PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
GGL-1331-PCT		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/US2017/058229	25 October 2017 (25-10-2017)	
Applicant		
GOOGLE LLC		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 5 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language,** the international search was carried out on the basis of:
      [X] 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))
   b. [ ] This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. [ ] With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. [ ] **Certain claims were found unsearchable** (See Box No. II)

3. [ ] **Unity of invention is lacking** (see Box No III)

4. With regard to the **title,**
   [X] the text is approved as submitted by the applicant
   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**
   [ ] the text is approved as submitted by the applicant
   [X] the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority

6. With regard to the **drawings,**
   a. the figure of the **drawings** to be published with the abstract is Figure No. 2
      [X] as suggested by the applicant
      [ ] as selected by this Authority, because the applicant failed to suggest a figure
      [ ] as selected by this Authority, because this figure better characterizes the invention
   b. [ ] none of the figures is to be published with the abstract

Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)

The present disclosure provides systems and a method that perform machine-learned natural language processing. A computing system includes a machine-learned natural language processing model that includes an encoder model trained to receive a natural language text body and output a knowledge graph and a programmer model trained to receive a natural language question and output a program. The computing system includes a computer-readable medium storing instructions that, when executed, cause the processor to perform operations. The operations include obtaining the natural language text body, inputting the natural language text body into the encoder model, receiving, as an output of the encoder model, the knowledge graph, obtaining the natural language question, inputting the natural language question into the programmer model, receiving the program as an output of the programmer model, and executing the program on the knowledge graph to produce an answer to the natural language question.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2017/058229

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F17/27 G06F17/30 G06N3/02
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)
G06F G06N

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CHEN LIANG ET AL: "Neural Symbolic Machines: Learning Semantic Parsers on Freebase with Weak Supervision", ARXIV.ORG, CORNELL UNIVERSITY LIBRARY, 201 OLIN LIBRARY CORNELL UNIVERSITY ITHACA, NY 14853, 31 October 2016 (2016-10-31), XP080728513, DOI: 10.18653/V1/P17-1003 cited in the application abstract Sections 1-3 & 5 ----- -/--	1-29

[X] Further documents are listed in the continuation of Box C.

[X] 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	Date of mailing of the international search report
9 July 2018	25/07/2018

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Woods, Justin

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Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JUN YIN ET AL: "Neural Generative Question Answering", PROCEEDINGS OF THE WORKSHOP ON HUMAN-COMPUTER QUESTION ANSWERING, 22 April 2016 (2016-04-22), pages 36-42, XP055404542, Stroudsburg, PA, USA DOI: 10.18653/v1/W16-0106 Section 2.2	1-29
A	US 2016/124962 A1 (BARBORAK MICHAEL A [US] ET AL) 5 May 2016 (2016-05-05) abstract paragraph [0037]	1-29
A	ZIHANG DAI ET AL: "CFO: Conditional Focused Neural Question Answering with Large-scale Knowledge Bases", PROCEEDINGS OF THE 54TH ANNUAL MEETING OF THE ASSOCIATION FOR COMPUTATIONAL LINGUISTICS (VOLUME 1: LONG PAPERS), 7 August 2016 (2016-08-07), pages 800-810, XP055490035, Stroudsburg, PA, USA DOI: 10.18653/v1/P16-1076 abstract Section 6.1	3,23
T	FAN YANG ET AL: "Learning to Organize Knowledge with N-Gram Machines", ARXIV.ORG, CORNELL UNIVERSITY LIBRARY, 201 OLIN LIBRARY CORNELL UNIVERSITY ITHACA, NY 14853, 17 November 2017 (2017-11-17), XP080838284, the whole document	

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2017/058229

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2016124962 A1	05-05-2016	US 2016124962 A1	05-05-2016
		US 2016125013 A1	05-05-2016