Coastal soil pollution detection and business English teaching index construction based on deep feature fusion

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Abstract

This paper proposes a deep learning model, which classifies web pages based on deep feature fusion. The model has the function of using Text CNN to extract the text of important tags in the web page. It also has the function of using XL Net to extract the text of other tags in the web page. The two parts of the function in the webpage are combined together, which effectively solves the problem of feature collinearity and vector sparseness in the process of network deep feature fusion. This article discusses a deep merging mechanism that can improve the merging of the semantic features of important tags with the semantic features of other web pages. Experimental results show that this method is based on a deep fusion deep learning model and can be used for efficient and high-precision classification of website text. At the same time, the development index of an effective English language model for business research and index system is established in the study. The research is based on theoretical analysis, concept deduction, teaching reform projects, textbook drafts, teaching materials, teacher training basic knowledge, and teaching competitions. Theoretical model of English teaching development index. In addition, this article also introduces the actual soil of a certain area of China as the research object, and 16 kinds of phthalate esters were tested in the soil of this area. By determining the physical and chemical properties of soil enzymes, the effects of phthalate microbial communities, and soil microbial communities on different planting methods were analyzed. This paper uses deep functional fusion technology to detect soil pollution and display the concentration of phthalate pollutants in the soil, as well as the response of business English to the construction of teaching index.

Keywords In-depth feature fusion · Coastal soil · Pollution detection · Business English · Teaching index construction

Introduction

With the development of computer technology, deep integration technology has gradually been applied in the wider Internet (Adamala et al. 2014). With the continuous increase
Chinese universities in the new era from the perspective of overall education, enhance the scientifi city of the business English teaching system and teaching level of Chinese universities, promote the cultivation of excellent business English talents in the economic field, and promote the social development of the country for construction. The powerful country and the revitalization of the nation in the new era have provided strong support, and put forward research problems, and solutions (Ebrahimian et al. 2010). At the same time, the follow-up test of the soil in a certain place in this article has found that the soil contains phthalates and other organic pollutants, which are important transportation and migration media. Although phthalates are widely present in various environments, the adsorption of phthalates and other pollutants in the soil in the geochanical cycle is stronger than other environmental media, causing these substances to accumulate in the soil (Elliott and Walker 1982). Ultimately, soil becomes the most important transportation and storage place for phthalates in the environment (Gillies 2008). At the same time, the matrix of the soil sample is more complex and has more interference components (Gillies and Smith 2005). However, especially considering the complexity of the sample matrix and the difficulty of detecting multiple trace pollutants at the same time, the method of extracting, and analyzing soil phthalates has its advantages (Ghorbani-Dashtaki et al. 2009). Therefore, the actual selection of extraction and detection methods should be based on the nature of the sample, detection limit requirements, cost constraints, etc (Green and Ampt 1911). Of course, the content of the research is the improvement and research of new methods of pretreatment and sample detection (Holtan 1961). Therefore, before using the equipment, the level of trace substances (such as phthalates) in the soil. During the test, the soil samples must be properly pretreated (Holzapfel et al. 2004).

Materials and methods

Sample collection

GPS positioning was performed on the selected sampling points and the coordinates were recorded (Horton 1941). Forty vegetable greenhouses and 23 corresponding field soils were selected. From April 2020 to May 2020, a total of 77 vegetable garden samples and 67 field soils were selected (Isbell 1996). The selection of sampling points should fully consider its geographic location, production type, history, and environment. In this study, 351 soil samples were collected from the vegetable garden and 270 soil samples were collected from the field (James 1988). Three samples from the same sampling point were mixed to form a composite sample, which was then placed in pre-treated tin foil. After being shipped back to the laboratory, an aliquot will be processed immediately, and approximately 3–5 g of fresh soil samples will be stored at −80°C for high-throughput sequencing (Kay 1990). The remaining samples are wrapped in aluminum foil to avoid contact with plastic (Khatri and Smith 2005). After removing the rocks and plant roots, place the soil sample in a small aluminum box, cover it with tin foil and freeze-dry for about 3 days (Khatri and Smith 2006). After the sample was dried, it was ground in a porcelain bowl and passed through 60 (Kiefer Jr 1965). After mixing, a stainless steel mesh is formed, filtered with a craft envelope and closed, and all samples are stored at −20°C for testing. Collect soil surface mulch from sampling points in Zhongmou, Wuqing, and Shouguang (Kostiakov 2002). Researched the agricultural material market in a certain place, and selected five types of agricultural film with large sales volume for source analysis. The agricultural film material is cling film (Lewis and Mîle 1938). The basic conditions are as follows: 1 transparent 0.8 silk, 2 black 0.8 silk, 3 transparent 1 silk, 4 black 1 silk, 5 black, and white 0.8 silk (McClymont and Smith 1996). The collected and purchased agricultural film samples were washed with ultrapure water, cut into 0.5 cm × 0.5 cm pieces with stainless steel scissors, and 0.5 g of the above agricultural film fragments were weighed into a 50 ml glass centrifuge tube. Before using the centrifuge tube, it must be calcined in a muffle furnace at 400°C for 4 h to remove possible phthalate contamination. Then, 30 ml of extractant (acetone:n-hexane=1:1, v/v) was added to the extract, placed in a light incubator, and extracted at 35°C for 1h, 5h, 10h, and 24h. The extract was discarded and 30 ml of extractant was added to continue the extraction, and the pooled extract was filtered through organic matter 0.22. The nylion membrane and the final extract were stored in a 1.5 ml amber glass ampoule for GCMS analysis (Mailapalli et al. 2008).

Reagent selection

The concentration of standard hexane solution DMP, DEP, DiBP, DBP, DMEP, BMP, DEP, DPP, DHXP, BBP, DBEP, DCHP, DEHP, DPhP, DNOP, and DNP is 1000 mg/l. Neutral silica gel (100–200 mesh, analytical grade) and anhydrous sodium sulfate (analytical grade) used for sample purification were purchased from Shanghai Sinopharm Co., Ltd., China. Before use, the cleaning chemicals must be baked in a muffle furnace at 400°C for 4 h to avoid possible phthalate contamination. After distillation, all solvents are used in glassware. Before use, undistributed glassware must be baked in a muffle furnace at a temperature of 400°C for 4 h.

In-depth feature fusion structure design

After Encode_Decode, the two part feature vectors are combined to obtain the feature vector of the entire content of the webpage, and then the classification is performed. By checking the content of the website classification, this article finds that the features contained in important tags are the features of other tags on the website. In the case of collinearity,
the vector function also has duplicates, and they have little effect on the process of pasting the vector. Therefore, this article uses Text CNN, the XL Net network function fusion model described in this article has been improved, and a semantic function fusion mechanism has been introduced. The text features of important webpage tags extracted by Text CNN are combined with the text features of other webpage tags extracted by XL Net. By using a semantic feature-based merging algorithm in the text processing process, the model can be compared to the semantic feature vectors of other important tags independently identify the meaning of semantic feature vectors of other tags, and weight and sum the two result feature vectors to obtain the final semantic vector, which is used to represent web page information.

The model structure of semantic feature fusion is shown in Fig. 1:

The algorithm formula is as formula (1):

\[ G = \text{Sigmoid}(W[V_{\text{important}}, V_{\text{other}}] + b)V_{\text{combined}} \]

\[ = V_{\text{important}} + G*V_{\text{other}} \tag{1} \]

**Fig. 1** Model structure diagram of semantic feature fusion

**Health risk assessment of coastal soil pollution**

In the test space of the coastal seabed, the split hyperplane can be expressed by formula (2):

\[ w^T x + b = 0 \tag{2} \]

where \( w=(w_1, w_2, \ldots, w_d) \) is the normal vector and \( b \) is the bias term. According to the formula of the distance from a point to a surface, each point in the sample space can be divisible by \( x \) to a known hyperplane, and the distance of \( x \) (w, b) is the formula (3):

\[ r = \frac{|w^T x + b|}{\|w\|} \tag{3} \]

Assuming that the hyperplane \( (w, b) \) can correctly classify the training mode, that is \( (x_i, y_i) \) \( y_i = +1, w^T x_i + b > 0; \) if \( y_i = -1 \), then \( w^T x_i + b < 0 \), the formula (4) can be obtained:

\[
\begin{align*}
    w^T x_i + b > +1, & \quad y_i = +1 \\
    w^T x_i + b < -1, & \quad y_i = -1
\end{align*}
\tag{4} \]

If the equal sign in Eq. (3) is retained, these samples are called support vectors, and the sum of the distances from two support vectors belonging to different categories to the hyperplane can be obtained by calculation, and expressed as Eq. (5):

\[ r = \frac{2}{\|w\|} \tag{5} \]

The hyperplane of the partition with the largest interval can satisfy the constraints of formula (3) with parameters \( w \) and \( b \) to maximize \( r \), that is, formula (6):

\[ \max \frac{2}{\|w\|}, s.t. y_i(w^T x_i + b) \geq 1, \quad i = 1, 2, \ldots, n \tag{6} \]

To maximize the interval, you only need to maximize \( \|w\|^{-1} \), that is, minimize \( \|w\|^2 \). The formula can be rewritten as formula (7):

\[ \min_{w, b} \frac{1}{2} \|w\|^2, s.t. y_i(w^T x_i + b) \geq 1, \quad i = 1, 2, \ldots, n \tag{7} \]

The construction and solution of constrained optimization problems, such as formula (8):

\[ \min_{w, b} \frac{1}{2} \|w\|^2, s.t. y_i(w^T x_i + b) \geq 1, \quad i = 1, 2, \ldots, N \tag{8} \]

Equation (9) leads to the divided hyperplane:

\[ w^* x + b^* = 0 \tag{9} \]

Classification solution function, such as formula (10):

\[ f(x) = \text{sign}(w^* + b^*) \tag{10} \]
Data analysis

Pollution source analysis uses SPSS26 to carry out correlation analysis and principal component analysis of agricultural land soil pollution data, and uses Origin9.0 for drawing.

Results

Analysis of the pollution level of coastal soils

This paper analyzed 117 mixed surface soil samples and 90 mixed surface soil samples from a farmland in a certain area. As shown in Fig. 2, five phthalates were found: DBP, BBP, DEHP, DNOP, and DiBP. The average concentration of DMEP is higher than the field soil. In the field soil, only DMP, DEP, and DBEP did not increase significantly. In contrast, the average concentration of DEP in field soils is higher, while in plant beds it is slightly higher.

This indicates that the vegetable garden of this plant is an important place for phthalate pollution. The aging of plastic boards and the vaporization and erosion of water vapor in the vegetable garden greenhouse have led to an increase in phthalate pollution. Water-soluble phthalates such as DMP and DEP are easier to move, leading to phthalate contamination.

Since the source of phthalate pollution is closely related to planting methods and agricultural resources, its pollution characteristics have strong regional characteristics. Therefore, further analysis of the data shows that the field soil pollution level in Province A is the highest. The average total amount of 16 phthalates is 842±714μg/kg, followed by B, C, and D. The average concentrations are 1082±502μg/kg, 760±457μg/kg, and 717±335μg/kg. The average concentration of phthalate pollutants in vegetable field soil is higher than that in field soil. In terms of phthalate monomer, the situation in each province is shown in Fig. 3, and the difference is obvious. Overall, DEHP and DBP are the main phthalic acid pollutants in the four provinces, but their concentrations are different.

According to the soil research shown in Fig. 3, it is found that most of the materials used for the mulch film are polyethylene, and BBP is the main plasticizer of polyethylene, so BBP can be obtained from the mulch film, and the detection rate of BBP in the agricultural film is 96%, the maximum concentration is 220μg/kg. In terms of the composition and concentration of phthalate monomers in different provinces, there is a big difference in phthalate content between Henan and Hebei. Except for the main pollutants (DBP and DEHP), the phthalate content in the other two provinces is very low, and the soil pollution of the cultivated land is also low. Except for DMP and DMEP, province A tends to have higher concentrations of various phthalates, and B has the highest total phthalates, but this is because the level of DEHP is higher than other provinces. Except for DEHP, other phthalates have lower concentrations. This study shows that when assessing phthalate pollution in arable soils in this area, it is not enough to consider the total concentration alone. The composition and concentration ratio of phthalate pollutants should also be considered.

Another issue worthy of attention is the variation of phthalate content with soil depth. Figure 4 shows the distribution of six alkaline phthalates in soil at different depths. The six phthalates studied have infiltration conditions that can be found in all soil layers, and the distribution laws of different phthalates are different. The DMP content in each layer is equivalent, and the pollution degree in each layer is very low. Due to the similar chemical structure and physical properties of DEP, its distribution law is similar to that of DMP.

As the main pollutant, DBP has a high content, and the pollutant level in each layer is the same. The material in Fig. 4 is highly soluble in water and easily permeable, and at the same time, it migrates to deep soil due to the high frequency of field irrigation. BBP and DEHP are mainly concentrated in the middle layer of soil (20–40cm), but the residual concentration in each layer is also higher. The distribution patterns of DNOP and DMP are similar. According to reports, only five phthalates were found in the 20–40cm section at 100%, and only one in the 40–60cm section was found, but it was found in soil inspection 40–60%. The phthalate monomer in this article exists in 40–60 cm of soil, and the concentration of some monomers (such as DEP) is even higher than the middle layer of the soil (20–40 cm), which may be due to the age of the vegetables. The sampling sites in this article have a relatively long shed age, and some sampling sites have reached the age of 30 years. Long-term use of agricultural film will lead to a continuous increase in the supply of phthalates. Phthalates will penetrate into the deep soil and accumulate slowly.

Taking into account the impact of planting methods on phthalate pollution, the data used for analysis is divided into
Correlation analysis and principal component analysis are used to collect statistical information about the data, as shown in Fig. 5, and to identify possible sources of phthalates. In the garden soil, at the level of 0.01, DBP has a strong correlation with the total concentration of 16 phthalates (R=0.77), DEHP (R=0.688), and DiBP (R=0.539). It can be seen from the concentration that these three phthalate monomers are the main pollutants, and their contribution to the total pollution is very obvious.

As far as phthalate monomers are concerned, there is a significant correlation between DMP and DEP, DBP, DEHP, DiBP, and DMEP ($p<0.01$), while BBP, DNOP, and DBEP also have the same significance ($p<0.01$). The load factors are 25.0% and 18.0%, respectively. DMP and DEP, DBP, DEHP, DiBP, and DMEP are grouped in the first group, and BBP, DNOP, and DBEP are grouped in the second group. This indicates that DMP and DMP, DBP, DEHP, DiBP, and DMEP may come from the same pollution source, while BBP, DNOP, and DBEP may come from different pollution sources.

The PCA analysis results of the field soil are shown in Fig. 6. The data set is simplified into two main parts, and the load factors are 30.8% and 19.31%, respectively. DMP and DEP, DBP, DEHP, DiBP, and DMEP can all come from the same pollution source, while BBP, DNOP, and DBEP come from different pollution sources, which is the same result as the phthalates at the bottom of the vegetable patch.

Studies on the exchange of phthalate esters between air and soil indicate that contaminated soil may be the second source of phthalate air pollution. One of the main ways to lose phthalates in the soil is phthalates, which evaporate from the soil into the air. Compared with soil, the volatility of phthalates in soil decreases with the increase of KOW. Highly volatile phthalates (such as DEP and DMP) are far from DEHP. Since agricultural films are not used in the field, this part must be taken away from the air due to the pollution of the field of plants. The source of phthalates can be the contaminated soil of the vegetable garden and the greenhouse film used in the vegetable garden, which explains why the results of principal component analysis and field correlation analysis are similar to those of the vegetable garden of plants. However, DBP, DiBP, and DEHP are still very close, which may be caused by the use of plastic products, pesticides or wastewater irrigation. In the same area, the sources of fertilizer and irrigation water are also similar. Therefore, the sources of the above-mentioned phthalates are the same.
Impact of coastal soil pollution on microbial communities

Figure 7 shows the concentrations of eight major phthalate monomers in these three regions. The soils in different regions have different concentrations of phthalate monomers. In the S area, DMP, DEP, DBP, BBP, and DBEP showed the highest pollution level among the 8 phthalates, which is the main pollution level, followed by the three types (DEHP, DNOP, and DiBP).

As shown in Fig. 8, the soil of NW is weakly alkaline with a pH of 7.2 to 7.9. The soil in the NE area is weakly acidic-neutral-weakly alkaline, with a pH of 6.7 to 7.5. The soil pH range in S area is relatively narrow, most of which are...
concentrated in the range of 7 to 7.5, and the soil is neutral. There is no statistical difference in conductivity, and the average value in the NE range is slightly higher than the other two ranges. Based on the total organic carbon content, the NW area is 6.31–28.63gkg⁻¹, the NE area is 5.46–14.80gkg⁻¹, and the S area is 8.3–23.48gkg⁻¹. In general, in these three regions, TOC content is the highest in S region, but it is not statistically significant.

The activities of soil dehydrogenase, catalase, invertase, and urease are shown in Fig. 9, and there is no statistical difference in the dehydrogenase activities of these three regions (Fig. 9A). The catalase activity in the NW and NE
regions was significantly lower than that in the S region (Fig. 9B, \( p < 0.01 \)), while the invertase activity also showed a similar trend (Fig. 9C, \( p < 0.05 \)), and the urease activity in the NE region was significantly higher in the NW area and S area (Fig. 9D, \( p < 0.05 \)).

High-throughput sequencing showed that the relative frequency (colony level) of dominant bacteria in the crop field soil of all the analyzed objects is shown in Fig. 10.

As shown in Fig. 11, the relative frequencies of Firmicutes in the three regions are quite different, with the NE, NW, and S regions being 5.5\%, 10.1\%, and 12.0\%, respectively. The relative abundance of this strain is comparable to the concentration of pollutants showing the opposite trend, and bacteria may be involved in the degradation of phthalates in this strain.

Meta Stat analysis is used to compare the relative abundance of bacteria at the genus level in the three regions. Figure 12 shows the relative abundance distribution of the 29 best bacteria in the three regions at the above level.

As shown in Fig. 13, the division of the microbial community into three regions is consistent with the regional division, which indicates that the microbial composition is closely related to the soil characteristics. The interpretation rates of the first two CCA axes were 19.9\% and 13.9\%, respectively,
reaching 23.8% in total. Compared with soil properties and soil enzyme activities, high concentrations of DEHP and DBEP have relatively little effect on the microbial community. However, the effects of low levels of DBP and DMF on microorganisms are more obvious.

**Discussion**

**Construction of business English teaching ability index model**

On the basis of combing and analyzing the business English teaching skills indicators, combined with the research of the research team, many discussions and soliciting opinions, the content of the national university teaching development indicators is defined as 7 indicators, as shown in Table 1, the specific content is derived as follows:

First of all, teacher guidance, counseling, and consulting for students, as well as professional ethics and classroom information (such as tuition fees) indicate the attributes of the teacher’s personal or group identity that can be obtained through the actual teacher’s identity.

Secondly, there are many indicators for the development of business English teaching at home and abroad, which indicate the resources, platforms, and practices for reform in the entire learning process, such as curriculum reform in the process of business English teaching. The teaching process of business English improves the environment and creates a business English teaching platform. These resources, platforms, or reform practices in China’s current higher education practice can be regulated for various projects created to improve education and teaching reforms. This article refers to them as “education reform projects”.

Third, there are also some indicators for the development of business English teaching at home and abroad, such as teachers’ teaching concepts, knowledge, and teaching activities, with the emphasis on summarizing teachers’ teaching and learning experience or academic research. The accumulation of professors in this field is mainly reflected in “textbooks” and “dissertations”. Textbooks are valuable experience and theoretical summaries of teachers’ years of learning. Business English teaching essays are teachers’ reflections and solutions to education and classroom problems. Based on the research and practice of teaching...
reform in Chinese universities, two indicators of "curriculum design" and "learning work" have been determined.

Fourth, in terms of the development of teachers' business English teaching, teachers' personal teaching and organizational training also stand out. Therefore, this article lists the "Teacher Training Base" as an important verification indicator.

Fifth, the skills, abilities and other micro indicators of business English teaching are indispensable for the development of college business English teaching. From the perspective of constructivism, classroom business English is a process of interaction between teachers and students and the creation of learning materials. From the perspective of usability, the teacher-student competition focuses on the teaching skills of teachers in simulated learning situations, and the teacher-student competition can be used as a key indicator of this dimension. Therefore, the “teacher education competition” parameter is set in the English teaching development indicators of teacher training companies.

Finally, although the Business English Teaching Achievement Award does not reach the international level in theory, the Business English Teaching Achievement Award is a summary of the experience and performance shared by university professors in conducting business English education activities, which can reflect teachers to a large extent the effectiveness of teaching development. Therefore, the index of the achievement award category is expected, which is called the “Business English...
Teaching Achievement Award”. After determining the first-level indicators, based on the actual development of Chinese college teachers’ English teaching in the past 30 years, the second- and third-level indicators will be further improved to obtain seven indicators. In the end, 7 first-level indicators, 38 second-level indicators, and 52 third-level indicators were obtained.

**The weight determination of the business English teaching ability index model**

Each indicator reflects the development of business English teaching by university professors in one dimension. Therefore, it is necessary to determine the weight of each indicator to reflect the importance of the indicator in the index. Different experts may have different opinions on the importance of each indicator and the degree to which each indicator should be included in the index. The key to modeling is to convert people’s intuitive judgments on the importance of each indicator into the coefficient of each indicator in the model. Due to the large amount of data in the Business English Teaching Development Index database, about 380,000 data are obtained, and the data structure is not balanced, and there is a lot of extreme data. Simply using the value of each indicator may also distort the overall structure of the index. Therefore, the research team accepted the idea of modeling objective data and subjective judgments. Objective evaluation uses descriptive statistics and entropy methods, subjective evaluation mainly uses analytic hierarchy process and Delphi method, and 20 experts from the field of education and education management are invited. It is said that several rounds of opinions, expert opinions, and objective data have been passed. Iteratively, determine the weight and specific process of the teaching indicator system of the teacher development index of colleges and universities, the specific process is as follows.

1. Descriptive analysis of business English teaching data, and a general understanding of the data structure.
2. Use the EM method to calculate the internal entropy of each indicator, and understand the impact and contribution of each indicator’s data to the overall data. However, only the EM method is used, there is still a risk of technical problems, because the quantitative value of some indicators may be different from the actual value. Therefore, after using the entropy method to provide basic information, this article will refer to the calculation results of the entropy method, and use two subjective estimation methods, the DM method, and the AHP method, to change the indicator weights.
3. Use the Delphi method to obtain the total index weight. According to the concept of the business English learning development index, the approximate share of the total score of each first-level indicator comes from the subjective perception of the expert on the development of business English learning. This subjective perception will greatly affect English teaching. This article invites experts to first determine the overall weight of the Level 1 Index of Business English Teaching Development Index and write it as $\omega_t$.

4. In addition to the concept of the Business English Teaching Development Index, the importance of each item will vary due to factors such as workload, difficulty level, and the importance of teachers’ personal development. Using the AHP method, experts are required to determine the importance of each element through pairwise comparison, and each weight represented by a three-level indicator is recorded as $\omega_t$. Since experts cannot consider the internal structure of the Business English Teaching Development Index when assessing the importance of individual elements, and because the amount of data between the various metrics of the index is very different, and there are extreme values, the total weight of the evaluation is based on each the weight of the weight element (denoted as $\omega_t'$) is calculated. In the first round of evaluation, the deviation from $\omega_t'$ is large, which violates the internal structure of teachers’ learning development indicators. Therefore, continuous iterative adjustments are required. According to the difference between $\omega_t'$ and $\omega_t$, adjust the weight of each three-level indicator and the total weight of the first-level indicator until the weights of all individual indicators are consistent with the expert’s estimate. The relationship between each other and the total weight of the first-level indicator obtained by weighing each indicator at the same time basically meets the requirement $\omega_t'$, as shown in Table 2.

**Analysis of business English teaching ability index model**

1. Reliability analysis of index model in theory. the advanced training of university teachers is a systematic project. The 6+1 level 1 indicator included in the Teacher Development Index can be regarded as teaching business English to Chinese university teachers. To develop a “portrait” of all aspects, each aspect must have certain common characteristics based on its particularity in the data plane, and teachers must have a certain degree of evaluation of each aspect of curriculum development. Correlation. In order to investigate this issue, the research team standardized the ranking of each index of each
university and calculated the correlation between the first-level indexes, as shown in Table 3. The results show that the correlation between each level 1 index is very significant. The Kendall correlation coefficient is between 0.348 and 0.677, which essentially shows a medium correlation, which indicates that index is at the same time for the various parameters of university professors’ development. They also have their own independence and correspond to theoretical assumptions. In addition, the reliability indicators of the model need to be considered. These indicators are represented by internal consistency or halved reliability. The so-called internal consistency refers to the degree of consistency between multiple metrics used to test the same concept. The so-called Cronbach $\alpha$ coefficient is widely used in testing, and it is generally believed that its internal consistency coefficient is greater than 0.7, which indicates that the measurement instrument has high reliability. The so-called halving reliability refers to the correlation between the scores of all subjects on the two halves after the test is divided into two equal halves. The higher the level, the higher the reliability. The internal consistency coefficient and halving reliability of all measures were calculated separately, and it was found that the internal consistency coefficient and halving coefficient of all other indicators were greater than 0.7 except for training costs, which met the measurement requirements. In business English training, the internal consistency coefficient is 0.676, while the half of the reliability is reduced to 0.693, which is close to 0.7, which is basically the same as the survey requirements.

(2) Validation analysis of business English level: validity is an evaluation of the degree of test measurement characteristics. This article uses content validity and standard-related validity to test the validity of the index model. Regarding the credibility of the content, because the data collected for all indicators in the index is objective data, and each indicator is set after several rounds of expert discussions and demonstrations, the content’s availability is guaranteed to a large extent. Reliability: the correlation effectiveness of a criterion refers to the degree of correlation between a measurement and other criteria used for predictive quantitative characteristics, usually expressed as the correlation between research indicators and criterion indicators. The development of business English teaching is complex system engineering, and all subsystems are interrelated. To some extent, the development level of college teachers is part of the overall performance of the school. It may be more practical to use university ranking data as a benchmark to verify the teacher development index. This article analyzes the Kendall correlation coefficients between the business English teaching indicators and the three ranking data. They all reach a very significant level, which shows that the model is the development status of

### Table 2

| Serial number | First level indicator       | Percentage |
|---------------|----------------------------|------------|
| 1             | Teacher team               | 26%        |
| 2             | Educational Reform Project | 28%        |
| 3             | Textbook item              | 10%        |
| 4             | Teaching Paper             | 5%         |
| 5             | Teaching Achievement Award | 24%        |
| 6             | Teacher training base      | 2%         |
| 7             | Teacher Teaching Competition | 5%       |

### Table 3

| Index                     | Teacher team | Educational Reform Project | Textbook item | Teaching Paper | Teaching Achievement Award | Teacher training base | Teacher Teaching Competition |
|---------------------------|--------------|-----------------------------|---------------|----------------|---------------------------|-----------------------|-----------------------------|
| Teacher team              | 1            |                             |               |                |                           |                       |                             |
| Educational Reform Project| 0.677**      | 1                           |               |                |                           |                       |                             |
| Textbook item             | 0.498**      | 0.582                       | 1             |                |                           |                       |                             |
| Teaching Paper            | 0.404**      | 0.501**                     | 0.370         | 1              |                           |                       |                             |
| Teaching Achievement Award| 0.580**      | 0.589**                     | 0.4921**      | 0.390**        | 1                         |                       |                             |
| Teacher training base     | 0.493**      | 0.436**                     | 0.415**       | 0.480**        | 0.495**                   | 1                     |                             |
| Teacher Teaching Competition| 0.485**   | 0.564**                     | 0.357**       | 0.387**        | 0.376**                   | 0.348**               | 1                           |
Conclusion

This paper studies and summarizes the deep feature fusion classification technology to understand the basic operation of deep text feature fusion, as well as its working principle and the performance of related algorithms. There are more algorithms to choose from in complex deep merging problems. At the same time, the semantic features of the text are extracted respectively, and then the two parts of the semantic features are used to classify deep learning web pages based on the important tags in the text semantics and other web page tags. After merging the two parts of the text, the general merging of the vectorized splicing and the deep feature fusion to create the text semantics will lead to the correlation and divergence of feature linearity and feature sparsity. The innovative research on the teaching methods of business English in Chinese universities in the new era aims to further improve the business of Chinese universities in the new era. This article, through research, understands the problems and their causes, deeply studies the principles and system structure of innovation in business English teaching, and comprehensively analyzes the real situation of business English teaching for Chinese college students in the new era. Chinese universities in the new era provide theoretical support and practical guidance to promote innovative business English teaching methods for students in the new era. This article examines the teaching methods of business English in Chinese universities in the new era from the aspects of overall education, the development of the business English teaching system and the teaching level of Chinese universities in the new era. This article takes farmland soil in a certain area of China as the research object, and uses ultrasonic extraction and GC-MS technology to study the pollution of 16 phthalate esters in facilities, field soils and agricultural supplies. In order to clarify the main pollutants and pollution sources based on high-throughput sequencing and related statistical analysis, this article explores the impact of phthalates on the microbial community of typical vegetable beds and the impact of different planting methods on the response of neighboring plants. Vegetable fields are the main source of phthalate pollution. The concentration of certain phthalates in field soil is the same as or even higher than that in vegetable fields, and pollution cannot be ignored. The distribution and regularity of phthalates in agricultural soils in this area have obvious regional characteristic and are related to agricultural resources and agricultural practices. This unity is reflected in the fact that for certain major pollutants, monomers with higher KOW and longer chain branched phthalates, such as DEHP and DNOP, which are more toxic, have the same reaction law. The purpose of DEHP is inhibition, while the purpose of DNOP is excretion. The difference is that the soil of vegetable fields is more sensitive to short-chain branched phthalates than fields. The field soil may also be related to the types of crops (such as wheat) that constitute the soil plants, and the microbial system is more sensitive to DBP.

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**Declarations**

**Competing interests** The authors declare no competing interests.

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