

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference IITM-017600WO		FOR FURTHER ACTION	
		see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/IN2020/050847	International filing date (<i>day/month/year</i>) 01-10-2020	(Earliest) Priority Date (<i>day/month/year</i>) 01-10-2019	
Applicant INDIAN INSTITUTE OF TECHNOLOGY MADRAS (IIT MADRAS)			

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 3 sheets.

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:

- 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 43.6bis(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**,

- 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.
- 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. 1

- 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.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2020/050847

<p>A. CLASSIFICATION OF SUBJECT MATTER G10L25/30,G10L15/16,G10L21/06 Version=2021.01</p> <p>According to International Patent Classification (IPC) or to both national classification and IPC</p>														
<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) G10L</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Databases: TotalPatent One, IPO Internal Database. Keywords: real data signals, phonetic data, neural network</p>														
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:10%;">Category*</th> <th style="width:70%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width:20%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>US8527276B1 (CHUN BYUNGHA et al.) 03-SEPTEMBER-2013 (03-09-2013) Abstract; Page 1, Line 28 - Line 35; Page 3, Line 24 - Line 63; Page 1, Line 43 - Line 56; Page 22, Line 29 - Line 36; Page 6, Line 31 - Line 52 -----</td> <td>1-10</td> </tr> <tr> <td>Y</td> <td>US9792900B1 (MALASPINA LABS (BARBADOS) INC) 17-OCTOBER-2017 (17-10-2017) Abstract; Page 1, Line 65 - Page 2, Line 16; Page 10 Line 1 - Line 17 -----</td> <td>1-10</td> </tr> <tr> <td>Y</td> <td>US5930754A (MOTOROLA INC) 27- JULY-1999 (27-07-1999) Abstract; Page 3, Line 36 - Line 52; Page 15, Line 20 - Line 25</td> <td>1-10</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US8527276B1 (CHUN BYUNGHA et al.) 03-SEPTEMBER-2013 (03-09-2013) Abstract; Page 1, Line 28 - Line 35; Page 3, Line 24 - Line 63; Page 1, Line 43 - Line 56; Page 22, Line 29 - Line 36; Page 6, Line 31 - Line 52 -----	1-10	Y	US9792900B1 (MALASPINA LABS (BARBADOS) INC) 17-OCTOBER-2017 (17-10-2017) Abstract; Page 1, Line 65 - Page 2, Line 16; Page 10 Line 1 - Line 17 -----	1-10	Y	US5930754A (MOTOROLA INC) 27- JULY-1999 (27-07-1999) Abstract; Page 3, Line 36 - Line 52; Page 15, Line 20 - Line 25	1-10
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<p><input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.</p>														
<p>* Special categories of cited documents:</p> <table style="width:100%;"> <tr> <td style="width:50%;"> <p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“D” document cited by the applicant in the international application</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“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)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width:50%;"> <p>“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</p> <p>“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</p> <p>“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</p> <p>“&” document member of the same patent family</p> </td> </tr> </table>			<p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“D” document cited by the applicant in the international application</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“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)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p>	<p>“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</p> <p>“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</p> <p>“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</p> <p>“&” document member of the same patent family</p>										
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<p>Date of the actual completion of the international search 10-02-2021</p>		<p>Date of mailing of the international search report 10-02-2021</p>												
<p>Name and mailing address of the ISA/ Indian Patent Office Plot No.32, Sector 14,Dwarka,New Delhi-110075 Facsimile No.</p>		<p>Authorized officer Himanshu Sourabh Telephone No. +91-1125300200</p>												

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IN2020/050847

Citation	Pub.Date	Family	Pub.Date
US 9792900 B1	17-10-2017	US 10297247 B2	21-05-2019
US 5930754 A	27-07-1999	GB 2326320 B	11-08-1999

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

To: INDIAN INSTITUTE OF TECHNOLOGY MADRAS (IIT MADRAS) RAMAKRISHNAN, GOPALAKRISHNAN MAXVAL IP SERVICES (P) LTD. INDIALAND TECHPARK, 4TH FLOOR, CHIL SEZ, KEERANATHAM ROAD, COIMBATORE-641035 INDIA	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">Date of mailing <i>(day/month/year)</i></td> <td style="width: 50%; padding: 2px;">10-02-2021</td> </tr> </table>	Date of mailing <i>(day/month/year)</i>	10-02-2021
Date of mailing <i>(day/month/year)</i>	10-02-2021		
Applicant's or agent's file reference IITM-017600WO	FOR FURTHER ACTION See paragraphs 1 and 4 below		
International application No. PCT/IN2020/050847	International filing date <i>(day/month/year)</i> 01-10-2020		
Applicant INDIAN INSTITUTE OF TECHNOLOGY MADRAS (IIT MADRAS)			

1. The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:
The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

How? Directly to the International Bureau preferably through ePCT, or on paper to:
The International Bureau of WIPO, 34, chemin des Colombettes, 1211 Geneva 20, Switzerland

For more detailed instructions, see the *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2. The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

The applicant may **submit comments on an informal basis on the written opinion of the International Searching Authority** to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Within **22 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/ Indian Patent Office Plot No. 32, Sector 14, Dwarka, New Delhi- 110075 Facsimile No.	Authorized officer Himanshu Sourabh Telephone No. +91-1125300200
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PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:
RAMAKRISHNAN, GOPALAKRISHNAN
MAXVAL IP SERVICES (P) LTD.
INDIALAND TECHPARK, 4TH FLOOR,
CHIL SEZ, KEERANATHAM
ROAD, COIMBATORE-641035 INDIA

Date of mailing
(day/month/year) 10-02-2021

Applicant's or agent's file reference
IITM-017600WO

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/IN2020/050847

International filing date (day/month/year)
01-10-2020

Priority date (day/month/year)
01-10-2019

International Patent Classification (IPC) or both national classification and IPC
G10L25/30,G10L15/16,G10L21/06 Version=2021.01

Applicant
INDIAN INSTITUTE OF TECHNOLOGY MADRAS (IIT MADRAS)

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- 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 Rule 43bis.1(a)(i) 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

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/
Indian Patent Office
Plot No. 32, Sector 14,
Dwarka, New Delhi-110075
Facsimile No.

Date of completion of this opinion
10-02-2021

Authorized officer
Himanshu Sourabh
Telephone No. +91-1125300200

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/IN2020/050847

Box No. I **Basis of this opinion**

1. With regard to the **language**, this opinion has been established on the basis of:
 - 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)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(b)).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. forming part of the international application as filed:
 - in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
 - b. furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. furnished subsequent to the international filing date for the purposes of international search only:
 - in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).
 - on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/IN2020/050847

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	_____	YES
	Claims	<u>1-10</u>	NO
Inventive step (IS)	Claims	_____	YES
	Claims	<u>1-10</u>	NO
Industrial applicability (IA)	Claims	<u>1-10</u>	YES
	Claims	_____	NO

2. Citations and explanations:

Reference is made to the following documents:

- D1:- US8527276B1 (CHUN BYUNGHA et al.) 03-SEPTEMBER-2013
(03-09-2013)
D2:- US9792900B1 (MALASPINA LABS (BARBADOS) INC) 17-OCTOBER-2017
(17-10-2017)
D3:- US5930754A (MOTOROLA INC) 27- JULY-1999 (27-07-1999)

ARTICLE 33(2) OF THE PCT - NOVELTY

The subject-matter of claims 1-10 is not novel (Article 33(2) of PCT) in view of the disclosure of document D1.

Regarding claim 1, D1 discloses (the references in parentheses applying to the document) the method of interpreting real-data signals (Page 1, Line 28 - Line 35), the method comprising: receiving, by a processor, a plurality of audio signals representing phonetic data and text data in a natural language (Page 3, Line 44 - Line 63); converting, by the processor, the plurality of audio signals into a plurality of digital signals (Page 3, Line 24 - Line 43); providing, by the processor, the plurality of digital signals and associated phonetic data and text data as training data to a point-to-point recurrent neural network (PPRNN) engine (Page 1, Line 43 - Line 56; Page 22, Line 29 - Line 36); receiving, by the processor, real-data signals as an input to PPRNN engine, wherein the real-data signal represents an electrical activity (Page 3, Line 44 - Line 66; Page 6, Line 31 - Line 52); predicting, by the processor, one or more of phonetics, letters, words, or sentences associated with the real-data signals using the

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Continuation of Citation and Explanation(Box5)

PPRNN engine (Page 3, Line 44 - Line 66; Page 6, Line 31 - Line 52); and
converting, by the processor, the predicted phonetics, letters, words, or sentences into speech signals in the natural language (Page 3, Line 44 - Line 66; Page 6, Line 31 - Line 52).

All technical features of claim 1 are thus disclosed by document D1. Therefore, the subject matter of claim 1 lacks novelty (Article 33(2) of PCT).

Claim 6 relates to the system for interpreting real-data signals and corresponds to method claim 1. The above reasoning is also valid for claim 6, since the said claim is based on the same essential features as those of claim 1. Thus the subject matter of claim 6 also lacks novelty (Article 33(2) of PCT).

Dependent claims 2-5 and 7-10 do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of PCT Article 33(2), since these features are directly derivable from the cited prior art document D1.

ARTICLE 33(3) OF THE PCT- INVENTIVE STEP

The subject matter of claims 1-10 does not have an inventive step in the sense of Article 33(3) of PCT because claimed features are disclosed in D1 as stated above for novelty consideration.

At the same time, the subject matter of claims 1-10 lacks an inventive step in view of the disclosures of D2 and D3 too.

Regarding claims 1-10, D2 discloses the method of training an expert-assisted phoneme recognition neural network system, the method comprising: at an expert-assisted phoneme recognition neural network system configured to generate one or more phoneme candidates as recognized within audible signal data, the expert-assisted phoneme recognition neural network system including an ensemble phoneme recognition neural network and a phoneme-specific experts system: selecting a target problematic phoneme; synthesizing a targeted training data set including an overemphasis of examples of the target problematic phoneme; synthesizing respective problematic phoneme-specific weight values for problematic phoneme-specific expert neural network (PPENN)

included in the phoneme-specific experts system by providing the synthesized target training data set to the PPENN in accordance with a determination that the respective problematic phoneme-specific weight values satisfy an error convergence threshold (Abstract; Page 1, Line 65 - Page 2, Line 16; Page 10 Line 1 - Line 17).

But, D2 does not disclose the concept of minimizing a loss function to optimize the training data.

However, D3 which also belongs to the same technical field discloses a method for providing, in response to orthographic information, efficient generation of a phonetic representation, comprising the steps of: inputting an orthography of a word and a predetermined set of input letter features; utilizing a neural network that has been trained using automatic letter phone alignment and predetermined letter features to provide a neural network hypothesis of a word pronunciation and after computation of the error signal, the weight values are then adjusted in a direction to reduce the error signal (Abstract; Page 3, Line 36 - Line 52; Page 15, Line 20 - Line 25).

Therefore, it would have been obvious to a person skilled in the art to combine the teaching of D2 with D3 to arrive at the subject matter of claims 1-10. Therefore the subject matter of claims 1-10 lacks an inventive step (Article 33(3) of PCT) in view of the disclosures of D2 and D3.

Article 33(4) PCT - Industrial Applicability

The subject matter of claims 1-10 is considered to have industrial applicability and therefore complies with the requirements of Article 33(4) of PCT.