(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
19 October 2023 (19.10.2023)

WIPO | PCT

(10) International Publication Number
WO 2023/201075 A4

(51) International Patent Classification:
G16H 50/20 (2018.01) *G06F 40/268* (2020.01)
G16H 10/60 (2018.01) *G06F 40/30* (2020.01)
G16H 10/20 (2018.01) *G06F 16/36* (2019.01)
G16H 10/40 (2018.01) *G06Q 50/26* (2012.01)
G16H 70/00 (2018.01)

(21) International Application Number:
PCT/US2023/018712

(22) International Filing Date:
14 April 2023 (14.04.2023)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
63/331,526 15 April 2022 (15.04.2022) US

(71) Applicant: **RECOVERY EXPLORATION TECHNOLOGIES INC.** [US/US]; 44 Tehama Street, Suite 412, San Francisco, California 94105 (US).

(72) Inventors: **TULLEY, Carl Bate**; 340 Fremont Street, San Francisco, California 94105 (US). **STIPP, Wian**; Holly House, The Street, Somerleyton Suffolk NR32 5QB (GB). **UNGER, Thomas**; Tiburon, California 94920 (US). **EPSTEIN, David A.**; 518 Half Moon Bay Drive, Croton-on-Hudson, New York 10520 (US). **MCSORLEY, Matthew**; 111 Deimling Road, Pittsburgh, Pennsylvania 15229 (US). **NAKHLA, Fady**; San Francisco, California (US). **ROBINSON, David**; 3340 Sheila Court, Santa Cruz, California 95062 (US). **LEE, Jennifer May**; 41 Newton Road, London W2 5JR (GB). **BÖÖK, Arthur**; San Francisco, California (US).

(54) **Title:** TRANSLATION OF MEDICAL EVIDENCE INTO COMPUTATIONAL EVIDENCE AND APPLICATIONS THEREOF

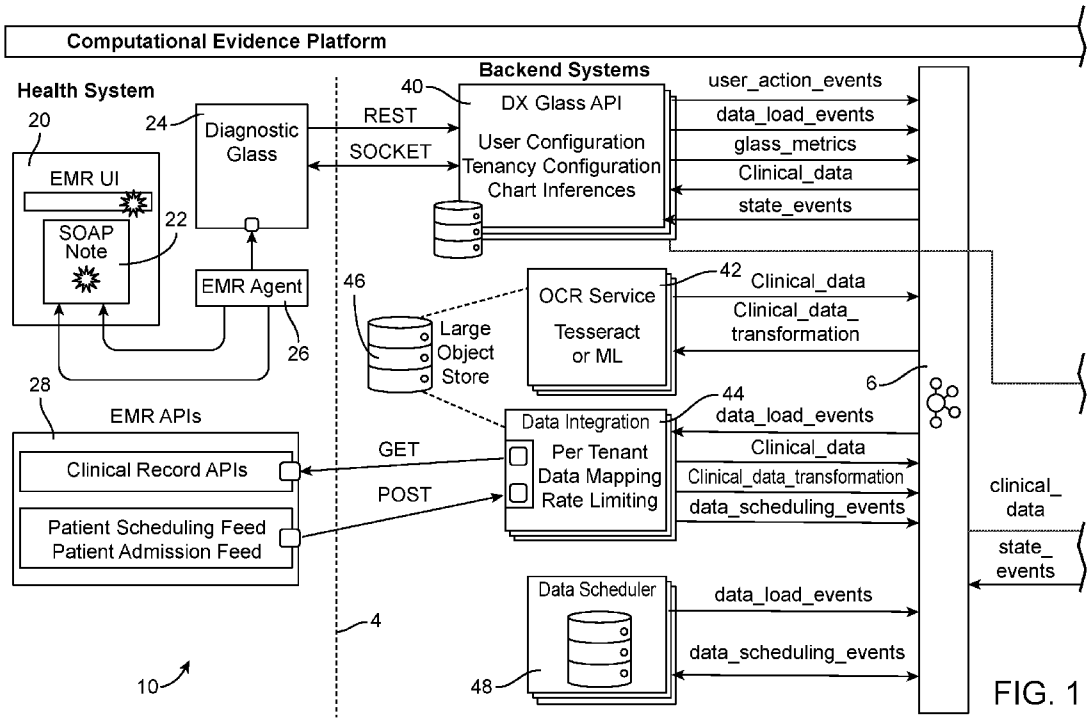

FIG. 1

(57) **Abstract:** A computational evidence platform extracts clinical concepts from medical evidence sources and creates a database of elemental diagnostic factors and elemental investigations links to medical conditions. Input from a person groups factors and investigations makes corrections and adds a ranking. Elemental factors and investigations do not include information specific to their associated conditions but include synonyms and a link to a medical ontology. A patient state is determined by extracting patient known diagnostic factors and investigation results from the patient chart. These known factors and results are matched to the database and a ranking of likely conditions are output. Next-best actions per condition are output by determining factors not yet known and investigations not yet performed. Next-best actions across conditions are determined by performing a recursive tree search of the database and assuming that unknown factors are now known to generate a score for each assumption.

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[Continued on next page]

(74) **Agent: SCOTT, Jonathan O.**; Beyer Law Group LLP, P.O. Box 51887, Palo Alto, California 94303-1887 (US).

(81) **Designated States** *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*
— *with amended claims (Art. 19(1))*

Date of publication of the amended claims:
09 November 2023 (09.11.2023)

AMENDED CLAIMS
received by the International Bureau on 10 October 2023 (10.10.2023)

We Claim:

1. (Currently Amended) A method of translating medical evidence into computational elements, said method comprising:

inputting a portion of electronic text pertaining to a medical condition from a medical evidence source;

processing said electronic text using natural language processing (NLP) to produce a plurality of diagnostic factors indicative of said medical condition;

displaying said diagnostic factors on a computing device to a person;

receiving input from said person via said computing device indicating a factor group that subsumes said diagnostic factors and a rank for said factor group; and

storing said medical condition, said factor group and each of said diagnostic factors each as a separate entry in a database, said medical condition linked to said factor group and said factor group linked to each of said diagnostic factors, wherein an entry of each of said diagnostic factors in said database does not include information specific to said medical condition.

2. (Currently Amended) A method as recited in claim 1 further comprising:

displaying on said computing device a portion of said database which includes said medical condition entry, said factor group entry and in each of said diagnostic factor entries and the links between them.

3. (Original) A method as recited in claim 1 wherein said database is a graph database and said each separate entry is a node.

4. (Original) A method as recited in claim 1 wherein said each diagnostic factor entry includes a unique identifier which links to an entry in a medical ontology representing said diagnostic factor.

5. (Original) A method as recited in claim 1 wherein each said diagnostic factor entry includes at least one synonym of said diagnostic factor.

6. (Original) A method as recited in claim 1 wherein each said diagnostic factor entry includes a temporality attribute, a negation attribute or an experiencer attribute.

7. (Currently Amended) A method as recited in claim 1 further comprising:

receiving input from said person via said computing device indicating a demographics corresponding to one of said diagnostic factors, said demographics indicating a type of person to which said diagnostic factor occurs in the context of said medical condition; and

storing said demographics in a demographics entry linked between said condition entry and said one of said diagnostic factors entry.

8. (Currently Amended) A method as recited in claim 1 further comprising:

repeating said steps of inputting, processing, and displaying for a second medical condition different from said medical condition, at least one of said produced plurality of diagnostic factors for said second medical condition being the same as one of said diagnostic factors produced for said first medical condition;

receiving input from said person via said computing device indicating a second factor group that subsumes said at least one diagnostic factor and a rank for said second factor group; and

storing said second medical condition and said second factor group each as a separate entry in said database, said second medical condition linked to said second factor group and said second factor group linked to an entry in said database for said at least one diagnostic factor.

9. (Original) A method as recited in claim 8 wherein traversing said database from said at least one diagnostic factor entry to said second medical condition produces a second rank for said at least one diagnostic factor in the context of said second medical condition which is different from a first rank produced by traversing from said at least one diagnostic factor entry to said medical condition.

10. (Original) A method as recited in claim 1 wherein said diagnostic factors produced from said electronic text are the finest granularity of information able to be extracted from said electronic text.

11. (Currently Amended) A method as recited in claim 1 wherein said processing produces at least one laboratory test indicative of said medical condition;

displaying said laboratory test on a computing device to said person;

receiving input from said person via said computing device indicating an investigation group that subsumes said laboratory test and a rank for said investigation group; and

storing said investigation group and said laboratory test each as a separate entry in said database, said medical condition linked to said investigation group and said investigation group linked to said laboratory test, wherein an entry of said laboratory test in said database does not include information specific to said medical condition.

12. (Currently Amended) A method of determining a state of a patient, said method comprising:

extracting, using natural language processing (NLP), from a medical evidence source a plurality of diagnostic factors indicative of a medical condition and storing each of said diagnostic factors and said medical condition as its own node in a database, said medical condition being linked to said diagnostic factors, wherein each of said diagnostic factor nodes do not include information specific to said medical condition;

for at least one of said diagnostic factors, storing demographics required to indicate said medical condition on the basis of said at least one diagnostic factor in a demographics node located between said medical condition node and a node representing said at least one diagnostic factor;

extracting from a medical evidence source a plurality of laboratory tests indicative of said medical condition and storing each of said laboratory tests as its own node in said database, said medical condition being linked to said laboratory tests, wherein each of said laboratory test nodes does not include information specific to said medical condition;

for at least one of said laboratory tests, storing test results required to indicate said medical condition on the basis of said at least one laboratory test in a results node located between said medical condition node and a node representing said at least one laboratory test; and

matching patient data from a patient medical chart to at least one of said diagnostic factor nodes, said demographics node, at least one of said laboratory test nodes, and said results node in order to display a result indicating a likelihood that said patient has said medical condition.

13. (Original) A method as recited in claim 12 further comprising:

determining a rank of said likelihood that said patient has said medical condition by reference to a node intermediate between said medical condition node and said diagnostic factor nodes that holds said rank of said diagnostic factors.

14. (Original) A method as recited in claim 12 further comprising:

determining a rank of said likelihood that said patient has said medical condition by reference to a node intermediate between said medical condition node and said laboratory test nodes that holds said rank of said laboratory tests.

15. (Original) A method as recited in claim 12 further comprising:

performing said extracting steps using natural language processing (NLP) that is initialized using existing diagnostic factor nodes and laboratory test nodes of said database.

16. (Original) A method of determining a state of a patient, said method comprising:

inputting a portion of a patient electronic health record (EHR) into natural language processing (NLP) to produce a plurality of diagnostic factors known to be present or absent in said patient;

matching said diagnostic factors to entries in a database that represent said diagnostic factors, each of said diagnostic factor entries being linked to a medical condition entry and not including information specific to said medical condition to which said each diagnostic factor entry is linked;

traversing a link from said each matched diagnostic factor entry to its linked medical condition and collecting a weight value indicative that said each matched diagnostic factor entry is caused by its linked medical condition;

summing all collected weight values for each linked medical condition to produce a total weight value for each linked medical condition; and

displaying on a computing device said linked medical conditions in order of weight value.

17. (Original) A method as recited in claim 16 further comprising:

displaying in association with each linked medical condition its corresponding total weight value.

18. (Original) A method as recited in claim 16 further comprising:

for each present diagnostic factor, traversing upward in a medical ontology link found in said matched diagnostic factor entry in order to infer other diagnostic factors present in said patient and matching these other diagnostic factors to diagnostic factor entries in said database.

19. (Original) A method as recited in claim 16 wherein each said diagnostic factor entry includes at least one synonym of said diagnostic factor.

20. (Original) A method as recited in claim 16 wherein each said diagnostic factor entry includes a temporality attribute, a negation attribute or an experiencer attribute.

21. (Original) A method as recited in claim 16 further comprising:

initializing said natural language processing with said entries and links of said database.

22. (Original) A method as recited in claim 16 wherein a demographics entry of said database located between one of said matched diagnostic factor entries and its corresponding linked medical condition includes demographics of people who exhibit said matched diagnostic factor in the context of said linked medical condition, said method further comprising:

only traversing said link from said one matched diagnostic factor entry to its linked medical condition when information of said patient from said EHR matches said demographics in said demographics entry.

23. (Original) A method as recited in claim 16 wherein said displaying is for the purpose of patient diagnosis, for an administrative medical purpose, or for a medical preauthorization.

24. (Original) A method of determining next-best actions for a medical condition, said method comprising:

for each medical condition of a patient having a probability greater than a threshold of being present in said patient, performing the following

identifying all known diagnostic factor entries in a database that each represent a diagnostic factor known to be present or absent in said patient, each known diagnostic factor entry being linked to a medical condition entry in said database representing said each medical condition but not including information specific to said each medical condition;

identifying all unknown diagnostic factor entries in said database that each represent an unknown diagnostic factor not known to be present or absent in said patient, each unknown diagnostic factor entry being linked to said medical condition entry;

identifying a rank of each unknown diagnostic factor entry that indicates likelihood that said corresponding unknown diagnostic factor indicates said medical condition, said rank being stored in a database entry link between said unknown diagnostic factor entry and said medical condition entry; and

displaying said unknown diagnostic factors corresponding to said unknown diagnostic factor entries in association with said each medical condition in order of said rank of said each unknown diagnostic factor.

25. (Currently Amended) A method as recited in claim 24 further comprising:

identifying said unknown diagnostic factor entries by traversing down through said database from said each medical condition entry and in disregarding said known diagnostic factor entries.

26. (Original) A method as recited in claim 24 wherein said rank of said each unknown diagnostic factor entry is located within a factor group entry located between said medical condition entry and said each unknown diagnostic factor entry.

27. (Original) A method as recited in claim 24 further comprising:

for each known diagnostic factor, traversing upward in a medical ontology link found in said identified known diagnostic factor entry in order to infer other known diagnostic factors present in said patient.

28. (Original) A method as recited in claim 24 wherein each said known and unknown diagnostic factor entry includes at least one synonym of said known and unknown diagnostic factor.

29. (Original) A method as recited in claim 24 wherein each said known and unknown diagnostic factor entry includes a temporality attribute, a negation attribute or an experiencer attribute.

30. (Currently Amended) A method as recited in claim 24 wherein traversing said database from one of said unknown diagnostic factor entries to a first one of said medical conditions produces a first rank for said one of said unknown diagnostic factor entries in the context of said first medical condition which is different from a second rank produced by traversing from said one of said unknown diagnostic factor entries to a second one of said medical conditions.