(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 926 549 A3**

(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
16.03.2022 Bulletin 2022/11

(43) Date of publication A2:
22.12.2021 Bulletin 2021/51

(21) Application number: **21164519.7**

(22) Date of filing: **24.03.2021**

(51) International Patent Classification (IPC):
G06N 3/08 *(2006.01)* ***G06N 5/04*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
G06N 3/082; G06N 5/045; G06N 10/60

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **26.03.2020 JP 2020055576**

(71) Applicant: **DENSO CORPORATION**
Aichi-pref., 448-8661 (JP)

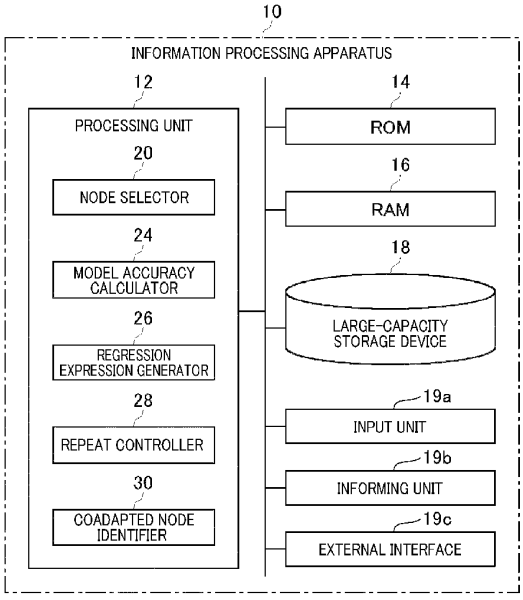
(72) Inventors:
- **MIKI, Akira**
  Kariya-city, Aichi-pref. 448-8661 (JP)
- **KADOWAKI, Tadashi**
  Kariya-city, Aichi-pref. 448-8661 (JP)

(74) Representative: **Winter, Brandl - Partnerschaft mbB**
Alois-Steinecker-Straße 22
85354 Freising (DE)

(54) **INFORMATION PROCESSING APPARATUS AND METHOD AND PROGRAM FOR IDENTIFYING COADAPTED NODES**

(57) In an information processing apparatus, a selection unit selects, from a plurality of nodes that constitute a trained model, one or more nodes that are to be dropped out from the trained model as one or more dropout nodes. The trained model is configured to output, in response to input information being input thereto, output information. An identifier is configured to identify, in the plurality of nodes that constitute the trained model, one or more relatively coadapted nodes in accordance with an appropriateness of the trained model from which the one or more dropout nodes have been dropped out.

FIG.1



EP 3 926 549 A3

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 16 4519

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	ROHIT KESHARI ET AL: "Guided Dropout", ARXIV.ORG, CORNELL UNIVERSITY LIBRARY, 201 OLIN LIBRARY CORNELL UNIVERSITY ITHACA, NY 14853, 10 December 2018 (2018-12-10), XP080991295, * abstract; figures 1-3 * * paragraphs [Introduction], [ProposedGuidedDropout] * * paragraph [DiscussionandConclusion] * -----	1-11	INV. G06N3/08 G06N5/04
X	US 10 380 484 B2 (IBM [US]) 13 August 2019 (2019-08-13)	1,10,11	
A	* abstract * * column 1, paragraph 1 - column 2, paragraph 2 * * column 3, line 19 - column 4, line 21 * -----	2-9	
X	SEUL-KI YEOM ET AL: "Pruning by Explaining: A Novel Criterion for Deep Neural Network Pruning", ARXIV.ORG, CORNELL UNIVERSITY LIBRARY, 201 OLIN LIBRARY CORNELL UNIVERSITY ITHACA, NY 14853, 18 December 2019 (2019-12-18), XP081569221,	1,10,11	TECHNICAL FIELDS SEARCHED (IPC) G06N
A	* abstract * * paragraphs [0001], [0003] * ----- -/--	2-9	

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 February 2022	Cakiroglu Garton, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 16 4519

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	MUNIR NAUMAN ET AL: "Investigation of deep neural network with drop out for ultrasonic flaw classification in weldments", JOURNAL OF MECHANICAL SCIENCE AND TECHNOLOGY, SPRINGER, DE, vol. 32, no. 7, 9 August 2018 (2018-08-09), pages 3073-3080, XP036565606, ISSN: 1738-494X, DOI: 10.1007/S12206-018-0610-1 [retrieved on 2018-08-09] * the whole document *	1-11	
A	JIECAO YU ET AL: "Scalpel", PROCEEDINGS OF THE 44TH ANNUAL INTERNATIONAL SYMPOSIUM ON COMPUTER ARCHITECTURE , ISCA '17, ACM PRESS, NEW YORK, NEW YORK, USA, 24 June 2017 (2017-06-24), pages 548-560, XP058369127, DOI: 10.1145/3079856.3080215 ISBN: 978-1-4503-4892-8 * the whole document *	1-11	TECHNICAL FIELDS SEARCHED (IPC)
A	XIE XUETAO ET AL: "Learning Optimized Structure of Neural Networks by Hidden Node Pruning With L_{1} Regularization", IEEE TRANSACTIONS ON CYBERNETICS, IEEE, PISCATAWAY, NJ, USA, vol. 50, no. 3, 1 March 2020 (2020-03-01), pages 1333-1346, XP011767486, ISSN: 2168-2267, DOI: 10.1109/TCYB.2019.2950105 [retrieved on 2020-01-21] * the whole document *	1-11	

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 February 2022	Cakiroglu Garton, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 16 4519

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

04-02-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 10380484 B2	13-08-2019	US 2016307096 A1	20-10-2016
		US 2016307098 A1	20-10-2016

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82