

PATENT COOPERATION TREATY

From the INTERNATIONAL PRELIMINARY EXAMINING
AUTHORITY

To:

**MARGARET BAUMGARTNER
PO BOX 771949
MEMPHIS, TENNESSEE 38117
UNITED STATES OF AMERICA**

PCT

NOTIFICATION OF TRANSMITTAL OF
INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY (CHAPTER II OF
THE PATENT COOPERATION TREATY)

(PCT Rule 71.1)

CONFIRMATION NO. 7779

Date of mailing

(day/month/year)

01 April 2026 (01.04.2026)

Applicant's or agent's file reference

P23053-WO-00

IMPORTANT NOTIFICATION

International application No.

PCT/US2024/043377

International filing date

(day/month/year)

**22 August 2024
(22.08.2024)**

Priority date

(day/month/year)

**10 October 2023
(10.10.2023)**

Applicant

GENESYS CLOUD SERVICES, INC.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the *PCT Applicant's Guide*.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed invention is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the IPEA/US

**COMMISSIONER FOR PATENTS
MAIL STOP PCT, ATTN: IPEA/US
P.O. Box 1450
Alexandria, VA 22313-1450
UNITED STATES OF AMERICA**

Authorized officer

RAFAEL D BACARES

Facsimile No. **571-273-8300**

Telephone No. **(571)272-3276**

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P23053-WO-00		FOR FURTHER ACTION See Form PCT/IPEA/416
International application No. PCT/US2024/043377	International filing date (<i>day/month/year</i>) 22 August 2024 (22.08.2024)	Priority date (<i>day/month/year</i>) 10 October 2023 (10.10.2023)
International Patent Classification (IPC) or both national classification and IPC IPC: G06F 40/284 (2023.01); G06F 40/289 (2023.01); G06F 40/30 (2023.01) CPC: G06Q 10/01 ; G06F 40/284 ; G06F 40/289 ; G06F 40/30		
Applicant GENESYS CLOUD SERVICES, INC.		

- This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 3 sheets, including this cover sheet.
- This report is also accompanied by ANNEXES, comprising:
 - ☒ a total of 19 sheets, as follows:
 - ☒ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions).
 - ☐ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4*bis*, 70.2(e), 70.16 and 91.2).
 - ☐ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)).
 - ☐ a separate electronic file containing a sequence listing (*sent to the International Bureau only*).
- This report contains indications relating to the following items:
 - ☒ Box No. I Basis of the report
 - ☐ Box No. II Priority
 - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - ☐ Box No. IV Lack of unity of invention
 - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
 - ☐ Box No. VI Certain documents cited
 - ☐ Box No. VII Certain defects in the international application
 - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand 07 August 2025 (07.08.2025)	Date of completion of this report 19 March 2026 (19.03.2026)
Name and mailing address of the IPEA/US COMMISSIONER FOR PATENTS MAIL STOP PCT, ATTN: IPEA/US P.O. Box 1450 Alexandria, VA 22313-1450 UNITED STATES OF AMERICA	Authorized officer RAFAEL D BACARES
Facsimile No. 571-273-8300	Telephone No. (571)272-3276

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:
- ☒ the international application in the language in which it was filed.
- ☐ a translation of the international application into _____ which is the language of a translation furnished for the purposes of:
- ☐ international search (Rules 12.3(a) and 23.1(b)).
- ☐ publication of the international application (Rule 12.4(a)).
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a) and (b)).
2. With regard to the **elements** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):
- ☐ the international application as originally filed/furnished, or
- ☒ the description:
- pages 1-22 as originally filed/furnished.
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☒ the claims:
- Nos. _____ as originally filed/furnished.
- Nos.* _____ as amended (together with any statement) under Article 19
- Nos.* 1-18 received by this Authority on 07 August 2025 (07.08.2025)
- ☒ the drawings:
- pages 1/5 -5/5 as originally filed/furnished.
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.
3. ☒ The amendments have resulted in the cancellation of:
- ☒ the description, pages None
- ☒ the claims, Nos. 19-20
- ☒ the drawings, sheets/figs None
- ☐ the sequence listing (*specify*): _____
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):
- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
5. ☐ This report has been established:
- ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(e)).
- ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rules 66.4bis and 70.2(e)).
6. With regard to top-up searches (Rules 66.1ter and 70.2(f)):
- ☒ A top-up search was carried out by this Authority on 17 March 2026 (17.03.2026)
- ☒ Additional relevant documents have been discovered during the top-up search.
- ☐ No top-up search was carried out by this Authority because it would serve no useful purpose.
7. ☐ Supplementary international search report(s) from Authority(ies) _____ has/ have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded."

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/US2024/043377

Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement		
1. Statement			
Novelty (N)	Claims	<u>1-18</u>	YES
	Claims	<u></u>	NO
Inventive step (IS)	Claims	<u>1-18</u>	YES
	Claims	<u></u>	NO
Industrial applicability (IA)	Claims	<u>1-18</u>	YES
	Claims	<u></u>	NO
2. Citations and explanations(Rule 70.7)			
----- NEW CITATIONS -----			
US 20220222439 A1 (Adobe, Inc) 14 July 2022 (14.07.2022)			
US 20210133264 A1 (Rubert Labs Inc) 06 May 2021 (06.05.2021)			
----- EXPLANATION -----			
Claims 1-18 meet the criteria as set forth under PCT Article 33(1)-(3) as having novelty and an inventive step because the prior art fails to teach or fairly suggest the claimed subject selecting a plurality of kernel sequences from the passage, each kernel sequence comprising one or more words of the passage; and for each kernel sequence, generating a respective hierarchical set of nested sequences by iteratively appending one or more words that are adjacent to the kernel sequence in the passage, wherein: each nested sequence in the respective hierarchical set comprises the kernel sequence and at least one additional word that directly precedes and/or directly follows the kernel sequence within the passage and forms a subset of words of a subsequent sequence in the respective hierarchical set; and the nested sequences are ordered by increasing length such that each subsequent sequence includes the entire preceding sequence and at least one additional adjacent word. Claims 1- 18 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.			

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.: PCT/US2024/043377
Confirmation No.: 7779
Applicant: GENESYS CLOUD SERVICES, INC.
Filing Date: 22 Aug 2024
Attorney Docket No.: P23053-WO-00
Title: A SYSTEM AND METHOD OF IDENTIFYING A VARIATION OF
A PHRASE IN A TEXTUAL PASSAGE

RESPONSE TO WRITTEN OPINION AND ARTICLE 34 AMENDMENTS

Mail Stop: PCT
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

In response to the Written Opinion dated December 4, 2024 (the “Written Opinion”), Applicant submits this Response to Written Opinion and Article 34 Amendments with a Demand for International Preliminary Examination of this application. Applicant requests that the IPEA/US consider the discussion in the Response, enter the amendments and reconsider the conclusions of the Written Opinion.

Amendments to the Claims begin on page 2.

Applicant Arguments/Remarks begin on page 9.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

CLAIMS

1. A method of identifying occurrence of a semantic variation of a phrase in a passage by at least one processor, the method comprising:

based on a textual representation of the phrase, calculating a phrase embedding vector, representing a semantic meaning of the phrase;

obtaining a textual representation of the passage, comprising a plurality of words;

extracting, from the textual representation of the passage, at least one hierarchical set of nested sequences of words by; ~~wherein each sequence of a hierarchical set forms a subset of words of a subsequent sequence in the hierarchical set;~~

selecting a plurality of kernel sequences from the passage, each kernel sequence comprising one or more words of the passage; and

for each kernel sequence, generating a respective hierarchical set of nested sequences by iteratively appending one or more words that are adjacent to the kernel sequence in the passage, wherein:

each nested sequence in the respective hierarchical set comprises the kernel sequence and at least one additional word that directly precedes and/or directly follows the kernel sequence within the passage and forms a subset of words of a subsequent sequence in the respective hierarchical set; and

the nested sequences are ordered by increasing length such that each subsequent sequence includes the entire preceding sequence and at least one additional adjacent word;

for each nested sequence, calculating a corresponding sequence embedding vector, representing a semantic meaning of the nested sequence;

for one or more sequence embedding vectors, calculating a corresponding vector similarity value, representing similarity with the phrase embedding vector;

identifying a sequence corresponding to a maximal vector similarity value of the one or more vector similarity values; and

determining the identified sequence as a semantic variation of the phrase, based on the maximal vector similarity value.

2. The method of claim 1, wherein the at least one hierarchical set comprises a plurality of hierarchical sets.

~~3. The method of claim 2, wherein extracting the plurality of hierarchical sets comprises:
— selecting a plurality of kernel sequences, each comprising one or more words of the passage;
and
— for each kernel sequence, producing a respective hierarchical set of nested sequences, each comprising the kernel sequence and subsequent, monotonically increasing, nesting sequences of words.~~

4. The method of claim 1, wherein the textual representation of the passage is a transcript of a conversation, and wherein selecting the kernel sequences comprises:

selecting a section of the transcript, associated with a specific speaker in the conversation; and
selecting the kernel sequences to comprise one or more words of the selected section.

5. The method of claim 1, wherein selecting the kernel sequences comprises:

calculating, for one or more words of the passage, one or more respective labels representing parts of speech (POS); and

selecting the kernel sequences to comprise one or more words of the passage based on the calculated POS labels.

6. The method of claim 1, wherein selecting the kernel sequences comprises:

calculating, for one or more words of the passage, one or more respective metrics of term relevance; and

selecting the kernel sequences to comprise one or more words of the passage based on the calculated metrics of term relevance.

7. The method of claim 1, wherein calculating a sequence embedding vector of a specific sequence comprises:

obtaining a machine-learning (ML) based model, pretrained to map between textual representations of words and corresponding word embedding vectors;

inferring the ML based model on one or more words of the specific sequence, to produce one or more corresponding word embedding vectors, based on said training; and

calculating the sequence embedding vector as a function of the one or more word embedding vectors.

8. The method of claim 7, wherein training the ML model comprises:

inferring the ML based model on a first word, to produce a first interim word embedding vector, representing a semantic meaning of the first word;

inferring the ML based model on a second word, to produce a second interim word embedding vector, representing a semantic meaning of the second word;

receiving a first annotation data element, representing semantic similarity between the first word and the second word;

calculating a vector similarity value, representing similarity between the interim word embedding vectors;

calculating a first loss function value, representing a difference between the vector similarity value and the semantic similarity, as represented by the first annotation data element; and

training the ML model so as to minimize the first loss function value.

9. The method of claim 7, wherein training the ML model comprises:

inferring the ML based model on a first sequence, to produce a first interim sequence embedding vector;

inferring the ML based model on a second sequence, to produce a second interim sequence vector;

receiving a second annotation data element, representing sequence semantic similarity between the first sequence and the second sequence;

calculating a second vector similarity value, representing similarity between the interim sequence embedding vectors;

calculating a second loss function value, representing a difference between the second vector similarity value and the sequence semantic similarity, as represented by the second annotation data element; and

training the ML model so as to minimize the second loss function value.

10. The method of claim 7, wherein training the ML model further comprises:

receiving a textual representation of a phrase;

receiving a passage annotation data element, indicating existence of a variation of the phrase in the passage;

inferring the ML based model on a hierarchical set of sequences obtained from said passage, to calculate an interim maximal vector similarity value; and

training the ML model such that a value of the interim maximal vector similarity value corresponds to occurrence of a variation of the phrase in the passage, as represented by the passage annotation.

11. The method of claim 10, wherein the passage annotation data element is devoid of information indicating location of the variation of the phrase within the received passage.

12. A system for identifying occurrence of a semantic variation of a phrase in a passage, the system comprising: a non-transitory memory device, wherein modules of instruction code are stored, and at least one processor associated with the memory device, and configured to execute the modules of instruction code, whereupon execution of said modules of instruction code, the at least one processor is configured to:

based on a textual representation of the phrase, calculate a phrase embedding vector, representing a semantic meaning of the phrase;

obtain a textual representation of the passage, comprising a plurality of words;

extract, from the textual representation of the passage, at least one hierarchical set of nested sequences of words ~~by, wherein each sequence of a hierarchical set forms a subset of words of a subsequent sequence in the hierarchical set;~~

selecting a plurality of kernel sequences from the passage, each kernel sequence comprising one or more words of the passage; and

for each kernel sequence, generating a respective hierarchical set of nested sequences by iteratively appending one or more words that are adjacent to the kernel sequence in the passage, wherein:

each nested sequence in the respective hierarchical set comprises the kernel sequence and at least one additional word that directly precedes and/or directly follows the kernel sequence within the passage and forms a subset of words of a subsequent sequence in the respective hierarchical set; and

the nested sequences are ordered by increasing length such that each subsequent sequence includes the entire preceding sequence and at least one additional adjacent word;

for each nested sequence, calculate a corresponding sequence embedding vector, representing a semantic meaning of the nested sequence;

for one or more sequence embedding vectors, calculate a corresponding vector similarity value, representing similarity with the phrase embedding vector;

identify a sequence corresponding to a maximal vector similarity value of the one or more vector similarity values; and

determine the identified sequence as a semantic variation of the phrase, based on the maximal vector similarity value.

13. The system of claim 12, wherein the at least one hierarchical set comprises a plurality of hierarchical sets.

~~14. The system of claim 13, wherein the at least one processor is further configured to extract the plurality of hierarchical sets by:~~

~~—selecting a plurality of kernel sequences, each comprising one or more words of the passage; and~~

~~—for each kernel sequence, producing a respective hierarchical set of nested sequences, each comprising the kernel sequence and subsequent, monotonically increasing, nesting sequences of words.~~

15. The system of claim 12, wherein the textual representation of the passage is a transcript of a conversation, and wherein the at least one processor is further configured to select the kernel sequences by:

- selecting a section of the transcript, associated with a specific speaker in the conversation; and
- selecting the kernel sequences to comprise one or more words of the selected section.

16. The system of claim 12, wherein the at least one processor is further configured to select the kernel sequences by:

- calculating, for one or more words of the passage, one or more respective labels representing parts of speech (POS); and
- selecting the kernel sequences to comprise one or more words of the passage based on the calculated POS labels.

17. The system of claim 12, wherein the at least one processor is further configured to select the kernel sequences by:

- calculating, for one or more words of the passage, one or more respective metrics of term relevance; and
- selecting the kernel sequences to comprise one or more words of the passage based on the calculated metrics of term relevance.

18. The system of claim 12, wherein the at least one processor is further configured to calculate a sequence embedding vector of a specific sequence by:

- obtaining a machine-learning (ML) based model, pretrained to map between textual representations of words and corresponding word embedding vectors;
- inferring the ML based model on one or more words of the specific sequence, to produce one or more corresponding word embedding vectors, based on said training; and
- calculating the sequence embedding vector as a function of the one or more word embedding vectors.

19. The system of claim 18, wherein the at least one processor is further configured to train the ML model further by:

receiving a textual representation of a phrase;

receiving a passage annotation data element, indicating existence of a variation of the phrase in the passage;

inferring the ML based model on a hierarchical set of sequences obtained from said passage, to calculate an interim maximal vector similarity value; and

training the ML model such that a value of the interim maximal vector similarity value corresponds to occurrence of a variation of the phrase in the passage, as represented by the passage annotation.

20. A method of identifying occurrence of a semantic variation of a phrase in a passage by at least one processor, the method comprising:

based on a textual representation of the phrase, calculating a phrase embedding vector, representing a semantic meaning of the phrase;

receiving a textual representation of the passage, comprising a plurality of n-grams,

extracting, from the textual representation of the passage, a plurality of sequences of n-grams by:

selecting a plurality of kernel sequences from the passage, each kernel sequence comprising one or more words of the passage; and

for each kernel sequence, generating respective sequences of n-grams by iteratively appending one or more words that are adjacent to the kernel sequence in the passage, wherein each sequence of n-grams comprises the kernel sequence and at least one additional word that directly precedes and/or directly follows the kernel sequence within the passage;

for each sequence, calculating a corresponding sequence embedding vector, representing a semantic meaning of the sequence;

for one or more sequence embedding vectors, calculating a similarity with the phrase embedding vector; and

determining the identified sequence as a semantic variation of the phrase, based on the calculated similarity.

REMARKS

In view of the above amendments and the following remarks, reconsideration and further examination are respectfully requested.

Status of All of the Claims

Below is the status of the claims in this application.

1. Claim(s) pending: 1, 2, 4-13, and 15-20
2. Claim(s) canceled: 3 and 14
3. Claim(s) added: 0
4. Claims withdrawn from consideration but not canceled: 0

In the Written Opinion, the Examiner objected to the clarity of claims 1, 3, 12, and 14. Specifically, the terms “hierarchy” and “subsequent” in claims 1 and 12, as well as the limitation “selecting a plurality of kernel sequences” in claims 3 and 14, were identified as unclear. In response, Applicant has amended independent claims 1 and 12 to incorporate features similar to those previously recited in dependent claim 3 and 14, respectively, and clarified the identified terms and limitations. Dependent claims 3 and 14 have been cancelled. Specifically, Applicant has amended independent claim 1 to recite the following:

A method of identifying occurrence of a semantic variation of a phrase in a passage by at least one processor, the method comprising:

based on a textual representation of the phrase, calculating a phrase embedding vector, representing a semantic meaning of the phrase;

obtaining a textual representation of the passage, comprising a plurality of words;

extracting, from the textual representation of the passage, at least one hierarchical set of nested sequences of words by:

selecting a plurality of kernel sequences from the passage, each kernel sequence comprising one or more words of the passage; and

for each kernel sequence, generating a respective hierarchical set of nested sequences by iteratively appending one or more

words that are adjacent to the kernel sequence in the passage, wherein:

each nested sequence in the respective hierarchical set comprises the kernel sequence and at least one additional word that directly precedes and/or directly follows the kernel sequence within the passage and forms a subset of words of a subsequent sequence in the respective hierarchical set; and

the nested sequences are ordered by increasing length such that each subsequent sequence includes the entire preceding sequence and at least one additional adjacent word;

for each nested sequence, calculating a corresponding sequence embedding vector, representing a semantic meaning of the nested sequence;

for one or more sequence embedding vectors, calculating a corresponding vector similarity value, representing similarity with the phrase embedding vector;

identifying a sequence corresponding to a maximal vector similarity value of the one or more vector similarity values; and

determining the identified sequence as a semantic variation of the phrase, based on the maximal vector similarity value.

(Emphasis added). Support for the amendments can be found throughout Applicant's description and figures including, but not limited to, Figs. 4 and 5 and paragraphs [0063]-[0069] and [0090]-[0093]. No new matter has been presented as a result of the amendments. As such, Applicant respectfully submits that amended claims 1 and 12 comply with the clarity requirement of Article 6 of the PCT.

Additionally, in the Written Opinion, the Examiner asserted that claims 1-20 lack an inventive step under PCT Article 33(3) as being obvious over US 2022/0261545 A1 by Lauber et al. (hereinafter "D1 reference"), while indicating that claims 1-20 are novel and possess industrial applicability. As noted above, Applicant has amended independent claims 1 and 12 to incorporate features similar to those previously recited in dependent claims 3 and 14, respectively. Dependent claims 3 and 14 have been cancelled. Applicant respectfully submits that the D1

reference fails to disclose or teach each and every feature of amended independent claims 1, 12, and 20 as presently amended.

Specifically, the D1 reference fails to teach “extracting, from the textual representation of the passage, at least one hierarchical set of nested sequences of words by: selecting a plurality of kernel sequences from the passage, each kernel sequence comprising one or more words of the passage; and for each kernel sequence, generating a respective hierarchical set of nested sequences by iteratively appending one or more words that are adjacent to the kernel sequence in the passage, wherein: each nested sequence in the respective hierarchical set comprises the kernel sequence and at least one additional word that directly precedes and/or directly follows the kernel sequence within the passage and forms a subset of words of a subsequent sequence in the respective hierarchical set; and the nested sequences are ordered by increasing length such that each subsequent sequence includes the entire preceding sequence and at least one additional adjacent word,” as recited in amended independent claim 1.

It appears that the Examiner acknowledges that the D1 reference does not disclose the feature of extracting “the hierarchical set of nested sequences of words” but has indicated that the language describing this feature is unclear in terms of deriving a technical effect. As presented above, independent claim 1 has been amended to clarify how the hierarchical set of nested sequences of words is extracted. Applicant respectfully submits that the D1 reference fails to disclose or suggest at least these features of amended independent claim 1. Applicant has made similar amendments to independent claims 12 and 20. Accordingly, Applicant respectfully submits that the subject matter of independent claims 1, 12, and 20, as presently amended, meets the requirements of Article 33(3) PCT.

Because claims 2 and 4-11 depend, directly or indirectly, from claims 1, and claims 13 and 15-19 depend, directly or indirectly, from claim 12, they incorporate all the terms and limitations of claims 1 and 12 in addition to other limitations, which together further patentably distinguish these claims over the art of record when considered as a whole.

Applicant respectfully notes that claim 4-13 and 15-20 have been renumbered as claims 3-12 and 13-18, respectively, in the replacement sheets filed with the Article 34 amendments.

Conclusion

In the event Applicant has inadvertently overlooked the need for a payment of an additional fee, Applicant conditionally petitions, therefor, and authorizes any fee deficiency to be charged to deposit account 50-5783. When doing so, please reference Attorney Docket No. P23053-WO-00.

Respectfully submitted,

By: s/Yoojin Jung/
Yoojin Jung, Reg. No. 76,302
Genesys Cloud Services, Inc.
1302 El Camino Real, Suite 300
Menlo Park, CA 94025
Telephone: (703) 673-1718
Email: kate.jung@genesys.com

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REPLACEMENT SHEET

CLAIMS

1. A method of identifying occurrence of a semantic variation of a phrase in a passage by at least one processor, the method comprising:

based on a textual representation of the phrase, calculating a phrase embedding vector, representing a semantic meaning of the phrase;

obtaining a textual representation of the passage, comprising a plurality of words;

extracting, from the textual representation of the passage, at least one hierarchical set of nested sequences of words by:

selecting a plurality of kernel sequences from the passage, each kernel sequence comprising one or more words of the passage; and

for each kernel sequence, generating a respective hierarchical set of nested sequences by iteratively appending one or more words that are adjacent to the kernel sequence in the passage, wherein:

each nested sequence in the respective hierarchical set comprises the kernel sequence and at least one additional word that directly precedes and/or directly follows the kernel sequence within the passage and forms a subset of words of a subsequent sequence in the respective hierarchical set; and

the nested sequences are ordered by increasing length such that each subsequent sequence includes the entire preceding sequence and at least one additional adjacent word;

for each nested sequence, calculating a corresponding sequence embedding vector, representing a semantic meaning of the nested sequence;

for one or more sequence embedding vectors, calculating a corresponding vector similarity value, representing similarity with the phrase embedding vector;

identifying a sequence corresponding to a maximal vector similarity value of the one or more vector similarity values; and

determining the identified sequence as a semantic variation of the phrase, based on the maximal vector similarity value.

2. The method of claim 1, wherein the at least one hierarchical set comprises a plurality of hierarchical sets.

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REPLACEMENT SHEET

3. The method of claim 1, wherein the textual representation of the passage is a transcript of a conversation, and wherein selecting the kernel sequences comprises:
 - selecting a section of the transcript, associated with a specific speaker in the conversation; and
 - selecting the kernel sequences to comprise one or more words of the selected section.
4. The method of claim 1, wherein selecting the kernel sequences comprises:
 - calculating, for one or more words of the passage, one or more respective labels representing parts of speech (POS); and
 - selecting the kernel sequences to comprise one or more words of the passage based on the calculated POS labels.
5. The method of claim 1, wherein selecting the kernel sequences comprises:
 - calculating, for one or more words of the passage, one or more respective metrics of term relevance; and
 - selecting the kernel sequences to comprise one or more words of the passage based on the calculated metrics of term relevance.
6. The method of claim 1, wherein calculating a sequence embedding vector of a specific sequence comprises:
 - obtaining a machine-learning (ML) based model, pretrained to map between textual representations of words and corresponding word embedding vectors;
 - inferring the ML based model on one or more words of the specific sequence, to produce one or more corresponding word embedding vectors, based on said training; and
 - calculating the sequence embedding vector as a function of the one or more word embedding vectors.
7. The method of claim 6, wherein training the ML model comprises:
 - inferring the ML based model on a first word, to produce a first interim word embedding vector, representing a semantic meaning of the first word;
 - inferring the ML based model on a second word, to produce a second interim word embedding vector, representing a semantic meaning of the second word;

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REPLACEMENT SHEET

receiving a first annotation data element, representing semantic similarity between the first word and the second word;

calculating a vector similarity value, representing similarity between the interim word embedding vectors;

calculating a first loss function value, representing a difference between the vector similarity value and the semantic similarity, as represented by the first annotation data element; and

training the ML model so as to minimize the first loss function value.

8. The method of claim 6, wherein training the ML model comprises:

inferring the ML based model on a first sequence, to produce a first interim sequence embedding vector;

inferring the ML based model on a second sequence, to produce a second interim sequence vector;

receiving a second annotation data element, representing sequence semantic similarity between the first sequence and the second sequence;

calculating a second vector similarity value, representing similarity between the interim sequence embedding vectors;

calculating a second loss function value, representing a difference between the second vector similarity value and the sequence semantic similarity, as represented by the second annotation data element; and

training the ML model so as to minimize the second loss function value.

9. (Original) The method of claim 6, wherein training the ML model further comprises:

receiving a textual representation of a phrase;

receiving a passage annotation data element, indicating existence of a variation of the phrase in the passage;

inferring the ML based model on a hierarchical set of sequences obtained from said passage, to calculate an interim maximal vector similarity value; and

training the ML model such that a value of the interim maximal vector similarity value corresponds to occurrence of a variation of the phrase in the passage, as represented by the passage annotation.

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10. The method of claim 9, wherein the passage annotation data element is devoid of information indicating location of the variation of the phrase within the received passage.

11. A system for identifying occurrence of a semantic variation of a phrase in a passage, the system comprising: a non-transitory memory device, wherein modules of instruction code are stored, and at least one processor associated with the memory device, and configured to execute the modules of instruction code, whereupon execution of said modules of instruction code, the at least one processor is configured to:

based on a textual representation of the phrase, calculate a phrase embedding vector, representing a semantic meaning of the phrase;

obtain a textual representation of the passage, comprising a plurality of words;

extract, from the textual representation of the passage, at least one hierarchical set of nested sequences of words by:

selecting a plurality of kernel sequences from the passage, each kernel sequence comprising one or more words of the passage; and

for each kernel sequence, generating a respective hierarchical set of nested sequences by iteratively appending one or more words that are adjacent to the kernel sequence in the passage, wherein:

each nested sequence in the respective hierarchical set comprises the kernel sequence and at least one additional word that directly precedes and/or directly follows the kernel sequence within the passage and forms a subset of words of a subsequent sequence in the respective hierarchical set; and

the nested sequences are ordered by increasing length such that each subsequent sequence includes the entire preceding sequence and at least one additional adjacent word;

for each nested sequence, calculate a corresponding sequence embedding vector, representing a semantic meaning of the nested sequence;

for one or more sequence embedding vectors, calculate a corresponding vector similarity value, representing similarity with the phrase embedding vector;

identify a sequence corresponding to a maximal vector similarity value of the one or more vector similarity values; and

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determine the identified sequence as a semantic variation of the phrase, based on the maximal vector similarity value.

12. The system of claim 11, wherein the at least one hierarchical set comprises a plurality of hierarchical sets.

13. The system of claim 11, wherein the textual representation of the passage is a transcript of a conversation, and wherein the at least one processor is further configured to select the kernel sequences by:

selecting a section of the transcript, associated with a specific speaker in the conversation; and

selecting the kernel sequences to comprise one or more words of the selected section.

14. The system of claim 11, wherein the at least one processor is further configured to select the kernel sequences by:

calculating, for one or more words of the passage, one or more respective labels representing parts of speech (POS); and

selecting the kernel sequences to comprise one or more words of the passage based on the calculated POS labels.

15. The system of claim 11, wherein the at least one processor is further configured to select the kernel sequences by:

calculating, for one or more words of the passage, one or more respective metrics of term relevance; and

selecting the kernel sequences to comprise one or more words of the passage based on the calculated metrics of term relevance.

16. The system of claim 11, wherein the at least one processor is further configured to calculate a sequence embedding vector of a specific sequence by:

obtaining a machine-learning (ML) based model, pretrained to map between textual representations of words and corresponding word embedding vectors;

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inferring the ML based model on one or more words of the specific sequence, to produce one or more corresponding word embedding vectors, based on said training; and calculating the sequence embedding vector as a function of the one or more word embedding vectors.

17. The system of claim 16, wherein the at least one processor is further configured to train the ML model further by:

receiving a textual representation of a phrase;

receiving a passage annotation data element, indicating existence of a variation of the phrase in the passage;

inferring the ML based model on a hierarchical set of sequences obtained from said passage, to calculate an interim maximal vector similarity value; and

training the ML model such that a value of the interim maximal vector similarity value corresponds to occurrence of a variation of the phrase in the passage, as represented by the passage annotation.

18. A method of identifying occurrence of a semantic variation of a phrase in a passage by at least one processor, the method comprising:

based on a textual representation of the phrase, calculating a phrase embedding vector, representing a semantic meaning of the phrase;

receiving a textual representation of the passage, comprising a plurality of n-grams,

extracting, from the textual representation of the passage, a plurality of sequences of n-grams by:

selecting a plurality of kernel sequences from the passage, each kernel sequence comprising one or more words of the passage; and

for each kernel sequence, generating respective sequences of n-grams by iteratively appending one or more words that are adjacent to the kernel sequence in the passage, wherein each sequence of n-grams comprises the kernel sequence and at least one additional word that directly precedes and/or directly follows the kernel sequence within the passage;

for each sequence, calculating a corresponding sequence embedding vector, representing a semantic meaning of the sequence;

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for one or more sequence embedding vectors, calculating a similarity with the phrase embedding vector; and

determining the identified sequence as a semantic variation of the phrase, based on the calculated similarity.