

Retraction

Retracted: Application of Deep Neural Network Algorithm in the Analysis of Legal Precedent Citation Basis

Mobile Information Systems

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] Y. Xie, "Application of Deep Neural Network Algorithm in the Analysis of Legal Precedent Citation Basis," *Mobile Information Systems*, vol. 2022, Article ID 3383428, 5 pages, 2022.

Research Article

Application of Deep Neural Network Algorithm in the Analysis of Legal Precedent Citation Basis

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In order to improve the retrieval efficiency of civil litigation cases, the research introduces the fuzzy neural network algorithm and constructs a targeted retrieval algorithm system. In the simulation verification, it is found that, in the artificial subjective evaluation results of the expert group, the comprehensive score of reference cases given by the retrieval scheme exceeds the level of reference cases in the cases promoted and studied by the Supreme Court. The use of this scheme can effectively save the preparation time of prelitigation documents and help to improve the fairness and justice of the court trial process. It is proved that the retrieval scheme has certain popularization value.

1. Introduction

Since the operation of the case guidance system, the academic circles have been arguing about the effectiveness, creation, and application of guiding cases. Based on the awareness of these problems, Xie systematically responded to these practical problems in commenting on Professor Wang Bin's new book case guidance and legal methods [1]. In the civil law system, precedent is an informal source of law. Except for individual cases, precedent is not recognized as binding in theory. In the common law system, case law is a formal source of law. Case law refers to the judgment that can be invoked as a legal basis after being confirmed by the competent authorities in some countries. The detailed interpretation is also called "case". The court may invoke the judgment as the basis for hearing similar cases [2]. The judicial interpretation of specific cases by the Supreme Court of China plays a similar role to the precedents of common law countries.

Case retrieval is a complex, systematic, and cumbersome work. We should find the content we really want to know from tens of thousands of judgment documents. Case retrieval engines in relevant literature emerge in endlessly. Relying on a single search engine cannot fully provide the information people need [3]. Therefore, a software or

website is needed to seamlessly integrate various search engines, so the intelligent search engine is also born. In addition to providing traditional functions such as fast retrieval and relevance ranking, it can also provide functions such as user role registration, automatic identification of user interests, semantic understanding of content, intelligent information filtering, and push.

2. Practical Significance of Precedents to Chinese Courts

Litigation act, also known as litigation activity, refers to the legal act that can produce litigation effect, which is carried out by the judicial organ and the litigants according to the procedure established in accordance with the law, including the filing, investigation, prosecution, detention, arrest, and trial of criminal cases by judicial organs, accept, investigate, collect evidence, and mediate civil cases, as well as the parties' prosecution, response, provision of evidence, debate, or defense. The above logic is shown in Figure 1.

In Figure 1, the Chinese courts now adopt the interrogation system. The presiding judge directs all trials. The presiding judge collects evidence and tracks down crimes according to his rights and listening to the defense lawyers of both sides. The lawyers of both parties shall defend

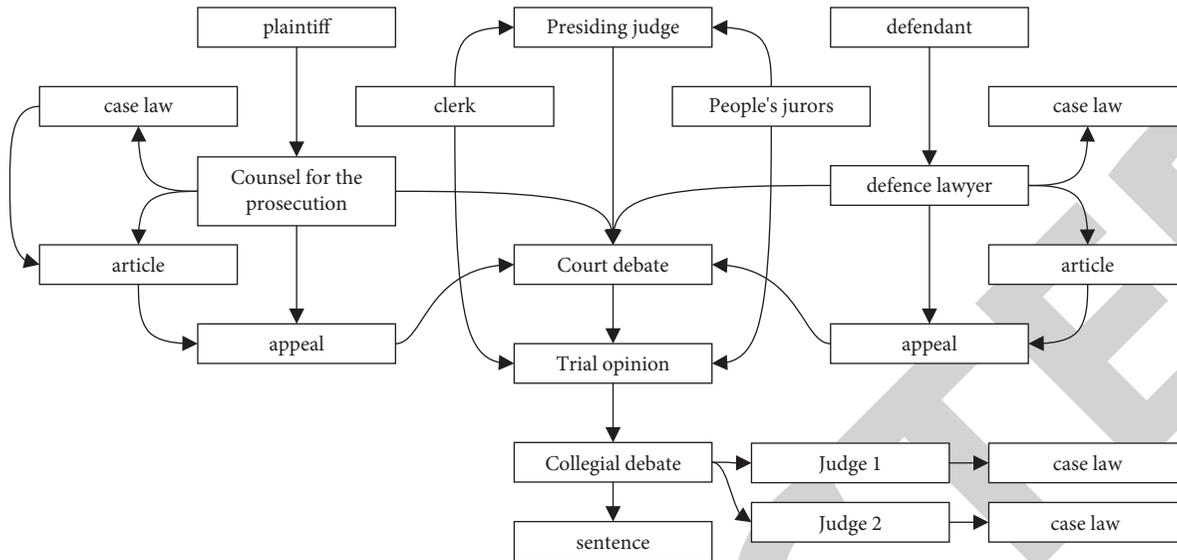


FIGURE 1: Schematic diagram of case citation process in Chinese court trial process.

according to the laws and regulations involved in the case and the case, and the presiding judge shall read out the judgment after hearing the opinions of both parties and deliberating by the collegial panel [4]. In the process of defense, lawyers provide evidence and put forward case reference, respectively, and the debate center focuses on the applicability of case law of both sides. If a lawyer cannot find a more applicable and new case law in the process of case preparation, he will be at a disadvantage in court debate. The case law system requires that the legal norms formed in the previous judgment must be followed in similar cases, that is, the norms in the previous case must be used to try and judge the case [5]. The legal provisions and trial logic quoted in the case law are of decisive significance in the Chinese court debate in which there is no jury and the presiding judge directly issues the trial opinion or even the judgment result [6].

In the case citation, it focuses on the demands of both sides of the case and their trial logic. Before entering the court debate, the lawyers of both sides cannot effectively obtain the debate direction of the other party, so they need to sort out a number of possible applicable cases [7]. Therefore, the design goal of the algorithm is to retrieve cases with higher coupling in the legal document network, rather than simply searching according to keywords. The judges of the collegial panel also need to cite precedents as arguments in the debate of the collegial panel, so their search needs for case-related precedents are basically the same as those of lawyers of both sides.

At present, there are about 12 million optional documents of actual cases in the legal document network, including criminal litigation, civil litigation, mediation and arbitration outside the office, and enforcement documents. If only keyword query is used, a large number of invalid search results will be produced. At present, the legal

document network provides advanced search options, but it is limited to the query conditions such as plaintiff, defendant, presiding judge, judicial unit, and document time, which cannot realize the query of specific demands. As analyzed above, lawyers of both parties and judges of the collegial panel need to search the case trial logic, which cannot be realized in the conventional search function.

That is, the retrieval requirement is applied to the ability of robot algorithm to understand nonstandard text, but the technology of this ability is not mature in the current research of robot algorithm. Therefore, this research selects the special text recognition scheme of small-scale neural network, which does not require the robot algorithm to understand the text, but provides the feature field extraction of semistandardized text. That is, the overall format of legal documents is basically the same. Key fields are extracted in a relatively fixed format to form a standardized arrangement of semistandardized text and a retrieval process with keyword attribute marking algorithm as the core algorithm.

3. Case Retrieval Algorithm Based on Neural Network

3.1. Nonstandardized Data Identification of Case Documents. Intelligent prosecution is a hot issue in recent years, and similar case retrieval is the basic requirement of public legal service module in intelligent prosecution. The traditional keyword-based retrieval method limits the similarity of cases to the superficial word level, which cannot meet the retrieval needs of users at the article and semantic level [8]. The “core” of case retrieval is the keyword, which is the label of our needs. The ideal keyword should ensure that all the information we need should include this demand label. A complete case file can use “natural person name,” “legal person name,” “lawsuit claim,” “defense opinion,”

“judgment result” as the extracted keywords, “Name of natural person,” and “name of legal person” can extract the identity information of natural person and legal person and clarify the subject in the case. “Judgment result” extracts the reference result, execution result, and appeal/protest result of the law article. The reference result of the law article can retrieve the reference times, file number, and judgment time in the document, make the retrieval content more concise and clear at a glance, and give the document closest to the user’s needs [9]. The above requirements are shown in Figure 2:

In Figure 2, by sorting out the data extracted from the text, four fields are set for each line of data, including field meaning (plaintiff’s name, defendant’s name, appeal, opinion, judgment, etc.), field serial number pointer (32 bit integer pointer variable), start character pointer (16 bit integer pointer variable), and end character pointer (16 bit integer pointer variable). Multiple rows of records containing the above four fields constitute the preliminary query results. If a case contains multiple plaintiffs or defendants, it can be reflected in the above records. The retrieval process will be realized by multicolumn neural network. Each forward certain pointer step of the case document will trigger a judgment, as shown in Figure 3, and each judgment will form a row of records containing the above four fields.

In Figure 3, the meaning of fuzzy neural network is to convert multiple input data into a double precision variable. The input data are a character sequence of string. No matter what coding is adopted, each character sequence can be forcibly transformed into integer variables, and integer variables can be forcibly transformed into floating-point double precision variables. Assuming that the step size in the above string generation process is 500 characters, the input layer of each fuzzy neural network is 500 input nodes, and one double precision variable is output after depth iteration. After the variable is defuzzified, it directly forms the value of the corresponding field, especially the field meaning part, and sets the landing point interval of the double precision variable to correspond to the corresponding field meaning. Therefore, the above four variables are numerical variables after sorting.

Polynomial depth iteration function is selected for the above fuzzy neural network nodes:

$$y = \sum_{i=1}^n \sum_{j=0}^5 A_j x_i^j, \quad (1)$$

where y is the output value of neural network node, x_i^j is J -order polynomial of the i th node result input to the upper neural network, A_j is the coefficient to be regressed of the j th order polynomial, and N is the total number of nodes of the upper layer neural network.

In the process of defuzzification, the linear weight method is used to defuzzify by multiplying the result value output by the fuzzy neural network by the fixed weight coefficient; that is, the double precision variable on the [0,1] interval output by the fuzzy neural network is multiplied by n to adjust the landing point interval to [0, n].

3.2. Similarity Comparison of Case Documents. Through the string array generated by the above algorithm, the algorithm realizes the comparison between A document and B document. Because the current file has not been tried, it only contains some elements such as the indictment. Therefore, the conventional comparison method cannot compare its consistency; that is, it belongs to the comparison algorithm between incomplete data. The algorithm is shown in Figure 4.

The numerical matrix formed by the two comparison modules in Figure 4 is a 4-row n -column matrix, and each element is a numerical variable. The specific numerical significance has been discussed above. In the comparison module of the two matrix inputs, the comparison module selects the log depth iterative regression algorithm to construct the neural network node, and the double precision variables’ output by the comparison module is processed by the binary module composed of the binary algorithm node to form the final output result.

The basis function of logarithmic iterative regression algorithm used in the comparison module is shown as

$$y = \sum_{i=1}^n (A \cdot \log x_i + B), \quad (2)$$

where A and B are variables to be regressed. See formula (1), for the meaning of other mathematical symbols.

The basis function of the binarization algorithm used in the binarization module is shown as

$$y = \sum_{i=1}^n \frac{1}{A \cdot e^{x_i} + B}, \quad (3)$$

where e is the natural constant, and the approximate value here is $e=2.7182818$. See formulas (1) and (2), for the meanings of other mathematical symbols.

The output result after binarization is a double precision variable, located in the interval [0,1] and infinitely close to 0.000 or 1.000. When the result is close to 1.000, it is considered that the two case documents are similar, and when the result is close to 0.000, it is considered that the two case documents are not similar. Search according to the comparison results, that is, instead of setting search keywords, directly input the indictment, directly sort all the retrieved documents in reverse order using the algorithms in Figures 3 and 4, and select the case file with the closest result of 1.000 for manual judgment.

4. Simulation Test of Algorithm Efficiency of Neural Network Retrieval Algorithm

The simulation environment selects *Python* simulation platform, takes 12 million data in the legal document network as the retrieved data, selects 200 classic cases recommended by the supreme law from January 2018 to December 2020 as the research object, inputs their indictments in the case search to search for reference cases, and uses the expert group manual evaluation method to judge the coupling degree between the search result cases and the

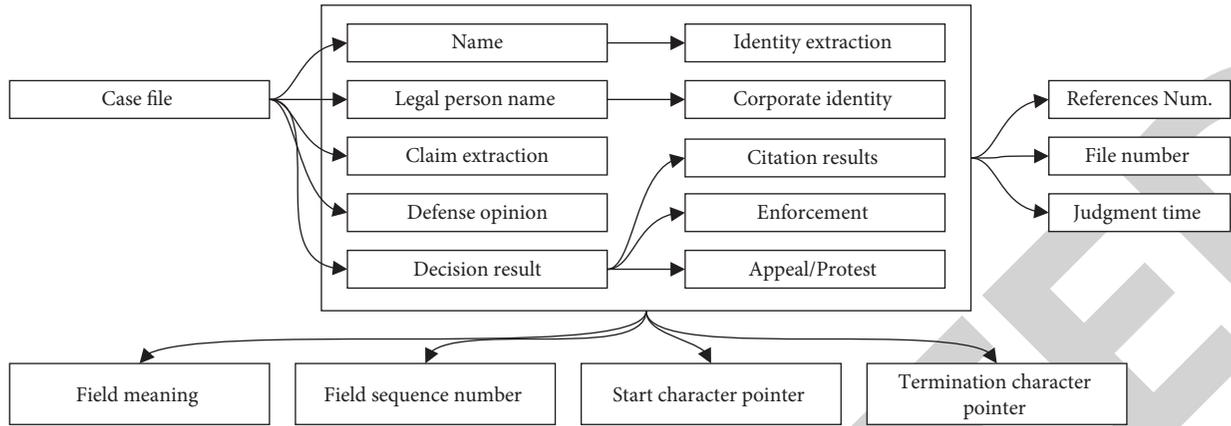


FIGURE 2: Schematic diagram of machine learning decomposition requirements of case documents.

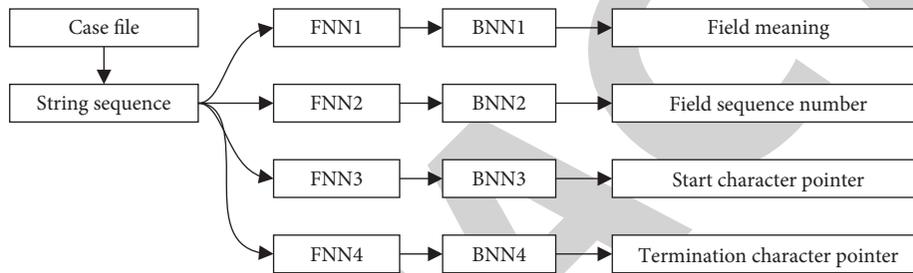


FIGURE 3: Logic architecture of multicolumn fuzzy neural network (FNN) algorithm.

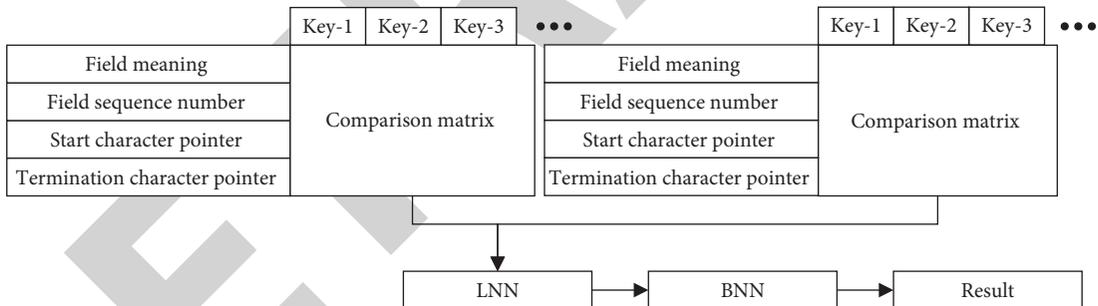


FIGURE 4: Logical architecture of document comparison algorithm.

actual cases. Fifty members of the expert group, all lawyers with more than 10 years of civil litigation experience and practitioners teaching law in Colleges and universities, are given a score in the form of subjective evaluation, with a full score of 10 and a minimum score of 0. The reference group is the case actually cited in the court debate, which is also scored by the above 50 experts. The scores of the two groups are calculated as the arithmetic average value, which is included in Table 1.

In Table 1, the highest score is the mean value of the highest score in all cases, the lowest score is the mean value of the lowest score in all cases, the average score is the mean value of all scores in all cases, and the standard deviation is the quotient of the sum of the difference between each specific score and the average score and the total number of cases. The data show that the manual evaluation scores of the

first 10 cases given by the system are higher than the original scores of the reference group. Even for the cases recommended by the supreme law, there is still much room for improvement in their internal case citations. If the case level recommended by the supreme law is reached, the algorithm has the ability to retrieve at least 20 available cases out of 12 million cases.

After evaluating the example, the expert group conducted a simulated court experiment on the above 200 cases, asked the expert group as a lawyer group to sort out the case data based on traditional keyword retrieval, calculated the working hours, and used the algorithm to sort out the case data based on neural network, and the comparison results are shown in Table 2:

In Table 2, the evaluation method of the search results is the same as that in Table 1. The total search time is the sum of

TABLE 1: Statistical table of subjective scoring results of the expert group.

Comparison items	Highest score	Lowest score	Average	Standard deviation
Reference group	7.89	5.72	7.24	0.52
Top 5	8.46	7.03	8.02	0.75
Top 10	8.12	5.83	7.45	0.71
Top 20	7.73	5.54	7.13	0.63

TABLE 2: Statistics of comparison results of data retrieval efficiency.

Comparison items	Total hours (h)	Response time (MS)	Evaluation of results
Keyword retrieval method	124	354	6.24
Neural network retrieval method	52	695	7.95

the actual material preparation time of the lawyer group in the mock court, calculated in hours (h). The search response time is the time spent from entering the search conditions to returning the search results to the system. The data show that although the neural network retrieval method takes a long time to retrieve each time, the actual man hour occupation is short, and the subjective evaluation results of the expert group on the prosecution or response materials are also high. It is proved that the neural network retrieval algorithm has high retrieval efficiency, less retrieval times, and high coupling of retrieval results.

5. Summary

The case oriented neural network retrieval algorithm formed by multicolumn fuzzy neural network shows high retrieval efficiency in simulation and demonstration and proves that its practical operability is much higher than the manual retrieval results of senior practitioners. After using this algorithm for case retrieval, it can save more prelitigation preparation time for lawyers of both sides and is of positive significance to improve the objectivity of court debate. However, the algorithm still has the disadvantages of long system response time and high requirements for big data system examples in the retrieval process. The follow-up research will be targeted and in-depth research will be carried out.

Data Availability

The data underlying the results presented in the study are available within the article.

Disclosure

The authors confirm that the content of the manuscript has not been published or submitted for publication elsewhere.

Conflicts of Interest

There are no potential conflicts of interest in our paper.

Authors' Contributions

All authors have seen the manuscript and approved to submit for publication.

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