

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)**

To:

see form PCT/ISA/220

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/EP2018/065212

International filing date (day/month/year)
08.06.2018

Priority date (day/month/year)
09.06.2017

International Patent Classification (IPC) or both national classification and IPC
INV. H04L12/24 ADD. H04L12/26

Applicant
BRITISH TELECOMMUNICATIONS PUBLIC LIMITED COMPANY

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 usually 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:



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Date of completion of this opinion

see form PCT/ISA/210

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Box No. I Basis of the 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 43bis.1(a))
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 13ter.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 13ter.1(a)).
 - on paper or in the form of an image file (Rule 13ter.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:

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of

- the entire international application
- claims Nos. 1, 9, 10

because:

- the said international application, or the said claims Nos. relate to the following subject matter which does not require an international search (*specify*):
- the description, claims or drawings (*indicate particular elements below*) or said claims Nos. 1, 9, 10 are so unclear that no meaningful opinion could be formed (*specify*):
see separate sheet
- the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed (*specify*):
- no international search report has been established for the whole application or for said claims Nos.
- a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:
 - furnish a sequence listing in the form of an Annex C/ST.25 text file, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.
 - furnish a sequence listing on paper or in the form of an image file complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.
 - pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rule 13^{ter}.1(a) or (b).
- See Supplemental Box for further details

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

1. Statement

Novelty (N)	Yes: Claims	
	No: Claims	<u>1-10</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-10</u>
Industrial applicability (IA)	Yes: Claims	<u>1-10</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

1 Reference is made to the following documents:

- D1: ARAYA DANIEL B ET AL: "Collective contextual anomaly detection framework for smart buildings", 2016 INTERNATIONAL JOINT CONFERENCE ON NEURAL NETWORKS (IJCNN), IEEE, 24 July 2016 (2016-07-24), pages 511-518, XP032992208, DOI: 10.1109/IJCNN.2016.7727242 [retrieved on 2016-10-31]
- D2: US 2016/210556 A1 (BEN SIMHON YONI YOM TOV [IL] ET AL) 21 July 2016 (2016-07-21)

Re Item III

Non-establishment of opinion with regard to novelty, inventive step or industrial applicability

In view of the excessive number of clarity objections raised under Article 6 PCT against independent **claims 1, 9 and 10** (see Item VIII), it is not practicable to carry out an examination of the application in respect of patentability in the sense of Article 33(1) PCT, and in particular whether the claimed subject-matter is **new** (Article 33(2) PCT) and **inventive** (Article 33(3) PCT).

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

However, as far as the subject-matter of the present set of claims could be interpreted with the help of the description, it is noted that the disclosure of document **D1** (see in particular page 512, section "III. Collective Contextual Anomaly Detection Framework (CCAD)"; and figure 1: *reconstruction errors generated by a pattern learner engine on the basis of training data-set are compared with reconstruction errors generated by a pattern recognizer engine on the basis real data-set for determining anomalies in network traffic*) or document **D2** (see in particular page 8, paragraphs 108-114; and figure 13: *stacked autoencoder is trained to detect anomaly in a time window of*

selected selected metrics based on representation errors of input and output data of the stacked autoencoder) describes similar subject-matter as it is disclosed in the present set of claims and it appears that these claims lack of novelty (Article 33(2) PCT) over the disclosure of these documents.

Re Item VII

Certain defects in the international application

- 1 The independent claims are not correctly cast in the two part form (Rule 6.3(b) PCT).
- 2 The claims do not contain reference signs placed in parentheses (Rule 6.2(b) PCT).
- 3 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the most relevant prior art, i.e. documents D1 and D2, is neither acknowledged by reference, nor briefly discussed in the introductory part of the description.

Re Item VIII

Certain observations on the international application

- 1 The feature "*...clustering a set of time series, each time series including a plurality of time windows of data corresponding to network communication characteristics for a device...*" in **claim 1** is broadly formulated and does not allow the skilled person to determine the exact content of the time series and the cluster, thereby rendering the definition of the subject-matter of said claim unclear (Article 6 PCT).
- 2 Moreover, the feature "*...training an autoencoder for each cluster based on time series in the cluster...*" in **claim 1** is also imprecise and does also not allow the skilled person to determine how said autoencoder is trained on a basis of time series in a cluster, thereby rendering the definition of the subject-matter of said claim unclear (Article 6 PCT). In this respect, it should

be noted that according to the description (see page 4, lines 17-21; and page 5, lines 21-25), the autoencoder associated with a particular cluster is trained on the basis of time series that are generated as training data and are known as normal, typical, non-suspicious, and non-erroneous communication.

- 3 Likewise, the definition "*...based on testing the autoencoder with data from time windows of at least a subset of the time series...*" in **claim 1** does also not clearly and unambiguously define upon which data (i.e. based on the above training time series or production time series of normal network traffic), said reconstruction errors are generated for each autoencoder, thereby rendering the definition of the subject-matter of said claim unclear (Article 6 PCT).
- 4 Furthermore, the term "*probabilistic model of reconstruction errors*" used in **claim 1** is vague and leaves the skilled person in doubt as to the meaning of the technical features to which it refers (i.e. what is generated on the basis of the reconstructions errors and how it is used for determining anomalies in the network traffic), thereby rendering the definition of the subject-matter of said claims unclear (Article 6 PCT).
- 5 Likewise, the feature "*...generating an aggregation of the probabilistic models for, in use, detecting reconstruction errors for a time series of data corresponding to network communication characteristics for a device as anomalous...*" in **claim 1** appears to disclose how anomalous network communication characteristics for a device is detected. However, said feature does not provide a clear and unambiguous definition what said probabilistic models represent and how by aggregating these probabilistic models, the anomalous network communication characteristics can be detected, contrary to the requirements of Article 6 PCT.
- 6 In this respect, it should be noted that according to the description (see page 4, lines 13-30; page 5, line 21 - page 6, line 14), reconstruction errors are generated both for the training time series and the production time series by using autoencoders for each cluster, and the reconstruction errors generated for the production time series are compared with the reconstruction errors determined for the training time series and if the difference exceeds a

predetermined threshold, an anomaly is identified and reported. Since these features appear to be essential for definition of the present invention, **claim 1** should include these technical features to meet the requirements following from Article 6 PCT taken in combination with Rule 6(3)(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

- 7 Finally, it should be also pointed out that although **claims 9 and 10** have been drafted as separate independent claims (i.e. a computer system and a computer program element), they relate effectively to the same subject-matter (i.e. a computer program code for causing a computer to perform the steps of method claim 1). As a consequence, said claims lack conciseness and do not meet the requirements of Article 6 PCT.