Thirdly, we design a feature extraction and anxiety classification method using a neural network model. Finally, through experiments with students in different classes, we have confirmed that the method proposed in this paper demonstrates excellent performance in classifying and recognizing English anxiety.

Key Words: Neural Network, Recognition Efficiency, Semantic English, Feature Extraction, Anxiety Classification.

I. INTRODUCTION

In today's world, English is recognized as the most widely used communication language, and its importance cannot be overstated [1-3]. The four basic skills of English include listening, speaking, reading, and writing. Listening is at the top of the list, which is enough to prove the importance of listening. In the field of linguistics, whether it is a child or an adult, the most important thing in the process of language learning is listening comprehension. For language learners, in the initial stage of language learning, a lot of language input is required. Listening is an important form of language input, especially for students. Language learning should be mainly based on auditory input, so listening plays a very important role in the process of language learning. Listening is not only the basis of language learning, but also acts as a bridge to communicate with other languages [4-6].

Anxiety refers to an emotional state characterized by feelings of nervousness and fear. Language anxiety is a complex psychological phenomenon that is unique to the language learning process, and is a type of anxiety that

arises from the distinctiveness of language learning in a classroom setting. Additionally, anxiety related to foreign language learning can be categorized into speaking anxiety, listening anxiety, reading anxiety, and writing anxiety [7-9]. Listening is one of the language skills most likely to cause anxiety in foreign language learners. Listening activities have the characteristics of strong fluidity, time limit and unknown. Therefore, the listener needs to perform a series of decoding behaviors such as recognition, understanding, processing connection, and memory storage of the sound in a short period of time. The speed of speech, pronunciation, chunks, sentence patterns and habitual expressions may all cause the listeners to have varying degrees of anxiety. During college students' English listening learning, various factors can combine and lead to feelings of anxiety, ultimately impacting the quality of classroom teaching as well as the students' individual listening proficiency.

A common view is that college students are afraid of negative evaluation in the process of English listening learning, which leads to fear and anxiety. It is mainly manifested in that teachers frequently correct the mistakes of college students in the teaching process, which causes

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college students to be nervous. This approach makes the enthusiasm and initiative of the students to study affected, so that they are afraid of participating in teaching activities and ultimately has an important impact on the quality of teaching. There are specific differences between listening learning and reading learning in college English. In the process of reading, college students can read and study the reading text repeatedly, and they can also learn by consulting dictionaries and other methods. However, in the process of listening learning, college students cannot understand and recognize the listening content in time. Because the listening material has ended, listening learning itself is more likely to cause panic among students than the content of other courses.

Judging from the actual situation of the current college English listening teaching, the main reasons for the anxiety of college students are as follows.

(1) The influence of teachers. In the process of classroom learning, the attitude of teachers will have an important impact on the learning attitude and learning psychology of college students [10-11]. Some English teachers are often impatient in the process of teaching. They lack patience and persistence when facing students with poor listening levels. Once these students make mistakes in classroom teaching, teachers will quickly correct them. Teachers cannot correctly guide students to gradually recognize and correct their mistakes, which often leads to nervousness in the process of learning, making them afraid to participate in teaching activities, thus affecting the effect of listening teaching. At the same time, in the current college English listening teaching, teachers often use a relatively single listening teaching material. The listening data is comprehensive. However, some students' English listening level is poor, and there is a situation of difficulty in understanding. Their enthusiasm for learning is vulnerable. Coupled with the negative evaluation of teachers, it further promotes the anxiety of college students in the classroom teaching of English listening, which in turn affects the quality of their teaching. In addition, some teachers cannot properly handle the relationship with students, which makes some students in a state of tension and anxiety in listening learning, and cannot focus on the learning of English listening knowledge, thus affecting their teaching quality and teaching efficiency.

(2) Student individual reasons. From the perspective of college students themselves, all aspects of their own factors also have an important impact on anxiety. There are great differences in English listening level among college students, especially in some art majors (such as music, sports, art, etc.). The school's assessment of students' cultural literacy is not strict enough, and a large number of students have poor English listening ability. Moreover, students think that they are art students, and their poor grasp of English listening knowledge will not affect their personal development,

so they cannot strictly demand themselves, which makes their basic knowledge of English weak. This also easily leads to the phenomenon that it is difficult for them to understand the teaching content in listening learning, thus hitting the enthusiasm for listening learning. Over time, students tend to feel bored and resisted. And with the increasing difficulty of listening materials, students will have anxiety, which has a serious impact on their English listening level.

(3) The impact of teaching methods [12-13]. In addition, a large number of teachers carry out English listening teaching through traditional translation methods, which can easily lead to students developing a bad study habit of first translating Chinese and then understanding the meaning in the process of learning. To a large extent, this will affect the efficiency of English listening, resulting in the weakening of students' learning effect.

In the English test, the listening part accounts for up to 20%, which is enough to explain the importance of English listening. English listening is often the first part of the test. The quality of students' answers will directly affect the answer of the latter part, especially the students' ability to temporarily regulate their emotions is weak, and they are eager to get good results. Therefore, when encountering difficulties in the listening session, the mood is more likely to become anxious than usual, and even the following questions cannot be answered attentively. It can be seen that the listening part directly affects the students' English performance, so the research on college students' English listening anxiety is very necessary and meaningful.

Not only that, in English learning, listening is the first and the foundation of spoken English [14-15]. A large number of listening exercises are conducive to cultivating students' intonation, sense of language, and foreign language thinking, and laying a solid foundation for the formation of standard and authentic spoken language. At the same time, listening is also the foundation of English reading and writing. Listening more can help students feel the real emotions communicated by English language users, and is conducive to improving students' reading and writing skills. The related research on college students' English listening anxiety and strategies can help to improve students' interest in learning English. At the same time, it promotes the development of students' oral and written communication ability, thinking ability, and organization and coordination ability, and helps students to form a preliminary comprehensive language application ability.

The goal of this paper is to utilize a neural network model for analyzing the various factors that influence psychological anxiety of college students and to formulate targeted and directional countermeasures for the causes of this problem. Through this method, we hope to effectively improve the anxiety of college students in college English listening

learning, so as to improve the quality of English listening teaching.

The contribution of this paper can be summarized as follows.

- (1) We propose a neural network-based model for English listening anxiety emotion classification and recognition.
- (2) In order to understand the phenomenon of students' listening anxiety more objectively and directly, we design a questionnaire to investigate and analyze the listening anxiety of students in different classes of different subjects.
- (3) We design a feature encoding method to map the corresponding multiple-choice questions into encoded features.
- (4) We experimentally demonstrate the effectiveness of the method proposed in this paper on the different subjects' statistics.

The remainder of this paper is structured as follows. Section 2 outlines the proposed method for examining the impact of listening anxiety on college English teaching through the use of a neural network. This section covers data preprocessing, model design, and anxiety classification utilizing the neural network model. In Section 3, we present the experimental studies and results, which serve to compare and demonstrate the performance of the proposed model in classifying listening anxiety within college English teaching. Finally, Section 4 presents the conclusion of the paper.

II. PROPOSED METHOD

In this paper, we aim to employ the deep learning model to study the psychological anxiety of college students and to formulate targeted and directional countermeasures for the causes of this problem. Through our proposed method, we hope to effectively improve the anxiety of college students in college English listening learning, so as to improve the quality of English listening teaching.

In order to better analyze the impact of listening anxiety on the effect of college English teaching, we propose an analysis and improvement method based on a neural network model. First, we designed a questionnaire to collect data on students, such as anxiety level, reasons, difficulty of listening materials, classroom atmosphere, emotion. Second, we use the text material obtained from the questionnaire as training data for the model, and we design a text processing and transformation method. Third, we design a feature extraction and anxiety classification method using a neural network model.

2.1. Data Preprocess

In order to understand the phenomenon of students' lis-

tening anxiety more objectively and directly, we used self-designed questionnaire and in-depth interview to investigate and analyze the listening anxiety of students in different classes of different subjects. The questionnaire consists of 20 questions, including 15 multiple choice questions and 5 open questions. The questionnaire covers all aspects of college English classroom, including classroom atmosphere, listening material difficulty, students' psychological bearing capacity, teachers' guidance and evaluation, etc. In the design of the questionnaire, the general psychological scale about emotion and anxiety was referred to and processed on the basis of the test. In order to reflect the situation of students' listening anxiety as realistically and objectively as possible, we interviewed some students on the basis of questionnaire survey, and asked them to describe the symptoms of anxiety in listening class, the reasons and the methods to relieve anxiety. Table 1 shows the content and levels of the questionnaire.

The original intention of the questionnaire is that listening anxiety is affected by teachers, classmates, listening materials, teaching methods and their own conditions. The more difficult the listening material is, the more likely the college students are to have the psychology of not being

Table 1. The content and levels of the questionnaire.

No.	Content	Type	Level
1	Classroom atmosphere	Choice	A-D
2	The teacher attitude	Choice	A-D
3	The teacher ability	Choice	A-D
4	The amount of homework	Choice	A-D
5	Quality of work	Choice	A-D
6	Self-learning ability	Choice	A-D
7	Learning attitude	Choice	A-D
8	Vocabulary	Choice	A-D
9	Degree of anxiety	Choice	A-D
10	Complexity	Choice	A-D
11	Mental capacity	Choice	A-D
12	Self-confidence	Choice	A-D
13	Teacher evaluation	Choice	A-D
14	Difficulty of listening materials	Choice	A-D
15	Mood	Choice	A-D
16	Opinions for teacher	Writing	1-10
17	Opinions for English	Writing	1-10
18	Opinions for class	Writing	1-10
19	Reasons for anxiety	Writing	1-10
20	Suggestion for listening	Writing	1-10

confident. This causes the worry and fear of listening materials, and then form anxiety. From the perspective of the differences in students' basic English learning ability and psychological quality, the differences in students' English foundation, English ability, understanding ability, and vocabulary will also make students have different degrees of anxiety in the listening class. Due to the lack of these basic abilities in the listening class anxiety students accounted for the majority. Secondly, low confidence can also lead to anxiety. Teachers' negative evaluations can also cause anxiety among students. In addition, teachers and classroom atmosphere play a great role in the formation of students' anxiety. Students are afraid of being asked questions and feel flustered and anxious when asked about themselves. However, some students agree with the teacher's questions, believing that the teacher's questions can help them maintain a high level of tension and concentrate more on their study. Some students and teachers believe that positive, reasonable and pertinent comments, encouragement and smiles from teachers can alleviate their anxiety.

After the questionnaire is completed, we preprocess the data of the questionnaire so that it can be input into the neural network model for feature extraction. For multiple-choice questions, we use the one-hot encoding method for processing. One-Hot Encoding [19-20], also referred to as one-bit efficient encoding, utilizes an N-bit state register to encode N states, where each state is associated with its own register bit. At any given time, only one register bit is active, represented by a value of 1, while the remaining bits are set to zero.

Table 2 shows the corresponding one-hot encoding for each option. In order to allow the model to learn the data features better, we expand the one-hot encoding, that is, expand the 4-dimensional data to 20 dimensions.

For short-answer questions, we first process and encode the text that students answer. Word segmentation is the first step in text processing, and words are the most basic unit of language. In text mining, both word bag representation and word vector form depend on word segmentation, so a good word segmentation is very important. After the text is divided into words, like data processing, there will be the fol-

lowing two problems: First, not all words are useful. Second, the vocabulary size of a corpus is very large. The conventional text mining approach relies on the vector space model, which can result in sparse data. In order to solve these two problems, stop word filtering and keyword extraction are generally performed, and the latter has two calculation methods based on frequency and calculation method based on graph iteration. Word embedding is a broader term used to describe language models and representation learning techniques in natural language processing (NLP) [21-23]. In essence, it involves mapping the high-dimensional space of all words into a lower-dimensional continuous vector space, with each word or phrase represented as a vector on the real number domain. We employ a word embedding model to feature map the text.

We design a word embedding model based on Autoencoders [24-25]. An autoencoder is an unsupervised learning model. The autoencoder algorithm model consists of two main parts: the Encoder and the Decoder. The neural network is guided by the input data X itself as a form of supervision, as it attempts to learn a mapping relationship that leads to the reconstructed output X^r . The encoder is responsible for converting the high-dimensional input X into low-dimensional latent variables h , which compels the neural network to learn the most informative features. The decoder function, on the other hand, restores the hidden variable h of the hidden layer to its original dimension. Ideally, the output of the decoder will perfectly or nearly restore the original input, resulting in X^r being approximately equal to X . Fig. 1 depicts the word encoding model based on an Autoencoder. As shown in Fig. 1, the encoding process is as follows.

$$h = E_{\theta_1}(X) = \sigma(W_1 X + b_1). \quad (1)$$

The decoding process is described as follows.

$$X^r = D_{\theta_2}(X) = \sigma(W_2 h + b_2). \quad (2)$$

2.2. Model Design and Anxiety Classification

After text preprocessing, we designed an anxiety classification model based on convolutional neural networks (CNN) [26]. Convolutional neural networks (CNNs) are a type of multi-layer feed-forward neural network model that employs convolutional operations in each layer. These operations utilize a set of convolution kernels to extract relevant features from data points that are locally related. To train the CNN, the backpropagation algorithm is utilized. The backpropagation algorithm optimizes an objective function, which is designed to mimic the response-based learning mechanism of the brain. The continuous success of the backpropagation algorithm and CNN has brought the

Table 2. The corresponding one-hot encoding for each option.

Option	One-hot encoding	Expansion
A	1000	111110000000000000000000
B	0100	000001111100000000000000
C	0010	00000000000111110000000000
D	0001	000000000000000000000011111

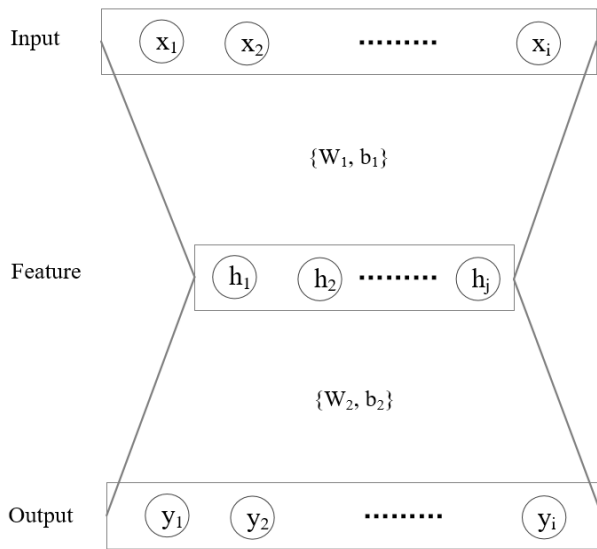


Fig. 1. The word encoding model based on an autoencoder.

field of artificial intelligence into a new stage of development. Deep architectures have demonstrated superior performance compared to shallow architectures in handling complex learning problems. This was particularly evident after the success of the LeNet convolutional neural network model on the MINST dataset, which led to the development of related network models like ResNet and MobileNet [27-30]. These models have found widespread applications in the areas of image processing, classification, and instance segmentation.

CNNs imitate the structure and function of biological neural networks by utilizing a core weight-sharing network architecture that allows for adjusting the size of the network model by modifying its depth and width. This chapter provides a summary of some key components found in popular deep neural network models. CNNs primarily consist of convolution layers, activation layers, normalization layers, and pooling layers. (a) Convolutional Layer. CNN models make certain assumptions about natural images, such as their statistical smoothness and local correlation. By using convolution operations, the learning complexity of the network model can be effectively reduced. This allows for fewer network connections and weight parameters, making the network easier to train compared to a fully connected network of similar size. There are four commonly used convolution operations: ordinary convolution, transposed convolution, dilated convolution, and depthwise separable convolution. (b) Activation Layers. Activation functions are crucial components of artificial neural networks, as they map the input of a neuron to its output. They enable neural network models to learn and comprehend complex and nonlinear functions, by introducing nonlinear properties into the network. In a neuron, the input data is weighted, summed, and then passed through the activation function.

This function is used to increase the nonlinearity of the neural network model. In the absence of an activation function, each layer is simply a matrix multiplication operation. (c) Batch Normalization (BN) Layer. As the depth of a network increases, the gap between the predicted value and the actual label also widens. This phenomenon slows down the training process because the model needs more time to learn and adjust the sample distribution. A normalization layer can be used to address this issue by reducing the internal covariate shift, leading to faster training. Apart from preventing problems related to gradient dispersion and explosion, the Batch Normalization (BN) layer can also prevent data failure associated with the ReLU activation function [32]. Additionally, it makes weight initialization less challenging. (d) Pooling Layer. The Pooling layer is a frequently used module in today's CNNs and was named "Pooling" in AlexNet. By simulating the human visual system, the Pooling layer reduces the data's dimensionality and employs more advanced characteristics to depict the image. Despite this, the original meaning of the text remains unchanged. Pooling layers can be very effective in reducing the size of matrices, i.e., statistical operations can be performed on features at different locations in local regions of the image. The pooling layer can alleviate the excessive sensitivity of the convolutional layer to the image position, reduce the parameters in the final fully connected layer, and speed up the calculation. Various pooling methods have been developed to improve feature compression and extraction, which in turn greatly reduces the time required for model training. Moreover, the pooling layer is an effective tool for preventing overfitting.

Based on the CNN model, we design an anxiety classification network. The model takes the features extracted in the previous steps as input and outputs the level of anxiety. We divide the anxiety level into 5 grades A~E, where A represents the lowest anxiety level and E represents the highest anxiety level. It is worth mentioning that the output of the model contains not only the anxiety level but also the cause of anxiety. The reasons for anxiety include teachers, students, content of textbooks, psychological reasons, and difficulty in listening. The structure of the model is depicted in Fig. 2.

III. EXPERIMENTS AND RESULTS

In this paper, we design a neural network-based method for analyzing and improving the effect of listening anxiety on college English teaching. We conducted experiments on the proposed method using a CNN model in this section.

In the experiment, we selected 50 college students as the research objects in the college English class. We surveyed and recorded these students respectively to obtain the de-

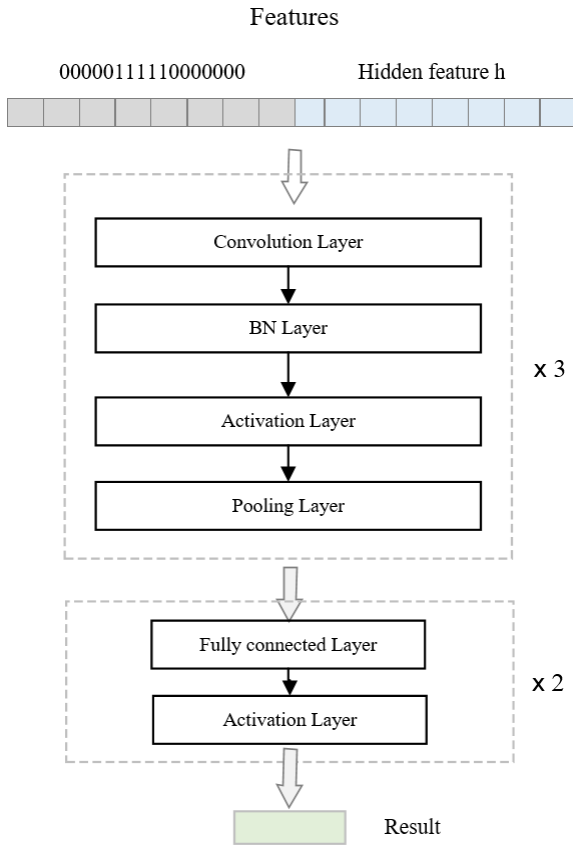


Fig. 2. The overall structure of the designed classification model.

gree and reason of their anxiety about English listening. We made a basic survey on these students from four aspects: (1) the difficulty of listening materials, (2) the students' English foundation, (3) the strength of students' self-confidence, and (3) the teacher's guidance evaluation. The basic survey situation of these 50 students is shown in Table 3.

The above statistics show that there are many reasons why students may be anxious in English listening classes, mainly the difficulty of listening materials, the quality of students' English foundation, the strength of students' self-confidence, the teacher's guidance evaluation, and classroom atmosphere. The most important of which is the difficulty of listening materials and the quality of the English foundation. Because in listening class, students' main task is to listen, and they are in a relatively passive state. The process of listening is fleeting and extremely short, and students must recognize, understand, process, connect, and

Table 3. The basic survey situation of these 50 students.

	A (%)	B (%)	C (%)	D (%)	E (%)
(1)	34	16	18	12	20
(2)	33	18	21	10	18
(3)	27	24	26	9	14
(4)	36	21	20	16	7

memorize the language materials they hear in a short period of time. At the same time, it is necessary to constantly awaken the accumulated knowledge in the mind to match the material listened to. Therefore, students are under greater psychological pressure in listening classes, and they need good psychological quality and basic knowledge in the process of listening, otherwise, the listening effect will be greatly reduced. As for the other factors mentioned above, they all play a role before or after listening, which indirectly affects students' psychology and makes them anxious.

Next, we preprocess the survey data and train the designed neural network model. We evaluate and analyze prediction accuracy. Our method utilizes a commonly used intelligent data processing approach based on deep learning technology. To better adapt to the learning characteristics of the neural network, we implement the following normalized preprocessing methods prior to inputting the data into the designed model. Their definitions are as follows.

$$f_{z-score} = \frac{f - \bar{f}}{\sigma}. \quad (3)$$

$$f_{min-max} = \frac{f - f_{min}}{f_{max} - f_{min}}. \quad (4)$$

Our first data preprocessing method aims to normalize data values to a range of 0 to 1. This range is known to be advantageous for training and learning neural networks. The second normalization method we employ transforms the original data set to have a mean of 0 and variance of 1. This allows the neural network model to learn the features of the data set more effectively.

The performance metrics adopted in our method include the following famous metrics to evaluate the experimental performance: Accuracy (Acc), Precision (Pre), Recall (Rec) and F-measure (F1). They are defined as:

$$Acc = \frac{TP+TN}{TP+TN+FP+FN}. \quad (5)$$

$$Pre = \frac{TN}{TN+FP}. \quad (6)$$

$$Rec = \frac{TP}{TP+FN}. \quad (7)$$

$$F - measure = \frac{2 \cdot Pre \cdot Rec}{Pre + Rec}. \quad (8)$$

$$MSE = \frac{1}{n} \sum_{i=1}^n (y - y')^2. \quad (9)$$

The true positive (TP), true negative (TN), false negative (FN), and false positive (FP) detections are defined, with y' being the predicted anxiety score and y being the actual

Table 4. The results of the five groups on the above five evaluation indicators.

	Acc (%)	Pre (%)	Rec (%)	F-measure (%)	MSE
Team 1	86.5	79.4	79.5	79.4	12.6
Team 2	84.5	85.3	82.5	83.9	13.5
Team 3	87.3	81.2	80.1	80.6	12.8
Team 4	79.3	74.2	73.2	73.7	16.8
Team 5	85.7	83.5	84.7	84.1	13.2

score. The MSE indicator measures the error between the predicted and actual scores, with smaller values indicating better model performance.

In order to compare the experimental results, we also selected 50 students for testing. We divided 50 students into 5 groups and compared the test results of different groups. Table 4 shows the results of the five groups on the above five evaluation indicators. From the Table 4, we can see that the English listening anxiety recognition classification model designed in this paper can well classify the anxiety of college students when learning English.

IV. CONCLUSION

The objective of our paper is to employ a neural network model to examine the factors that contribute to psychological anxiety among college students. Based on the findings, we aim to develop specific and effective strategies to address the root causes of this issue. We proposed a neural network-based model for classification and recognition of English listening anxiety. Through this method, we hope to effectively improve the anxiety of college students in college English listening learning, so as to improve the quality of English listening teaching. In detail, first, we designed a questionnaire to collect data on students, such as anxiety level, reasons, difficulty of listening materials, classroom atmosphere, emotion. Second, we use the text material obtained from the questionnaire as training data for the model, and we design a text processing and transformation method. Third, we design a feature extraction and anxiety classification method using a neural network model.

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