

# 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/IB2019/059139

International filing date (day/month/year)  
24.10.2019

Priority date (day/month/year)  
03.12.2018

International Patent Classification (IPC) or both national classification and IPC  
INV. G16B20/30 G16B40/20 G06N3/04

Applicant  
KING ABDULLAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

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:



European Patent Office  
D-80298 Munich  
Tel. +49 89 2399 - 0  
Fax: +49 89 2399 - 4465


Date of completion of this opinion

see form PCT/ISA/210

Authorized Officer

Thumb, Werner

Telephone No. +49 89 2399-0



---

**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. 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>1-20</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-20</u>
Industrial applicability (IA)	Yes: Claims	<u>1-20</u>
	No: Claims	

2. Citations and explanations

**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**

**Re Item V**

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

Reference is made to the following document:

D1        RAMZAN UMAROV ET AL: "PromID: human promoter prediction by deep learning",  
             ARXIV.ORG, CORNELL UNIVERSITY LIBRARY, 201 OLIN LIBRARY  
             CORNELL UNIVERSITY ITHACA, NY 14853, 2 October 2018 (2018-10-02)

1        Novelty (Article 33(2) PCT)

Claim 1 lacks novelty within the meaning of Article 33(2) PCT over the teaching of document D1.

D1 discloses:

- *A method for training a deep neural network model (100) based on a known genome sequence (500),*

(see the abstract; page 3, penultimate paragraph)

- *the method comprising:  
receiving (1100) the known genome sequence (500);*

(paragraph bridging pages 3 and 4)

- *training (1102) the deep neural network model (100) with a current negative set (502) obtained from the known genome sequence (500);*

(page 4, paragraph 1; section 2.4)

- *applying (1104) the deep neural network model (100) to the known genome sequence (500) and recording false positive sets;*

(page 7, last paragraph, point 2.)

- *selecting (1106) a subset of the new false positive sets (508);*

(page 7, last paragraph, point 3.)

- *updating (1108) the current negative set (502) with the new false positive sets (508); and*

*repeating (1110) the steps of training, applying, selecting and updating until a number of the new false positive sets is smaller than a given threshold.*

(page 8, paragraphs 2 and 3)

The method of D1 is identical to the method of claim 1, which as a consequence lacks novelty within the meaning of Article 33(2) PCT.

2 The subject-matter of dependent claims 2-8 is also disclosed in D1.

Claim 2, referring to the construction of the negative set, is disclosed in section 2.4.

Calculation of a score according to claims 3-5 is disclosed on page 5, first full paragraph.

Claim 6 is disclosed on page 8, paragraph 2.

Claims 7 and 8 are disclosed on page 6, paragraph 1 and page 4, paragraph 1, respectively.

Claims 2-8 are thus also not novel within the meaning of Article 33(2) PCT.

3 Claims 9-16 refer to a method for determining a transcription start site of a promoter, using a neural network trained as defined in the method of claims 1-8. Determining a transcription start site of a promoter is also disclosed in D1 (see the abstract, sections 2.6 and 3.2).

Claims 9-16 thus also lack novelty within the meaning of Article 33(2) PCT over the teaching of document D1.

4 Claims 17-20 refer to a computing device that implements a deep neural network model according claims 1-8, and thus also lacks novelty within the meaning of Article 33(2) PCT over the teaching of document D1.

### **Re Item VIII**

#### **Certain observations on the international application**

Claim 3 does not meet the requirements of Article 6 PCT in that it is unclear how the score referred to in the claim is calculated or what it represents.