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(54) Title: SYSTEM AND METHOD OF DETERMINING A PROBABILITY OF AN EMPLOYEE TO TERMINATE THEIR EMPLOYMENT

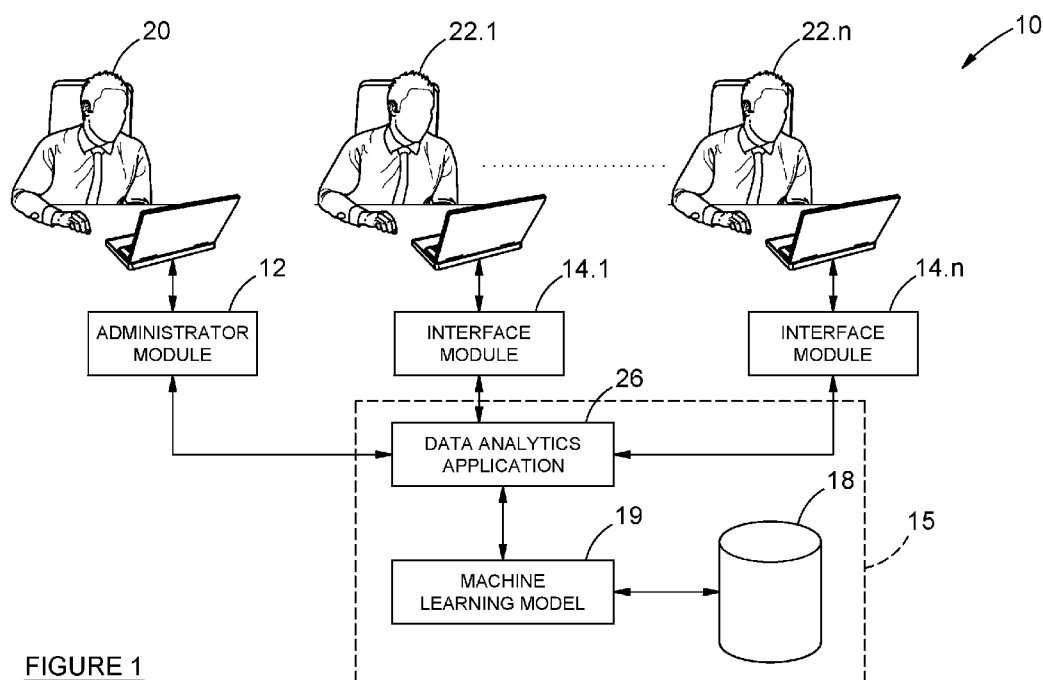


FIGURE 1

(57) Abstract: A system (10) for determining a probability of an employee to terminate employment with an employer, comprises an administrator interface module (12), an employee interface module (14.1), a processor, a memory arrangement (18). The module (14.1) configured to present a set of prompts to an employee (22.1) and to receive a response to the set of prompts. The memory arrangement (18) comprising stored instructions and historical data, the instructions being executable by the processor to cause the processor to: receive data relating to the response; use the data relating to the response to identify relevant historical data; use the relevant historical data to train a machine learning model to determine an indicator P representing a probability of the employee to terminate their current employment within a time period. The administrator interface module configured to receive the data related to the indicator P and to present the indicator P.

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SYSTEM AND METHOD OF DETERMINING A PROBABILITY OF AN EMPLOYEE TO TERMINATE THEIR EMPLOYMENT

5

FIELD OF THE INVENTION

The invention relates to a system and method for determining a probability of an employee to terminate their employment and more particularly to a system and method for determining a probability of an employee to terminate their employment, which
10 system and method incorporate machine learning.

BACKGROUND TO THE INVENTION

Employee turnover (churn) can be highly detrimental to an employer. One reason for this is that there are costs associated with replacing a departing employee, such as
15 recruitment of a new employee and dealing with disruptions caused by the previous employee's departure.

Known methods of addressing the risks associated with employee turnover include conducting employee satisfaction surveys and analysing responses to the surveys. The
20 responses to the surveys are typically analysed by a human resource professional in order to acquire information regarding employee wellness and productivity. The acquired information may provide the employer with insights in regards to the workplace happiness levels and whether some of its employees may want to leave their current employment. Further, if the analysis is done thoroughly, the acquired information may
25 highlight which specific aspects contribute to an employee's desire to leave their current employment.

When the employer acquires the above information soon enough, it may be in a position to address the specific aspects in a manner which may serve to decrease the employee's desire to leave their current employment. Alternatively, or in addition to the
5 latter, the employer may opt to address the risk of employee departure by starting skills transfer initiatives or by compiling short lists of potential replacement candidates.

At least a first disadvantage of known methods is that it is time-intensive to analyse the responses to surveys, particularly when the survey was conducted by a large group of
10 employees. This means that the employer may receive the analysis when it is too late to take corrective action and it may be expensive to conduct the analysis.

OBJECT OF THE INVENTION

It is an object of the present invention to provide a system and a method with which the
15 applicant believes that above-discussed disadvantages may at least be partially overcome, or which would provide a useful alternative to known systems and methods for predicting a probability of an employee to terminate employment and proposing specific-action(s) to improve such probability of employment termination.

20 SUMMARY OF THE INVENTION

According to a first aspect of the invention there is provided a system for determining a probability of an employee to terminate employment with an employer, the system comprising:

- at least one employee interface module configured to:
 - o present a first set of prompts to the employee; and
 - o receive a response to the first set of prompts from the employee;
- a processor;
- 5 - a memory arrangement comprising stored instructions and historical data, the instructions being executable by the processor to cause the processor to:
 - o receive data relating to the response to the first set of prompts from the at least one employee interface module;
 - o use the data relating to the response to identify relevant historical data
 - 10 corresponding to the response;
 - o use the relevant historical data to train a machine learning model to determine an indicator P representing a probability of the employee to terminate their current employment within a time period;
- an administrator interface module configured to:
 - o receive data related to the indicator P ; and
 - 15 o present the indicator P to a user of the administrator interface module.

The memory arrangement may further comprise instructions to cause the processor to:

- determine a plurality of indicators P , each of the plurality of indicators
- 20 representing a probability of a respective employee to terminate their current employment within the time period, each of the respective employees forming part of a group of employees; and

- to aggregate the plurality of indicators P to represent a collective indicator P_c which indicates an average probability for each of the respective employees forming part of the group to terminate their employment.

5 The administrator interface module may be configured to receive the first set of prompts and/or time period.

Alternatively, the first set of prompts may be stored on the memory arrangement.

10 The memory arrangement may be a database.

The historical data may comprise a plurality of specific-action proposals, any one of which when implemented by an employer could serve to decrease a probability of an employee to terminate employment. The processor may be configured to select a
15 specific-action proposal based on the data relating to the response to the first set of prompts.

The specific-action proposal may comprise proposals such as implementing fun committees, recognising people on special days, making the workplace more personal,
20 implementing professional development plans, having communication sessions, addressing poor tools and resources at the employee's disposal and improving leadership development in order to deliver on employee needs.

The first set of prompts may comprise questions and feedback requests.

The first set of prompts may be in the form of a first survey.

5

The first survey may be directed to at least one or more of the following themes: leadership, engagement, alignment, development, enablement and readiness.

The first survey may be structured such that the response thereto is benchmarkable.

10

The first survey may be one of a plurality of surveys.

The plurality of surveys may sum up to a total of twelve surveys.

15 Each of the plurality of surveys may be presented by the at least one employee interface module at a first predetermined interval during a fixed time period. The fixed time period may start at a date which coincides with the employee's employment start date or a predetermined number of days after a start date.

20 Results of the plurality of surveys may be used to determine a holistic score, referred to as a LEADER score.

The first predetermined interval may be a 6-month interval and the fixed time period may be a 12-month period.

- 5 The at least one employee interface module may further be configured to:
- present a second set of prompts to the employee; and
 - receive a response to the second set of prompts from the employee.

The machine learning model may further be configured to:

- 10
- receive the response to the second set of prompts from the at least one employee interface module; and
 - utilise the response to the second set of prompts to generate the data related to the indicator P .

The second set of prompts may be in the form of a second survey.

- 15
- There is provided for the second set of prompts to be receivable at the administrator interface model.

- 20
- At least one of the prompts of the second set of prompts may be presented by the at least one employee interface module at a second predetermined interval during the fixed time period.

The second predetermined interval may be any one of a weekly and a bi-weekly interval.

The machine learning model may comprise a machine learning algorithm.

- 5 The machine learning algorithm may be configured to use responses to more than one survey.

The machine learning algorithm may be configured to use a biographical data set related to the employee in generating the data related to the indicator P .

10

The biographical data set may be receivable at any one of the administrator interface module and the at least one employee interface module.

- 15 The at least one employee interface module may be a web browser user interface. The web browser user interface may be configured to allow the employee to enter at least one of a numeric value and a written answer.

The web browser user interface may be configured to calculate a numerical value for each theme.

20

The machine learning model may be configured to identify from the written answer, issues such as workplace safety, diversity and inclusion and mental wellness issues.

5 The administrator interface model may be for any one or both of the employer and an external service provider.

According to another aspect of the invention there is provided a method of determining a probability that an employee will terminate employment with an employer, the method comprising the steps of:

- 10 - training a machine learning model by feeding the machine learning model an initial data set;
- applying the machine learning model to actual data by feeding to the machine learning model, a response of an employee to a set of prompts, biographical data associated with the employee and a time period; and
- 15 - receiving an indicator (P) from the machine learning model, the indicator (P) representing a probability of the employee to terminate employment with the employer within the time period.

The machine learning model may be a supervised learning model.

20

The method may further comprise the step of feeding data related to actual employee turnover to the machine learning model.

The method may further comprise determining whether the probability (P) exceeds a threshold value. If (P) exceeds the threshold value, the machine learning model may determine at least one specific-action proposal, which if implemented may serve to
5 decrease the probability of the employee to terminate their employment.

The method may further comprise the step of sending the at least one specific-action proposal from the machine learning model.

10 The method may be computer implemented.

The set of prompts may be in the form of an employee survey.

The employee survey may be directed to at least one of the following aspects:
15 leadership, engagement, alignment, development, enablement and readiness.

The employee survey may be conducted any number of times during a fixed time period.

20 The method may further comprise using a previous response by the employee to determine the probability of the employee to terminate employment within the period.

BRIEF DESCRIPTION OF THE ACCOMPANYING DIAGRAMS

5 The invention will now further be described, by way of example only, with reference to the accompanying diagrams wherein:

figure 1 is a diagrammatic representation of a system according to the invention;

figure 2 is a first schematic diagram of a flow of data to and from a machine learning algorithm;

10 figure 3 is a flow diagram associated with a method according to the invention; and

figure 4 is a high-level example of a table comprising data for training the machine learning model.

15 DETAILED DESCRIPTION OF THE INVENTION

An example embodiment of a system for determining a probability of an employee to terminate their current employment is generally designated by the reference numeral 10 in figure 1.

20 Referring to figure 1, the system 10 comprises an administrator module 12, at least one employee interface module 14.1, a processor (not shown), and a memory arrangement (also not shown). The processor and memory arrangement typically forms part of a

server 15. In the embodiment shown, the at least one employee interface module 14.1 forms part of a plurality of employee interface modules 14.1 to 14.n. The administrator module 12 is associated with an administrator 20, such as a resource associated with the employer, typically a human resources professional. Each employee interface module 14.1 to 14.n is associated with one of a plurality of employees 22.1 to 22.n. The employee interface modules 14.1 to 14.n are typically electronic devices such as computers but may also be web user interfaces (UI). The transmission of data between the employee interface modules 14.1 to 14.n and the server 15 is of any known type as will become apparent to a person skilled in the art when reading through the description.

The system 10 typically works as follows. The administrator 20 enters the following into the administrator interface module 12: a) a first set of prompts; b) a second set of prompts; c) the predetermined time period; optionally d) a biographical data set relating to each of the employees 22.1 to 22.n; and e) actual historical data relating to whether an employee has terminated their employment. In turn, the actual historical data is typically stored on a database 18 of the server 15.

The first set of prompts is typically in the form of a first survey which comprises questions and feedback requests relevant to an employee and the employee's working environment. The first survey is directed to at least one of the following themes: leadership, engagement, alignment, development, enablement and readiness. The second set of prompts comprise questions and feedback requests similar to those of the first survey. The time period is a period in future during which the employee may terminate their employment. In this example the time period is three months.

During a fixed time period (in this example a year), at predetermined intervals (in this example every 6 months), each of the employee interface modules 14.1 to 14.n presents the first survey to the respective employee 22.1 to 22.n. Similarly, but on a more frequent
5 basis (in this example weekly), each of the employee interface modules 14.1 to 14.n also presents a question or request for feedback from a second set of prompts to the respective employee 22.1 to 22.n. The employee interface modules 14.1 to 14.n allow the employees 22.1 to 22.n to enter responses to the first surveys and to the questions or requests for feedback from the second set of prompts. In a case where the
10 biographical data set related to the employee is not entered by the administrator, the biographical data set may be entered by the employee.

The memory arrangement (not shown) comprises stored instructions which are executable by the processor and cause the processor to receive data relating to the
15 response to the first set of prompts from the at least one employee interface module. The processor uses the data relating to the response to identify relevant historical data from the historical data stored on the memory arrangement and/or the database 18 and which corresponds to the response. Then, the processor uses the relevant historical data to train a machine learning model 19 to determine an indicator P representing a
20 probability of the employee to terminate their current employment within a predetermined time period. In the embodiment shown, machine learning model 19 cooperates with a data surveying and data analytics application 26 (also installed on the server 15). The machine learning model 19 comprises a machine learning algorithm (described in more detail below and with reference to figure 2).

The machine learning model 19 generates data related to a plurality of indicators P for each employee 22.1 to 22.n forming part of a group of employees. Each indicator P represents a probability of the respective employee to terminate their employment within the time period. The indicator is preferably expressed as a numeric value between 0 and 1. In this case, the value of 0 indicates that the probability that the employee will terminate their current employment within three months is the lowest. Accordingly, the value of 1 indicates that the probability that the employee will terminate their employment within three months is the highest.

The memory arrangement may also comprise stored instructions which are executable by the processor and cause the processor to aggregate the plurality of indicators P to represent a collective indicator P_c which indicates an average probability for each of the respective employees forming part of the group to terminate their employment.

The database 18 typically stores the following a) the responses as received by the machine learning model 19, b) specific-action proposals and optionally c) at least one of the first set of prompts and the second set of prompts. The specific-action proposals are proposed actions which when implemented by an employer, may serve to decrease the probability of the employee terminating employment within the next three months. When, the value of P is below a certain threshold value, the machine learning model 19 selects a relevant specific-action proposal from the database 18.

The specific-action proposal can be proposals such as implementing fun committees, recognising people on special days, making the workplace more personal, implementing professional development plans, having communication sessions, addressing poor tools and resources at the employee's disposal and improving leadership development in order to deliver on employee needs. The list of specific-action proposals is not an exhaustive list and a Large Language Model may be used to generate a relevant specific action proposal.

The administrator interface module 12 receives the data related to the indicator P and the relevant specific-action proposal from the machine learning model 19 for each employee 22.1 to 22.n or for the group of employees.

Referring to figure 2, the machine learning algorithm 30 uses the following data inputs: first survey data 32, second survey data 34, a biographical data set 36, actual historical data 38 and data stored on the database 18. The data stored on the database 18 comprises data relating to specific-action proposals. The machine learning algorithm 30 produces the following outputs: a) a probability P of an employee to terminate employment 40; and b) a specific-action proposal to improve the probability of employment termination 42.

Figure 3 is a flow diagram which indicates a method 100 of determining a probability that an employee will terminate employment with an employer. The process 100 comprises the steps of presenting a set of prompts to an employee 110, receiving a response from the employee 112, using data relating to the response to identify relevant

historical data 114, training a machine learning model with the relevant historical data 116, applying the machine learning model to actual data 118, receiving a probability (P) of employment termination 120, if the probability (P) exceeds a threshold value, determining a specific-action proposal 122 and sending the probability and specific-
5 action proposal to an administrator 124.

Figure 4 is a high-level example of a table 120 comprising data for training the machine learning model. The table 120 comprises biographical data 122 and LEADER score data 124. The LEADER score data is typically calculated by evaluating the response to
10 the first and second surveys. The data within the table 120 may be fictional data which is used to train the machine learning model before applying the machine learning model to actual data. Alternatively, this data may be actual data which is used to train the machine learning model in order to improve the accuracy of the machine learning model.

15 The description and example embodiments above are presented in the cause of providing what is believed to be the most useful and readily understandable description of the principles and conceptual aspects of the invention. In this regard, no attempt is made to show structural details of the invention in more detail than is necessary for a fundamental understanding of the invention. The words used should therefore be
20 interpreted as words of description rather than words of limitation.

Where details of hardware components or the interactions between components are not disclosed in full details it should be assumed that these components or interactions are of the known kind. The invention furthermore extends to functionally equivalent

components and interactions between components that fall within the scope of the current disclosure.

CLAIMS

1. A system for determining a probability of an employee to terminate employment with an employer, the system comprising:

- at least one employee interface module configured to:

- present a first set of prompts to the employee; and
- receive from the employee, a response to the first set of prompts;

- a processor;

- a memory arrangement comprising stored instructions and historical data, the instructions being executable by the processor to cause the processor to:

- receive data relating to the response to the first set of prompts from the at least one employee interface module;

- use the data relating to the response to identify relevant historical data corresponding to the response;

- use the relevant historical data to train a machine learning model to determine an indicator P representing a probability of the employee to terminate their current employment within a time period;

- an administrator interface module configured to:

- receive the data related to the indicator P ; and

- present the indicator P to a user of the administrator module.

2. The system according to claim 1, wherein the memory arrangement comprises instructions to cause the processor to:

- determine a plurality of indicators P , each of the plurality of indicators representing a probability of a respective employee to terminate their current employment within the time period, each of the respective employees forming part of a group of employees; and
- to aggregate the plurality of indicators P to represent a collective indicator P_c which indicates an average probability for each of the respective employees forming part of the group to terminate their employment.

3. The system according to any one of claim 1 and claim 2, wherein the historical data comprises a plurality of specific-action proposals, any one of which when implemented by an employer serve to reduce a probability of an employee to terminate their employment, and wherein the processor is configured to select a specific-action proposal based on the data relating to the response to the first set of prompts.

4. The system according to claim 3, wherein the specific-action proposal comprises at least one of the following: implementing fun committees, recognising people on special days, making the workplace more personal, implementing professional development plans, having communications sessions, addressing poor tools and resources at the employee's disposal and improving leadership development in order to deliver on employee needs.

5. The system according to any one of the preceding claims, wherein the first set of prompts comprises questions and feedback requests.
- 5 6. The system according to any one of the preceding claims, wherein the first set of prompts is in the form of a first survey.
7. The system of any one of the preceding claims wherein the first survey is directed to at least one of the following themes: leadership, engagement, alignment, development, enablement and readiness.
- 10
8. The system of any one of the preceding claims, wherein the first survey is structured such that the response thereto is benchmarkable.
- 15 9. The system of any one of the preceding claims, wherein the first survey forms part of a plurality of surveys.
10. The system according to any one of the preceding claims, wherein:
- the at least one employee interface module is further configured to:
 - 20 ○ present a second set of prompts to the employee; and
 - receive a response to the second set of prompts from the employee;
 - and

- the processor is configured to:
 - receive data relating to the response to the second set of prompts from the at least one employee interface module; and
 - utilise the response to the second set of prompts to generate the data related to the indicator P .

5

11. The system according to any preceding claim, wherein the memory arrangement comprises a biographical data set related to the employee and wherein the processor, uses data from the biographical data set to train the machine learning model to determine the indicator P .

10

12. A computer-implemented method of determining a probability that an employee will terminate employment with an employer, the method comprising the steps of:

- at an employee interface module:
 - presenting a first set of prompts to the employee;
 - receiving a response to the first set of prompts from the employee;
- using data relating to the response to identify relevant historical data corresponding to the response;
- using the relevant historical data to train a machine learning model to determine an indicator P representing a probability of the employee to terminate their current employment within a time period; and
- at an administrator interface module:

15

20

- receiving data related to the indicator P_i ; and
- presenting the indicator P to a user of the administrator module.

13. The method according to claim 12, further comprising the steps of:

- 5
- determining a plurality of indicators P_i , each of the plurality of indicators representing a probability of a respective employee to terminate their current employment within the time period, each of the respective employees forming part of a group of employees; and
 - to aggregate the plurality of indicators P_i to represent a collective indicator P_c
- 10
- which indicates an average probability for each of the respective employees forming part of the group to terminate their employment.

14. The computer-implemented method according to any one of claim 12 and claim 15

13, wherein the machine learning model is a supervised learning model.

15. The computer-implemented method according to any one of claims 12 to 14 further comprising the step of feeding data related to actual employee turnover to the machine learning model.

20

16. The computer-implemented method according to any one of claims 12 to 15 further comprising the steps of: determining whether the indicator (P) exceeds a

threshold value; and when the indicator (P) exceeds the threshold, determining at least one specific-action proposal, to be implemented by the employer to decrease an actual probability of the employee to terminate their employment.

- 5 17. The computer-implemented method according to any one of claims 12 to 16, wherein the set of prompts is in the form of an employee survey.
18. The computer-implemented method according to claim 17, wherein the employee survey is directed to at least one of the following aspects: leadership,
10 engagement, alignment, development, enablement and readiness.
19. The computer-implemented method according to any one of claims 17 and 18, wherein the employee survey forms part of a plurality of surveys, each of the plurality of surveys being presented by the at least one employee interface
15 module at a first predetermined interval during a fixed time period.
20. The computer-implemented method according to claim 19, wherein results of the plurality of surveys are used to determine a holistic score.
- 20 21. The computer-implemented method according to any one of claims 19 and 20 wherein the first predetermined interval is a 6-month interval and the fixed time period is a 12-month period.

22. The computer-implemented method according to claim 19 further comprising the step of using a previous response by the employee to determine the indicator (P) representing the probability of the employee to terminate employment within the period.
23. The computer-implemented method according to claim 19, wherein the second predetermined interval is any one of a weekly and a bi-weekly interval.
24. The computer-implemented method according to any one of claims 19 to 23, wherein the machine learning model comprises a machine learning algorithm.
25. The computer-implemented method according to claim 24, wherein the machine learning algorithm is configured to use responses to more than one survey.
26. The computer-implemented method according to any one of claims 12 to 25, further comprising the step of using a biographical data set related to the employee in generating the data related to the indicator P .
27. The computer-implemented method according to any one of claims 12 to 25, further comprising the step of using the data relating to the response to identify

at least one of the following issues: workplace safety, diversity and inclusion and mental wellness issues.

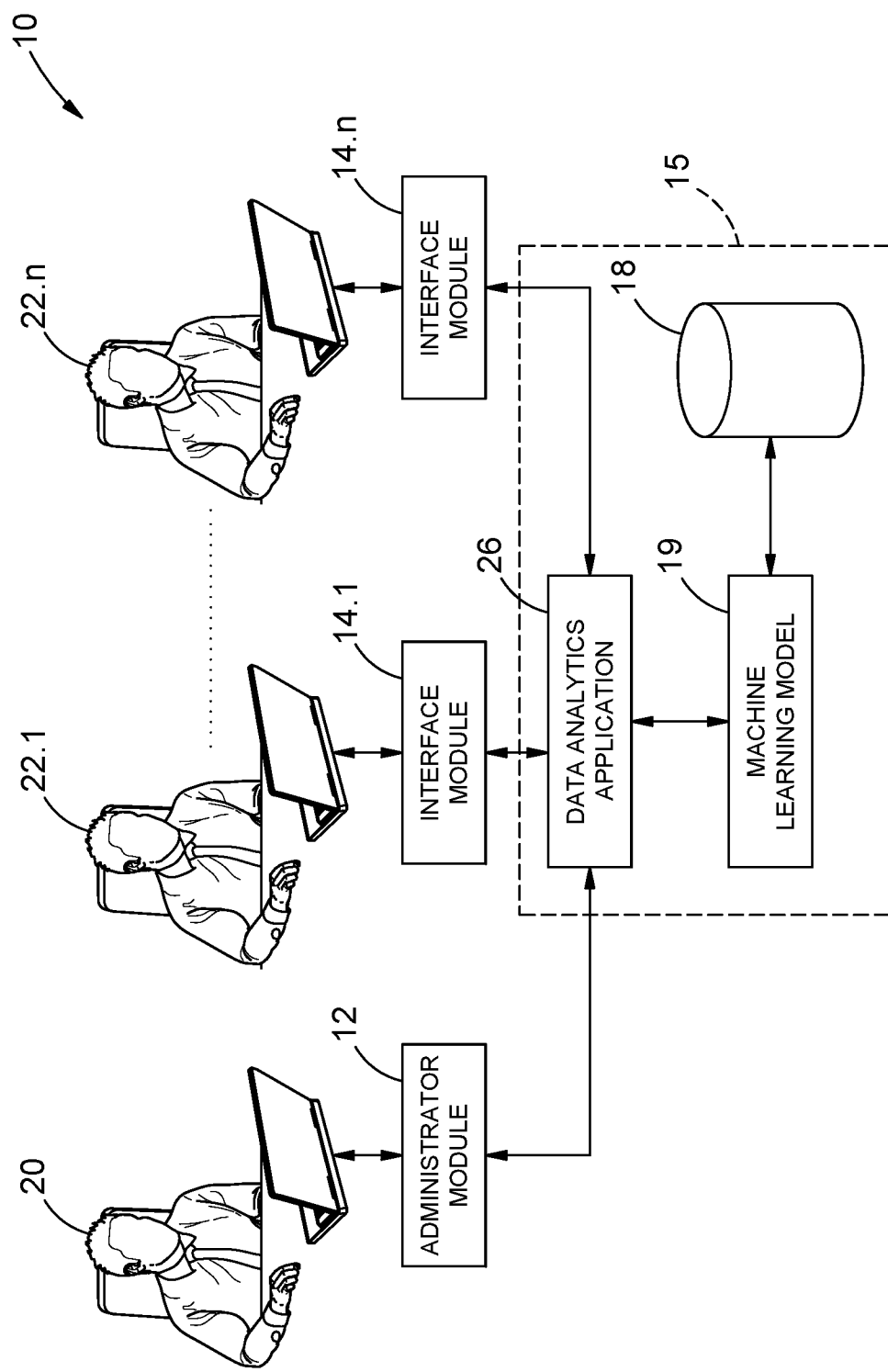
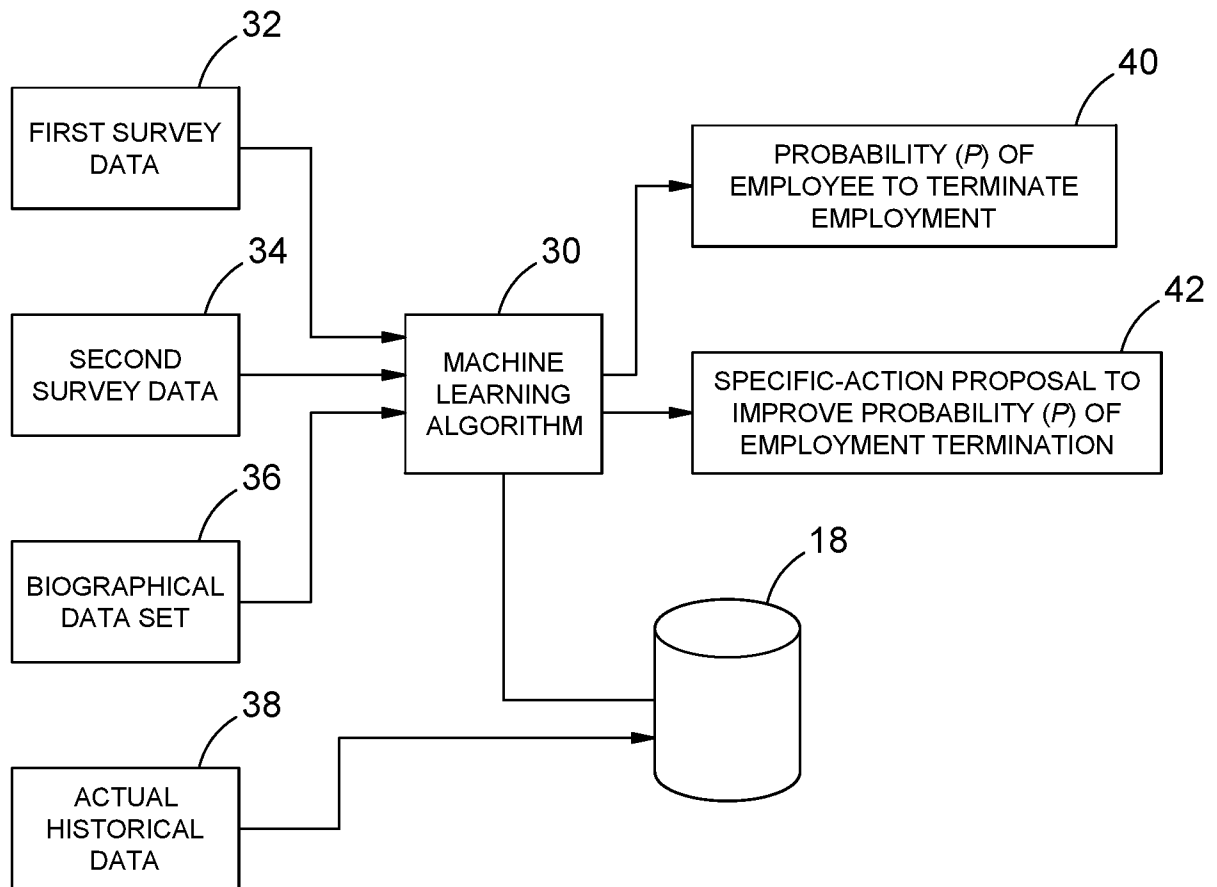
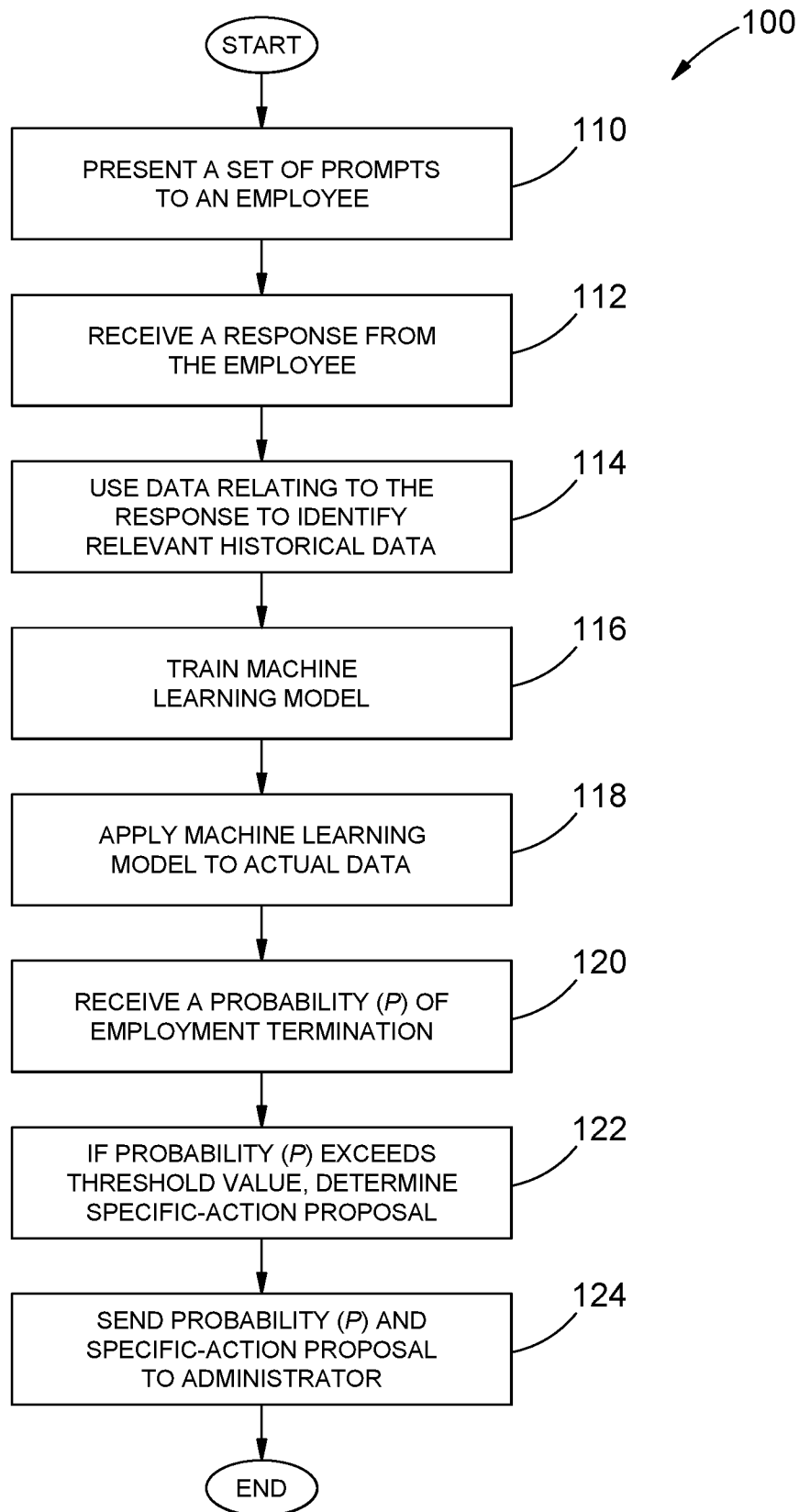


FIGURE 1

FIGURE 2

FIGURE 3

130

132134

ID	YEAR IN WHICH EMPLOYMENT STARTED	DISTANCE TO WORK	AGE	LEADER SCORE	DID PERSON LEAVE EMPLOYMENT WITHIN THREE MONTHS (0-YES/1-NO)
1	2003	1.2	30	85	0
2	2015	2.0	26	45	0
3	2009	0.8	42	26	1
4	2018	4.0	31	52	1
5	2015	15.0	55	46	1
6	2014	4.0	61	71	1
7	2017	8.0	63	69	1
8	2011	20.0	50	88	1
⋮	⋮	⋮	⋮	⋮	⋮

FIGURE 4

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2024/055827

A. CLASSIFICATION OF SUBJECT MATTER INV. G06Q10/063 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) G06Q G06F G06N A61B G16H H04M Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2021/326785 A1 (MCBURNETT MICHAEL [US] ET AL) 21 October 2021 (2021-10-21) paragraph [0003] - paragraph [0107]; claims 1-20; figures 1-5 -----	1 - 27
X	US 2022/114522 A1 (CARDOSO EDUARDO [BR] ET AL) 14 April 2022 (2022-04-14) paragraph [0004] - paragraph [0072]; claims 1-31; figures 1-4 -----	1 - 27
X	US 2021/217532 A1 (HEIMERL KRISTEN M [US]) 15 July 2021 (2021-07-15) paragraph [0013] - paragraph [0260]; claim 1; figures 1-35 ----- - / - -	1 - 27
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 22 August 2024		Date of mailing of the international search report 05/09/2024
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Viets, Ana

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2024/055827

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 608 593 A (ANDREAS LOROCH [DE]; CHRISTIAN KUGELMEIER [DE]) 11 January 2023 (2023-01-11) page 5, line 25 - page 53, line 18; claims 1-20; figures 1-2 -----	1 - 27

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2024/055827

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