
METHOD AND DEVICE OF CONSTRUCTING MEDICAL DATABASE, COMPUTING DEVICE AND STORAGE MEDIUM

CROSS-REFERENCE TO RELATED APPLICATION

5 **[01]** The present application declares priority of the Chinese patent application with number 201910883391.9, filed on September 18, 2019, entitled “method and device of constructing medical database, computing device and storage medium”. Entire content of the Chinese patent application is incorporated in the present application by reference.

TECHNICAL FIELD

10 **[02]** The present application relates to a field of data processing technologies, in particular to a method and a device of constructing a medical database, a computing device and a computer-readable storage medium.

BACKGROUND

15 **[03]** A medical database is of a great value to a construction and a development of medical institutions. At present, the existing medical database is established based on a recommendation scheme of an auxiliary treatment recommendation system, the auxiliary treatment recommendation system is a system that can improve and enhance the efficiency of clinical decision-making through a way of the human-computer interaction.

20 **[04]** In the process of researching the present application, the applicant found that the existing treatment recommendation system directly realizes medication recommendation based on a medical guideline, which having poor robustness and inaccurate medication recommendation, which leads to a relatively low accuracy of the medical database established in the prior art.

SUMMARY

25 **[05]** The objective of the present application provides a method and a device of constructing a medical database, a computing device and a computer-readable storage medium, which can provide a more accurate medical database.

[06] One aspect of the present application provides a method of constructing a medical

database, including: receiving a symptom characteristic group input by a user, wherein the symptom characteristic group comprises several symptom characteristics; determining whether the symptom characteristic group covers N necessary symptom characteristics; when the symptom characteristic group covers the N necessary symptom characteristics, inputting the symptom characteristic group into a pre-established decision tree model; when the symptom characteristic group doesn't cover the N necessary symptom characteristics, selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom characteristic group meets a similarity rule, and inputting the several characteristic trajectories selected into the decision tree model, wherein, the characteristic trajectories comprise the N necessary symptom characteristics, and N is an integer greater than or equal to 1; selecting a medication regimen output by the decision tree model, and recommending the medication regimen to the user; obtaining a score of the user on the medication regimen, and adding a solution case to the medical database, wherein the score of the solution case reaches a score threshold; wherein, when the symptom characteristic group covers the N necessary symptom characteristics, the solution case comprises the symptom characteristic group and the medication regimen, and when the symptom characteristic group doesn't cover the N necessary symptom characteristics, the solution case comprises the symptom characteristic group, the several characteristic trajectories selected, and the medication regimen.

[07] Another aspect of the present application provides a device of constructing a medical database, including: a receiving module, receiving a symptom characteristic group input by a user, wherein the symptom characteristic group comprises several symptom characteristics; a determining module, determining whether the symptom characteristic group covers N necessary symptom characteristics; a first processing module, when the symptom characteristic group covers the N necessary symptom characteristics, inputting the symptom characteristic group into a pre-established decision tree model; a second processing module, when the symptom characteristic group doesn't cover the N necessary symptom characteristics, selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom characteristic group meets a similarity rule, and inputting the several characteristic trajectories selected into the decision tree

model, wherein, the characteristic trajectories comprise the N necessary symptom characteristics, and N is an integer greater than or equal to 1; a recommending module, selecting a medication regimen output by the decision tree model, and recommending the medication regimen to the user; an adding module, obtaining a score of the user on the medication regimen, and adding a solution case to the medical database, wherein the score of the solution case reaches a score threshold; wherein, when the symptom characteristic group covers the N necessary symptom characteristics, the solution case comprises the symptom characteristic group and the medication regimen, and when the symptom characteristic group doesn't cover the N necessary symptom characteristics, the solution case comprises the symptom characteristic group, the several characteristic trajectories selected, and the medication regimen.

[08] Another aspect of the present application provides a computing device, the computing device including: a memory, a processor, and computer programs that are stored in the memory and operable executed by the processor, wherein when the computer programs are executed by a processor, the following steps are implemented: receiving a symptom characteristic group input by a user, wherein the symptom characteristic group comprises several symptom characteristics; determining whether the symptom characteristic group covers N necessary symptom characteristics; when the symptom characteristic group covers the N necessary symptom characteristics, inputting the symptom characteristic group into a pre-established decision tree model; when the symptom characteristic group doesn't cover the N necessary symptom characteristics, selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom characteristic group meets a similarity rule, and inputting the several characteristic trajectories selected into the decision tree model, wherein, the characteristic trajectories comprise the N necessary symptom characteristics, and N is an integer greater than or equal to 1; selecting a medication regimen output by the decision tree model, and recommending the medication regimen to the user; obtaining a score of the user on the medication regimen, and adding a solution case to the medical database, wherein the score of the solution case reaches a score threshold; wherein, when the symptom characteristic group covers the N necessary symptom characteristics, the solution case comprises the symptom characteristic group and the

medication regimen, and when the symptom characteristic group doesn't cover the N necessary symptom characteristics, the solution case comprises the symptom characteristic group, the several characteristic trajectories selected, and the medication regimen.

[09] Another aspect of the present application provides a computer-readable storage medium, which stores computer programs that upon, wherein, the computer programs are executed by a processor, the following steps are implemented: receiving a symptom characteristic group input by a user, wherein the symptom characteristic group comprises several symptom characteristics; determining whether the symptom characteristic group covers N necessary symptom characteristics; when the symptom characteristic group covers the N necessary symptom characteristics, inputting the symptom characteristic group into a pre-established decision tree model; when the symptom characteristic group doesn't cover the N necessary symptom characteristics, selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom characteristic group meets a similarity rule, and inputting the several characteristic trajectories selected into the decision tree model, wherein, the characteristic trajectories comprise the N necessary symptom characteristics, and N is an integer greater than or equal to 1; selecting a medication regimen output by the decision tree model, and recommending the medication regimen to the user; obtaining a score of the user on the medication regimen, and adding a solution case to the medical database, wherein the score of the solution case reaches a score threshold; wherein, when the symptom characteristic group covers the N necessary symptom characteristics, the solution case comprises the symptom characteristic group and the medication regimen, and when the symptom characteristic group doesn't cover the N necessary symptom characteristics, the solution case comprises the symptom characteristic group, the several characteristic trajectories selected, and the medication regimen.

[10] The method of constructing a medical database provided by the present application outputs a use-case scenario through a pre-established decision tree model, when a symptom characteristic group input by the user covers N necessary symptom characteristics that must be input to the decision tree model, inputs the symptom characteristic group into the decision number model directly, when the symptom characteristic group does not cover the N necessary symptom characteristics that must be input to the decision tree model, selects several

characteristic trajectories whose similarity with the symptom characteristic group meets a similarity rule to input to the decision tree model and selects one use-case scenario output by the decision tree model, and recommends the use-case scenario to the user, when a user's score for the use-case scenario reaches a score threshold, it indicates that the accuracy of the use-case scenario is high, based on this, a solution case can be formed and added to the medical database to improve the accuracy of medical database. Through the method of constructing the medical database provided by the present application, a relatively accurate medical database can be constructed, the medical database is stored, organized, managed and used in the form of a collection of professional knowledge in a computer memory according to the requirement for solving problems in the professional field, and compared with the prior art medication recommendations are determined by traversing a knowledge graph, the present application outputs medication recommendations quickly by using a decision tree, which improves the processing speed of the computer processor.

BRIEF DESCRIPTION OF THE DRAWINGS

[11] By reading the detailed description of the preferred embodiments below, various other advantages and benefits will become clear to those ordinary skilled in the art. The drawings are only used for the purpose of illustrating the preferred embodiments, and are not considered as a limitation to the present application. Also, throughout the drawings, the same reference symbols are used to denote the same components. In the drawings:

[12] FIG. 1 schematically shows a flowchart of a method of constructing a medical database according to an embodiment of the present application;

[13] FIG. 2 schematically shows a block diagram of a device of constructing a medical database according to an embodiment of the present application;

[14] FIG. 3 schematically shows a block diagram of a computing device suitable for implementing a method of constructing a medical database according to an embodiment of the present application.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[15] In order to make the objectives, technical solutions, and advantages of the present

application clearer, the following further describes the present application in detail with reference to the accompanying drawings and embodiments. It should be understood that the specific embodiments described here are only used to explain the present application, and not used to limit the application. Based on the embodiments in the present application, all other
5 embodiments obtained by those ordinary skilled in the art without creative work shall fall within the protection scope of the present application.

[16] It should be noted that in this article, the terms “including”, “comprising” or any other variants thereof are intended to cover non-exclusive inclusion, so that a process, method, article or device including a series of elements not only includes those elements, also includes other
10 elements not explicitly listed, or elements inherent to the process, method, article, or device. If there are no more restrictions, the element defined by the sentence “including a...” does not exclude the existence of other same elements in the process, method, article or device that includes the element.

[17] The method of constructing a medical database provided by the present application,
15 outputs a use-case scenario through a pre-established decision tree model, when a symptom characteristic group input by the user covers N necessary symptom characteristics that must be input to the decision tree model, inputs the symptom characteristic group into the decision number model, directly, when the symptom characteristic group does not cover the N necessary symptom characteristics that must be input to the decision tree model, selects several
20 characteristic trajectories whose similarity with the symptom characteristic group meets a similarity rule to input to the decision tree model and selects one use-case scenario output by the decision tree model, and recommends the use-case scenario to the user, when a user’s score for the use-case scenario reaches a score threshold, it indicates that the accuracy of the use-case scenario is high, based on this, a solution case can be formed and added to the medical database
25 to improve the accuracy of medical database. Through the method of constructing the medical database provided by the present application, a relatively accurate medical database can be constructed, the medical database is stored, organized, managed and used in the form of a collection of professional knowledge in a computer memory according to the requirement for solving problems in the professional field, and compared with the prior art medication
30 recommendations are determined by traversing a knowledge graph, the present application

outputs medication recommendations quickly by using a decision tree, which improves the processing speed of the computer processor.

[18] FIG. 1 schematically shows a flowchart of a method of constructing a medical database according to an embodiment of the present application. As shown in FIG. 1, the method of constructing the medical database includes steps S101 to S106, wherein:

[19] Step S101, receiving a symptom characteristic group input by a user, wherein the symptom characteristic group includes several symptom characteristics.

[20] The user inputs several symptom characteristics in an interactive interface according to sickness symptoms, and the several symptom characteristics input by the user are taken as the symptom characteristic group. For example, the symptom characteristic group includes: age 30, weight 47kg, blood sugar 7.2 16mmol/L.

[21] Step S102, determining whether the symptom characteristic group covers N necessary symptom characteristics.

[22] The N necessary symptom characteristics are preset in the interactive interface, such as five necessary symptom characteristics: age, height, weight, blood lipids, and blood sugar. When the symptom characteristic group covers the N necessary symptom characteristics, step S103 is executed, when the symptom characteristic group doesn't cover the N necessary symptom characteristics, step S104 is executed.

[23] Step S103, inputting the symptom characteristic group into a pre-established decision tree model.

[24] The decision tree model is used to output a medication regimen based on the input symptom characteristic group. Of course, before that, the decision tree model is required to be established first, specifically, a decision tree is trained according to taking historical solution cases of historical users as a training set, and the decision tree is trained through real solution cases to make the accuracy of an output result of the decision tree model far better than the existing technology. The method of constructing the medical database also includes:

[25] obtaining the historical solution cases of multiple historical users, wherein the historical solution cases include historical check items, historical check values, and historical medication regimens;

[26] training the decision tree by using the historical solution cases to obtain the decision tree

model.

[27] Wherein, the historical check items and the historical check values are used as inputs, the historical medication regimens are used as outputs, and the inputs and the outputs as the historical solution cases are used as a training sample to train the decision tree to obtain the decision tree model. The historical check item is, for example, blood sugar, and the historical check value is, for example, the value of the blood sugar. In addition, the inputs also include: basic information, disease history, and medication history of the historical user, and the basic information is, for example, age, gender, height, weight and so on.

[28] In order to ensure the accuracy of the output of decision number model, after the decision tree model is constructed, the decision tree model can be revised. Specifically, the method further includes:

[29] revising the decision tree model according to a preset rule;

[30] wherein, the revising the decision tree model according to a preset rule, comprises:

[31] when a first path between a root node and a leaf node of the decision tree model is inconsistent with the preset rule, setting a probability of the first path to be zero;

[32] when a second path between the root node and the leaf node of the decision tree model is consistent with the preset rule, retaining a probability of the second path;

[33] when a third path between the root node and the leaf node of the decision tree model does not exist in the preset rule, retaining a probability of the third path.

[34] In the embodiment, the preset rule can be obtained by combing out medical books or authoritative expert opinions, taking medical books as an example, the combing method is illustrated. For example, the method also includes:

[35] extracting related feature variables, operators, thresholds and medical conclusions in medical books;

[36] constructing the preset rule by using the feature variables, the operators, and the thresholds as input conditions, and using the medical conclusions as output results.

[37] Wherein, the feature variables are specific features, such as age and blood sugar, the operators are “<”, “=” and so on, and the thresholds are the values corresponding to the feature variables, such as 35 years old and 7.2 16mmol/L. The medical conclusions are the medication regimens recommended in medical books. For example, a certain preset rule is:

users who are less than 35 years old and whose blood sugar is 7.2 16mmol/L are recommended to take metformin.

[38] Further, traversing all paths of the decision tree and performing the following operations: when traversing a path is inconsistent with the preset rule, taking the path that is inconsistent with the preset rule as the first path, and setting the probability of the first path to zero, that is, deleting the first path in the decision tree model; when traversing the path is consistent with the preset rule, taking the path that is consistent with the preset rule as the second path, and retaining the probability of the second path, that is, confirming that the features included in the second path in the decision tree model correspond to the medication regimen correctly; when traversing the path does not exist in the preset rule, taking the path that does not exist in the preset rule as the third path, and retaining the probability of the third path.

[39] Step S104, selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom characteristic group meets a similarity rule, and inputting the several characteristic trajectories selected into the decision tree model, wherein, the characteristic trajectories include the N necessary symptom characteristics, and N is an integer greater than or equal to 1.

[40] Each of the characteristic trajectories can also be obtained by fitting a historical check item and a historical check value of a certain historical user at a certain time, when fitting, the features can be fitted in a predetermined order, such as, age is the first and gender is the second and so on. For all the characteristic trajectories obtained by fitting, clustering can also be performed, and one characteristic trajectory is selected for each category. For example, there are X samples, each sample includes the historical check item and the historical check value of a historical user at a certain time, and each sample has Y features, that is, there are Y historical check items and the historical check values corresponding to each of the historical check items, the Y features of each sample are fitted into a Polyline in the predetermined order to obtain one characteristic trajectory, X characteristic trajectories are clustered into M categories, and one characteristic trajectory is selected from these characteristic trajectories belonging to each category as a representative of each category. For example, there are 3 categories, the first category is that the age is less than or equal to 25 years old, the second category is that the age is greater than 25 years old and less than or equal to 50 years old, and the third category is that

the age is greater than 50 years old.

[41] All the characteristic trajectories clustered are regarded as the characteristic trajectory group, and several characteristic trajectories whose similarity with the symptom characteristic group meets the similarity rule are selected, such as, the characteristic trajectory with the maximum similarity is selected, two characteristic trajectories with the maximum similarity are selected, and so on, specifically, the selecting several characteristic trajectories whose similarity with the symptom characteristic group meets the similarity rule from the pre-fitted characteristic trajectory group includes: calculating a Euclidean distance between each of the characteristic trajectories in the characteristic trajectory group and the symptom characteristic group to obtain a Euclidean distance group; selecting several characteristic trajectories sequenced before a preset position from the Euclidean distance group. Wherein, the several characteristic trajectories can be one characteristic trajectory or multiple characteristic trajectories.

[42] Specifically, for each characteristic trajectory in the characteristic trajectory group, the Euclidean distance between each symptom characteristic in the symptom characteristic group and a feature corresponding to the characteristic trajectory is calculated, and Euclidean distances calculated are summed to obtain the Euclidean distance between the symptom characteristic group and the characteristic trajectory. That is:

$$D_j = \sum_{i=0}^n \rho$$

[43]

[44] Wherein, D_j represents the Euclidean distance of the j-th characteristic trajectory, n is the total number of symptom characteristics in the symptom characteristic group, i represents the i-th symptom characteristic, and ρ represents the Euclidean distance between the i-th symptom characteristic in the symptom characteristic group and a corresponding feature in the j-th characteristic trajectory.

[45] Further, the Euclidean distance is sequenced, such as sequenced from small to large, then several characteristic trajectories sequenced before the second position are one characteristic trajectory corresponding to the minimum Euclidean distance. For another example, sequenced from small to large, the several characteristic trajectories sequenced before the third position are

one characteristic trajectory corresponding to the minimum two Euclidean distances, that is, two characteristic trajectories can be selected.

[46] The several characteristic trajectories selected are sequentially input into the decision tree model to obtain several medication regimens, and each characteristic trajectory corresponds to a medication regimen.

[47] Step S105, selecting a medication regimen output by the decision tree model, and recommending the medication regimen to the user.

[48] Whether only one medication regimen obtained according to the step S103 or several medication regimens obtained according to the step S104, the step S105 only selects one medication regimen output by the decision tree model, and recommends the medication regimen to the user.

[49] Wherein, the step S105 includes:

[50] when the symptom characteristic group doesn't cover the N necessary symptom characteristics, obtaining the medication regimen for each of the characteristic trajectories selected output by the decision tree model to obtain several medication regimens;

[51] determining an intersection of the several medication regimens, and recommending the intersection to the user;

[52] wherein, when the symptom characteristic group covers the N necessary symptom characteristics, obtaining the medication regimen output by the decision tree model, and directly recommending the medication regimen to the user.

[53] Specifically, when the symptom characteristic group doesn't cover the N necessary symptom characteristics, the decision tree model outputs several medication regimens, in order to ensure the accuracy, the intersection of the several medication regimens is determined, and the intersection is recommended to the user as a final medication regimen. For example, if the first medication regimen is 999 Ganmaoling and cephalosporin, and the second medication regimen is the 999 Ganmaoling, then the 999 Ganmaoling is recommended to the user as the final medication regimen.

[54] Optionally, when the symptom characteristic group doesn't cover the N necessary symptom characteristics, the obtaining one medication regimen output by the decision tree model and recommending the medication regimen to the user, further includes:

[55] when it is determined that the intersection of the several medication regimens does not exist, selecting one medication regimen from the several medication regimens to recommend to the user. When it is determined that the intersection of the several medication regimens does not exist, selecting one medication regimen from the several medication regimens to
5 recommend to the user.

[56] The medication regimen can be randomly selected recommend to the user, or can be selected by the following rules. For example , the selecting one medication regimen from the several medication regimens to recommend to the user, includes:

[57] selecting the medication regimen with a minimum probability from the several
10 medication regimens to recommend to the user; or

[58] selecting the medication regimen corresponding to one of the characteristic trajectories with a maximum similarity from the several medication regimens to recommend to the user; or

[59] selecting the medication regimen with a maximum product of probability and similarity from the several medication regimens to recommend to the user.

[60] A selected regimen is: for several medication regimens output by the decision tree model, determining the probability of each medication regimen, and recommending the medication regimen with the minimum probability to the user, wherein the smaller the probability is, the more accurate the medication regimen is.

[61] Another selected regimen is: for several medication regimens output by the decision tree
20 model, determining the characteristic trajectory with the maximum similarity to the symptom characteristic group, and recommending the medication regimen corresponding to the characteristic trajectory with the maximum similarity to the user, for example, recommending the medication regimen corresponding to the characteristic trajectory with the minimum Euclidean distance to the user, wherein the smaller the Euclidean distance is, the greater the
25 similarity is.

[62] Another selected regimen is: for several medication regimens output by the decision tree model, calculating the product of the probability and similarity corresponding to each medication regimen, and recommending the medication regimen with the minimum product to the user, for example, recommending the medication regimen with the minimum product of the
30 probability and the Euclidean distance to the user.

[63] When the symptom characteristic group covers the N necessary symptom characteristics, the decision tree model only outputs one medication regimen, and at this time, the medication regimen is directly recommended to the user.

[64] Step S106, obtaining a score of the user on the medication regimen, and adding a solution case to the medical database, wherein the score of the solution case reaches a score threshold; wherein, when the symptom characteristic group covers the N necessary symptom characteristics, the solution case comprises the symptom characteristic group and the medication regimen, and when the symptom characteristic group doesn't cover the N necessary symptom characteristics, the solution case comprises the symptom characteristic group, the several characteristic trajectories selected, and the medication regimen.

[65] The user can also score the recommended medication regimen, when the score reaches the score threshold, it indicates that the accuracy of the recommended medication regimen is high, and the medical database can be constructed based on the recommended medication regimen, for example, when the symptom characteristic group covers N necessary symptom characteristics, the symptom characteristic group and medication regimen are added to the medical database as one solution case; when the symptom characteristic group does not cover N necessary symptom characteristics, the symptom characteristic group, the several characteristic trajectories selected, and the medication regimen are added to the medical database as one solution case.

[66] The embodiment of the present application also provides a device of constructing a medical database, the device of constructing a medical database corresponds to the method of constructing a medical database provided in the embodiment, corresponding technical features and technical effects are not detailed in this embodiment, relevant parts can refer to the embodiments. Specifically, FIG. 2 schematically shows a block diagram of a device of constructing a medical database according to an embodiment of the present application. As shown in FIG. 2, the device of constructing a medical database 200 may include a receiving module 201, a determining module 202, a first processing module 203, a second processing module 204, a recommending module 205, and an adding module 206, wherein:

[67] the receiving module 201, receiving a symptom characteristic group input by a user, wherein the symptom characteristic group comprises several symptom characteristics;

[68] the determining module 202, determining whether the symptom characteristic group covers N necessary symptom characteristics;

[69] the first processing module 203, when the symptom characteristic group covers the N necessary symptom characteristics, inputting the symptom characteristic group into a pre-established decision tree model;

[70] the second processing module 204, when the symptom characteristic group doesn't cover the N necessary symptom characteristics, selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom characteristic group meets a similarity rule, and inputting the several characteristic trajectories selected into the decision tree model, wherein, the characteristic trajectories comprise the N necessary symptom characteristics, and N is an integer greater than or equal to 1;

[71] the recommending module 205, selecting a medication regimen output by the decision tree model, and recommending the medication regimen to the user;

[72] the adding module 206, obtaining a score of the user on the medication regimen, and adding a solution case to the medical database, wherein the score of the solution case reaches a score threshold;

[73] wherein, when the symptom characteristic group covers the N necessary symptom characteristics, the solution case comprises the symptom characteristic group and the medication regimen, and when the symptom characteristic group doesn't cover the N necessary symptom characteristics, the solution case comprises the symptom characteristic group, the several characteristic trajectories selected, and the medication regimen.

[74] Optionally, when the second processing module selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom characteristic group meets a similarity rule, further: selecting several characteristic trajectories with the minimum Euclidean distance to the symptom characteristic group from the pre-fitted characteristic trajectory group.

[75] Optionally, the recommending module further: obtaining the medication regimen for each of the characteristic trajectories selected output by the decision tree model to obtain several medication regimens, when the symptom characteristic group doesn't cover the N necessary

symptom characteristics; determining an intersection of the several medication regimens, and recommending the intersection to the user; wherein, when the symptom characteristic group covers the N necessary symptom characteristics, obtaining the medication regimen output by the decision tree model, and directly recommending the medication regimen to the user.

5 **[76]** Optionally, the recommending module further: selecting one medication regimen from the several medication regimens to recommend to the user, when it is determined that the intersection of the several medication regimens does not exist.

10 **[77]** Optionally, when the recommending module selecting one medication regimen from the several medication regimens to recommend to the user, the recommending module further: selecting the medication regimen with a minimum probability from the several medication regimens to recommend to the user; or selecting the medication regimen corresponding to one of the characteristic trajectories with a maximum similarity from the several medication regimens to recommend to the user; or selecting the medication regimen with a minimum product of probability and similarity from the several medication regimens to recommend to the user.

15 **[78]** Optionally, the device of constructing a medical database further includes: an obtaining module, obtaining historical solution case of multiple historical users, wherein the historical solution cases include historical check items, historical check values, and historical medication regimens; a training module, training a decision tree by using the historical solution cases to obtain the decision tree model.

20 **[79]** Optionally, the device of constructing a medical database further includes: a revising module, revising the decision tree model according to a preset rule; wherein, the revising module further: setting a probability of a first path to zero, when the first path between a root node and a leaf node of the decision tree model is inconsistent with the preset rule; retaining a probability of a second path, when the second path between the root node and the leaf node of the decision tree model is consistent with the preset rule; retaining a probability of a third path, when the third path between the root node and the leaf node of the decision tree model does not exist in the preset rule.

25 **[80]** Optionally, the device of constructing a medical database further includes: an extracting module, extracting related feature variables, operators, thresholds and medical conclusions in

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medical books; a constructing module, constructing the preset rule by using the feature variables, the operators, and the thresholds as input conditions, and using the medical conclusions as an output result.

[81] FIG. 3 schematically shows a block diagram of a computing device suitable for implementing a method of constructing a medical database according to an embodiment of the present application. In this embodiment, the computing device 300 can be a smart phone, a tablet computer, a notebook computer, a desktop computer, a rack server, a blade server, a tower server, or a cabinet server (including independent servers, or a server cluster composed of multiple servers) that executes the programs, and so on. As shown in FIG. 3, the computing device 300 of the embodiment at least includes but not limited to: a memory 301, a processor 302, and a network interface 303 that can be communicably connected to each other through a system bus. It should be pointed out that FIG. 3 only shows the computing device 300 with components 301-303, but it should be understood that it is not required to implement all illustrated components, and more or fewer components may be implemented instead.

[82] In the embodiment, the memory 301 includes at least one type of computer-readable storage medium, the readable storage medium includes a flash memory, a hard disk, a multimedia card, a card-type memory (such as, SD or DX memory, and so on), a random access memory (RAM), a static random access memory (SRAM), a read only memory (ROM), electrically erasable programmable read only memory (EEPROM), programmable read only memory (PROM), a magnetic memory, a magnetic disk, an optical disk, and so on. In some embodiments, the memory 301 can be an internal storage unit of the computing device 300, such as a hard disk or memory of the computing device 300. In other embodiments, the memory 301 can also be an external storage device of the computing device 300, such as a plug-in hard disk, a smart memory card (SMC), and a secure digital (SD) card, a flash card, and so on. Of course, the memory 301 can also include both the internal storage unit of the computing device 300 and its external storage device. In the embodiment, the memory 301 is generally used to store the operating system and all kinds of application software installed in the computing device 300, for example, program codes of the method of constructing a medical database. In addition, the memory 301 can also be used to temporarily store various types of data that have been output or will be output.

[83] The processor 302 can be a central processing unit (CPU), a controller, a microcontroller, a microprocessor, or other data processing chips in some embodiments. The processor 302 is generally used to control the overall operation of the computing device 300. For example, executing the program codes of the method of constructing a medical database for data
5 interaction or communication-related control and processing with the computing device 300.

[84] In the embodiment, the method of constructing a medical database stored in the memory 301 can also be divided into one or more program modules and executed by one or more processors (the processor 302 in the embodiment), to complete the present application.

[85] The network interface 303 can include a wireless network interface or a wired network
10 interface, and the network interface 303 is generally used to establish a communication link between the computing device 300 and other computing devices. For example, the network interface 303 is used to connect the computing device 300 with an external terminal through a network, and establish a data transmission channel and a communication link between the computing device 300 and the external terminal. The network can be an Intranet, the Internet,
15 a Global System of Mobile communication (GSM), a Wideband Code Division Multiple Access (WCDMA), a 4G network, a 5G network, a Bluetooth, a Wi-Fi and other wireless or wired networks.

[86] The embodiment also provides a computer-readable storage medium, including a flash memory, a hard disk, a multimedia card, a card-type memory (for example, SD or DX memory,
20 and so on), a random access memory (RAM), a static random access memory (SRAM), an only Read memory (ROM), an electrically erasable programmable read-only memory (EEPROM), a programmable read-only memory (PROM), a magnetic memory, magnetic disks, optical disks, servers, App application malls, etc., on which computer programs are stored, the computer programs are executed by the processor to realize the method of constructing a medical
25 database.

[87] Obviously, those skilled in the art should understand that the modules or steps of the embodiments of the present application described above can be implemented by a general computing device, and they can be concentrated on a single computing device or distributed among multiple computing devices. Optionally, they can be implemented with program codes
30 executable by the computing device, so that they can be stored in the storage device for

execution by the computing device, and in some cases, the steps shown or described may be performed in a different order than here, or they can be respectively fabricated into individual integrated circuit modules, or multiple modules or steps of them are fabricated into a single integrated circuit module for implementation. In this way, the embodiments of the present application are not limited to any specific combination of a hardware and a software.

[88] Through the description of the above embodiments, it is clear to those skilled in the art that the above embodiments may be implemented by means of software and a necessary common hardware platform, and of course it can also be done by hardware, but in many cases the former is a better implementation.

[89] The above are only preferred embodiments of the present application, and thus do not limit the patent scope of the present application. Any equivalent structure or equivalent process transformation made by using the description and drawings of the present application, or directly or indirectly used in other related technical fields, is also included in the protection scope of the present application.

WHAT IS CLAIMED IS:

1. A method of constructing a medical database, wherein the method comprises:

receiving a symptom characteristic group input by a user, wherein the symptom characteristic group comprises several symptom characteristics;

5 determining whether the symptom characteristic group covers N necessary symptom characteristics;

when the symptom characteristic group covers the N necessary symptom characteristics, inputting the symptom characteristic group into a pre-established decision tree model;

when the symptom characteristic group doesn't cover the N necessary symptom
10 characteristics, selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom characteristic group meets a similarity rule, and inputting the several characteristic trajectories selected into the decision tree model, wherein, the characteristic trajectories comprise the N necessary symptom characteristics, and N is an integer greater than or equal to 1;

15 selecting a medication regimen output by the decision tree model, and recommending the medication regimen to the user;

obtaining a score of the user on the medication regimen, and adding a solution case to the medical database, wherein the score of the solution case reaches a score threshold;

wherein, when the symptom characteristic group covers the N necessary symptom
20 characteristics, the solution case comprises the symptom characteristic group and the medication regimen, and when the symptom characteristic group doesn't cover the N necessary symptom characteristics, the solution case comprises the symptom characteristic group, the several characteristic trajectories selected, and the medication regimen.

25 2. The method of claim 1, wherein the selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom characteristic group meets a similarity rule, comprises:

calculating a Euclidean distance between each of the characteristic trajectories in the characteristic trajectory group and the symptom characteristic group to obtain a Euclidean distance group;

5 selecting several the characteristic trajectories sequenced before a preset position from the Euclidean distance group.

3. The method of claim 1, wherein the selecting a medication regimen output by the decision tree model, and recommending the medication regimen to the user, comprises:

10 when the symptom characteristic group doesn't cover the N necessary symptom characteristics, obtaining the medication regimen for each of the characteristic trajectories selected output by the decision tree model to obtain several medication regimens;

determining an intersection of the several medication regimens, and recommending the intersection to the user;

15 wherein, when the symptom characteristic group covers the N necessary symptom characteristics, obtaining the medication regimen output by the decision tree model, and recommending the medication regimen to the user directly.

4. The method of claim 3, wherein the selecting a medication regimen output by the decision tree model, and recommending the medication regimen to the user, further comprises:

20 when it is determined that the intersection of the several medication regimens does not exist, selecting one medication regimen from the several medication regimens to recommend to the user.

5. The method of claim 4, wherein the selecting one medication regimen from the several medication regimens to recommend to the user, comprises:

25 selecting the medication regimen with a minimum probability from the several medication regimens to recommend to the user; or

selecting the medication regimen corresponding to one of the characteristic trajectories with a maximum similarity from the several medication regimens to recommend to the user; or

selecting the medication regimen with a minimum product of probability and similarity from the several medication regimens to recommend to the user.

5

6. The method of claim 1, wherein the method further comprises:

obtaining historical solution cases of multiple historical users, wherein the historical solution cases include historical check items, historical check values, and historical medication regimens;

10 training a decision tree by using the historical solution cases to obtain the decision tree model.

7. The method of claim 1, wherein the method further comprises:

revising the decision tree model according to a preset rule;

15 wherein, the revising the decision tree model according to a preset rule, comprises:

when a first path between a root node and a leaf node of the decision tree model is inconsistent with the preset rule, setting a probability of the first path to zero;

when a second path between the root node and the leaf node of the decision tree model is consistent with the preset rule, retaining a probability of the second path;

20 when a third path between the root node and the leaf node of the decision tree model does not exist in the preset rule, retaining a probability of the third path.

8. The method of claim 7, wherein before the revising the decision tree model according to a preset rule, the method further comprises:

25 extracting related feature variables, operators, thresholds and medical conclusions in medical books;

constructing the preset rule by using the feature variables, the operators, and the thresholds

as input conditions, and using the medical conclusions as output results.

9. A device of constructing a medical database, wherein comprises:

a receiving module, receiving a symptom characteristic group input by a user, wherein the

5 symptom characteristic group comprises several symptom characteristics;

a determining module, determining whether the symptom characteristic group covers N necessary symptom characteristics;

a first processing module, when the symptom characteristic group covers the N necessary symptom characteristics, inputting the symptom characteristic group into a pre-established
10 decision tree model;

a second processing module, when the symptom characteristic group doesn't cover the N necessary symptom characteristics, selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom characteristic group meets a similarity rule, and inputting the several characteristic
15 trajectories selected into the decision tree model, wherein, the characteristic trajectories comprise the N necessary symptom characteristics, and N is an integer greater than or equal to 1;

a recommending module, selecting a medication regimen output by the decision tree model, and recommending the medication regimen to the user;

an adding module, obtaining a score of the user on the medication regimen, and adding a
20 solution case to the medical database, wherein the score of the solution case reaches a score threshold;

wherein, when the symptom characteristic group covers the N necessary symptom characteristics, the solution case comprises the symptom characteristic group and the medication regimen, and when the symptom characteristic group doesn't cover the N necessary symptom
25 characteristics, the solution case comprises the symptom characteristic group, the several characteristic trajectories selected, and the medication regimen.

10. The device of claim 9, wherein when the second processing module selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom characteristic group meets a similarity rule, the second processing module further:

5 calculating a Euclidean distance between each of the characteristic trajectories in the characteristic trajectory group and the symptom characteristic group to obtain a Euclidean distance group;

 selecting several the characteristic trajectories sequenced before a preset position from the Euclidean distance group.

10

11. The device of claim 9, wherein the recommending module further:

 when the symptom characteristic group doesn't cover the N necessary symptom characteristics, obtaining the medication regimen for each of the characteristic trajectories selected output by the decision tree model to obtain several medication regimens;

15 determining an intersection of the several medication regimens, and recommending the intersection to the user;

 wherein, when the symptom characteristic group covers the N necessary symptom characteristics, obtaining the medication regimen output by the decision tree model, and recommending the medication regimen to the user directly.

20

12. The device of claim 11, wherein the recommending module further:

 selecting one medication regimen from the several medication regimens to recommend to the user, when it is determined that the intersection of the several medication regimens does not exist.

25

13. The device of claim 12, wherein when the recommending module selecting one medication regimen from the several medication regimens to recommend to the user, the

recommending module further:

selecting the medication regimen with a minimum probability from the several medication regimens to recommend to the user; or

5 selecting the medication regimen corresponding to one of the characteristic trajectories with a maximum similarity from the several medication regimens to recommend to the user; or

selecting the medication regimen with a minimum product of probability and similarity from the several medication regimens to recommend to the user.

14. The device of claim 9, wherein the device further comprises:

10 an obtaining module, obtaining historical solution cases of multiple historical users, wherein the historical solution cases include historical check items, historical check values, and historical medication regimens;

a training module, training a decision tree by using the historical solution cases to obtain the decision tree model.

15 15. The device of claim 9, wherein,
the device further comprises: a revising module, revising the decision tree model according to a preset rule;

wherein, the revising module further:

20 setting a probability of a first path to zero, when the first path between a root node and a leaf node of the decision tree model is inconsistent with the preset rule;

retaining a probability of a second path, when the second path between the root node and the leaf node of the decision tree model is consistent with the preset rule;

25 retaining a probability of a third path, when the third path between the root node and the leaf node of the decision tree model does not exist in the preset rule.

16. The device of claim 15, wherein,

the device further comprises: an extracting module, extracting related feature variables, operators, thresholds and medical conclusions in medical books;

a constructing module, constructing the preset rule by using the feature variables, the operators, and the thresholds as input conditions, and using the medical conclusions as an output
5 result.

17. A computing device, the computing device comprises a memory, a processor; and computer programs that are stored in the memory and operable executed by the processor, wherein when the computer programs are executed by a processor, the following steps are
10 implemented:

receiving a symptom characteristic group input by a user, wherein the symptom characteristic group comprises several symptom characteristics;

determining whether the symptom characteristic group covers N necessary symptom characteristics;

15 when the symptom characteristic group covers the N necessary symptom characteristics, inputting the symptom characteristic group into a pre-established decision tree model;

when the symptom characteristic group doesn't cover the N necessary symptom characteristics, selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom
20 characteristic group meets a similarity rule, and inputting the several characteristic trajectories selected into the decision tree model, wherein, the characteristic trajectories comprise the N necessary symptom characteristics, and N is an integer greater than or equal to 1;

selecting a medication regimen output by the decision tree model, and recommending the medication regimen to the user;

25 obtaining a score of the user on the medication regimen, and adding a solution case to the medical database, wherein the score of the solution case reaches a score threshold;

wherein, when the symptom characteristic group covers the N necessary symptom

characteristics, the solution case comprises the symptom characteristic group and the medication regimen, and when the symptom characteristic group doesn't cover the N necessary symptom characteristics, the solution case comprises the symptom characteristic group, the several characteristic trajectories selected, and the medication regimen.

5

18. The computing device of claim 17, wherein the selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom characteristic group meets a similarity rule, comprises:

10 calculating a Euclidean distance between each of the characteristic trajectories in the characteristic trajectory group and the symptom characteristic group to obtain a Euclidean distance group;

 selecting several the characteristic trajectories sequenced before a preset position from the Euclidean distance group.

15

19. A computer-readable storage medium, which stores computer programs that upon, wherein, the computer programs are executed by a processor, the following steps are implemented:

 receiving a symptom characteristic group input by a user, wherein the symptom
20 characteristic group comprises several symptom characteristics;

 determining whether the symptom characteristic group covers N necessary symptom characteristics;

 when the symptom characteristic group covers the N necessary symptom characteristics, inputting the symptom characteristic group into a pre-established decision tree model;

25 when the symptom characteristic group doesn't cover the N necessary symptom characteristics, selecting several characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom

characteristic group meets a similarity rule, and inputting the several characteristic trajectories selected into the decision tree model, wherein, the characteristic trajectories comprise the N necessary symptom characteristics, and N is an integer greater than or equal to 1;

5 selecting a medication regimen output by the decision tree model, and recommending the medication regimen to the user;

obtaining a score of the user on the medication regimen, and adding a solution case to the medical database, wherein the score of the solution case reaches a score threshold;

10 wherein, when the symptom characteristic group covers the N necessary symptom characteristics, the solution case comprises the symptom characteristic group and the medication regimen, and when the symptom characteristic group doesn't cover the N necessary symptom characteristics, the solution case comprises the symptom characteristic group, the several characteristic trajectories selected, and the medication regimen.

20. The computer-readable storage medium of claim 19, wherein the selecting several
15 characteristic trajectories from a pre-fitted characteristic trajectory group, wherein a similarity of the several characteristic trajectories with the symptom characteristic group meets a similarity rule, comprises:

calculating a Euclidean distance between each of the characteristic trajectories in the characteristic trajectory group and the symptom characteristic group to obtain a Euclidean
20 distance group;

selecting several the characteristic trajectories sequenced before a preset position from the Euclidean distance group.