

LEVERAGING AI AND TWO DECADES OF EXAMINER EXPERTISE FOR ENHANCED PATENT CLASSIFICATION AT EPO

ALEXANDER KLENNER-BAJAJA | DATA SCIENCE | 28.11.2023

PATENT CLASSIFICATION

- Each published patent comes with classification (IPC, FI, **CPC**,..)

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最終頁に続く

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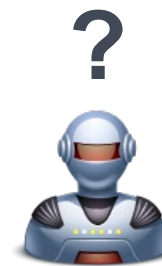
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(54) **COMPUTERPROGRAMM, MENSCH-MASCHINE-SCHNITTSTELLE UND VERFAHREN ZUR
COMPUTERGESTÜTZTEN ERSTELLUNG UND PRÜFUNG BAUTECHNISCHER AUFMASSE**

(57) Die vorliegende Erfindung schafft eine techni- der Prozesse gesteigert, da die unterschiedlichen Nutzer
sche computergestützte Lösung für die Durchführung bei ihren Aufgaben durch die vorliegende Erfindung un-
terstützt werden kann, indem die Aufgaben der Nutzer durch die vorliegende Erfindung un-

HISTORY – MORE THAN TWO DECADES

Digitalisation started....



1930-1960

International Patent Institute (IIB)
“Indeling der Techniek”
89 to 124 classes

1970

ECLA developed
140.000 dynamic

1989

One Terminal
per floor with ECLA

**2013
CPC
(USPTO&EPO)**

250.000 dynamic, growing

2015

ML Project

AutoPre/ReCla
uses GOFML for 1400 MUSE
ranges

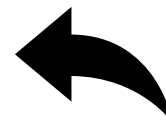
2018

AI@EPO

Deep Learning for Y02/Y04
Deep Learning for AutoCla
Deep Learning for PreCla

Future

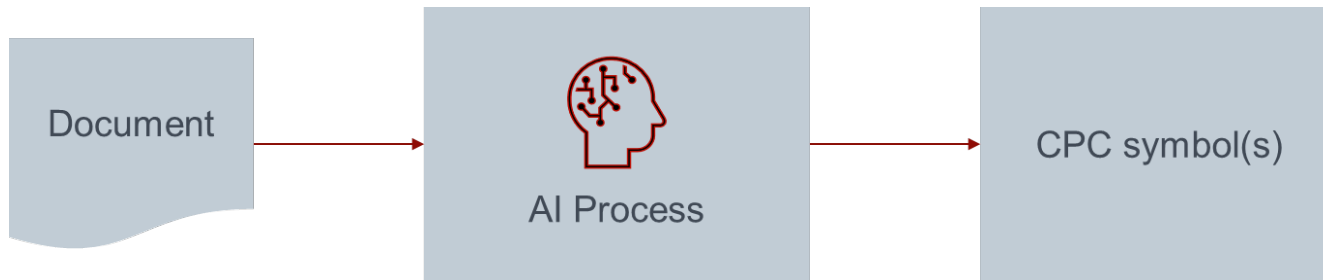
SLIDE FROM 2018



STRATEGIC PLAN 2023 – AI PROGRAMME

Objective:

Deliver a state-of-the art Artificial Intelligence model that supports examiners in assigning one or several out of 250.000 CPC symbols.



(TECHNICAL) CHALLENGES

- Possible inputs:
 - Patent documents – claims, description, abstract, individual paragraphs?
 - NPL documents
 - Arbitrary text (websites, video transcripts, examiner notes, ...)
- Many CPC symbols (> 200.000)
- A document can have several (many) CPC symbols
- Different classification practices across offices (data drift)
- What is “the truth”? ...and is this truth “correct”?

COMPLEXITY OF CPC

243 611 CPC symbols in latest CPC 2023.01 (sections A to H)

Section	Description	# symbols	%
A	HUMAN NECESSITIES	29 596	12
B	PERFORMING OPERATIONS; TRANSPORTING	56 588	23
C	CHEMISTRY; METALLURGY	38 168	16
D	TEXTILES; PAPER	5 639	2
E	FIXED CONSTRUCTIONS	9 207	4
F	MECHANICAL ENGINEERING; LIGHTING; HEATING; WEAPONS; BLASTING	27 857	11
G	PHYSICS	37 757	15
H	ELECTRICITY	38 799	16

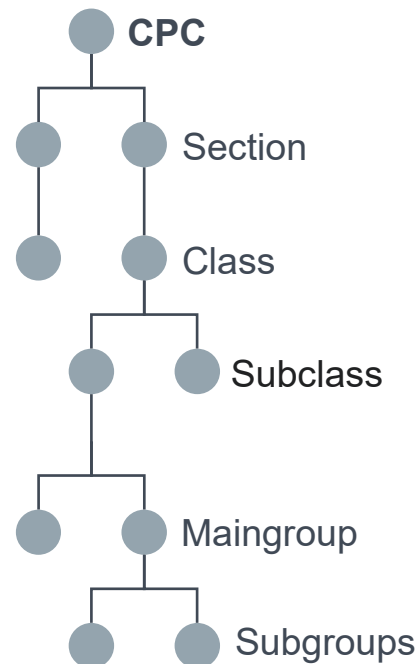
COMPLEXITY OF CPC

71% of the CPC scheme was used in 2021 and 91% was used since 2000

Publication date	Documents	Families	# symbols CCI+CCA ¹
2021	2M	780k	174 036 (71%)
2000-2021	35M	7.8M	222 020 (91%)

A family has in average 5.7 CPC symbols

	Average	Median	P75	P95	Max
# symbols per family CCI+CCA	5.7	4	7	16	328



Data available

COMPLEXITY OF CPC

CPC section	CPC depth	Model name
A to H	main group /00	maingroup
	leaves	aggleaves
Y02 & Y04 Climate change & smart grids	leaves	y0204

- Training dataset
 - Families with oldest priority date ≥ 2000
 - Input text: claims in English
 - Labels: EPO confirmed symbols, inventive and additional (CCI + CCA)

- Model
 - EP-RoBERTa with a multi-label classification head
The sum of predicted scores can be > 100%

H04L67/12	62%
H04L41/0853	46%
H04L67/34	32%
...	...

RISE OF TRANSFORMER MODELS IN NLP

State-of-the-art models in Natural Language Processing (NLP)
are based on the **Transformers**¹ architecture

Transformers models are extremely versatile, here are some example tasks:

Classification	Summarisation	Question answering
Translation	Text generation	Conversation
Entity recognition	Multiple choices	Language modeling

Models that recently made the headlines are (partly) based on this architecture

ChatGPT and DALL·E by OpenAI



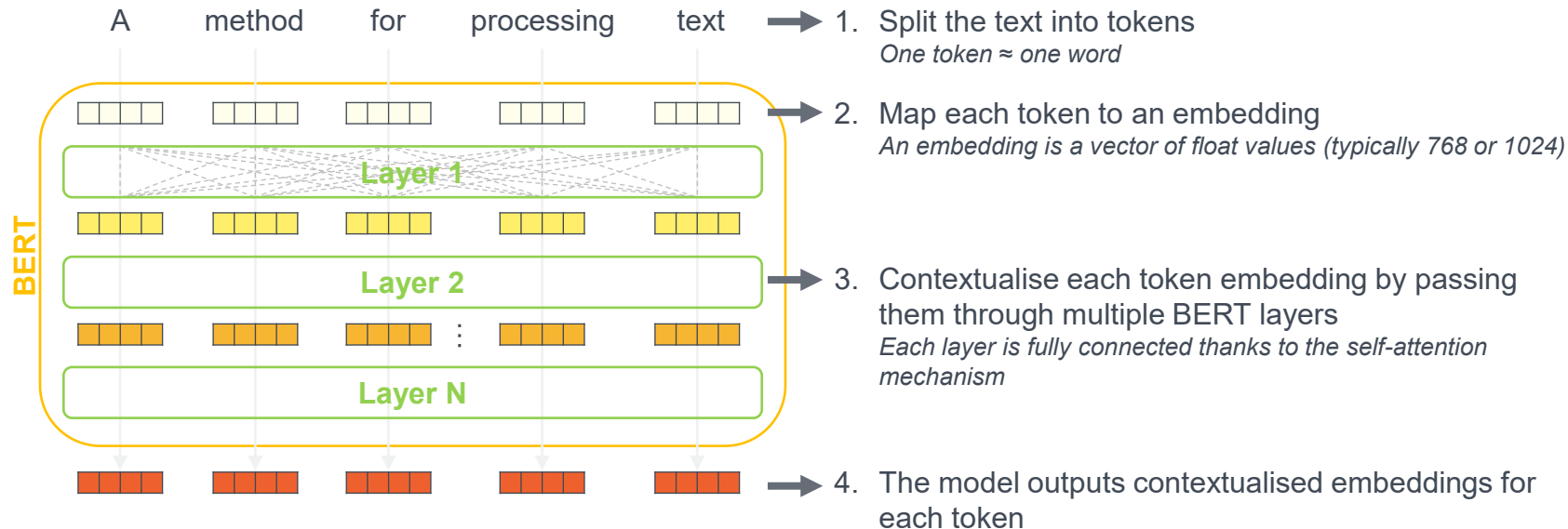
LaMDA by Google



¹ Vaswani, Ashish, et al. *Attention Is All You Need*. arXiv, 5 Dec. 2017. arXiv.org, <https://doi.org/10.48550/arXiv.1706.03762>

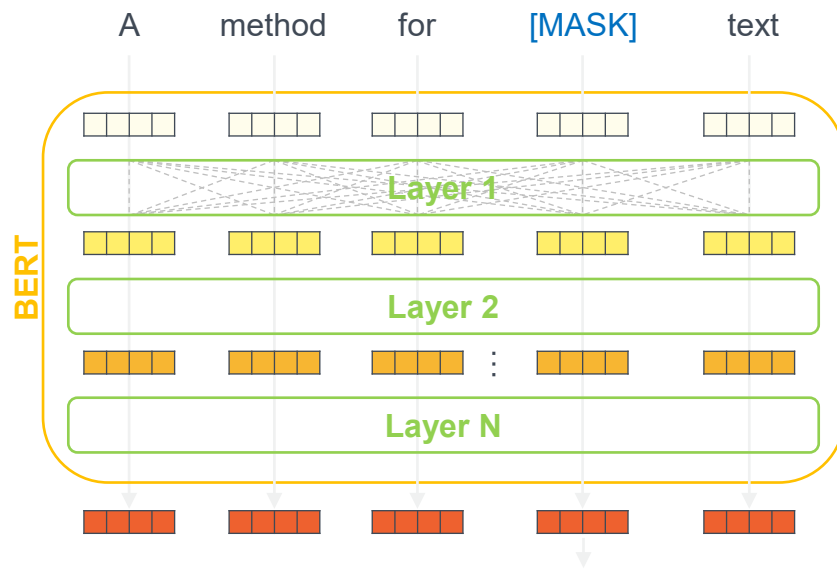
TRANSFORMERS FOR NLP

BERT¹ is one of the most famous Transformer models for text



¹ Devlin, Jacob, et al. BERT: Pre-Training of Deep Bidirectional Transformers for Language Understanding. arXiv, 24 May 2019. arXiv.org. <https://doi.org/10.48550/arXiv.1810.04805>

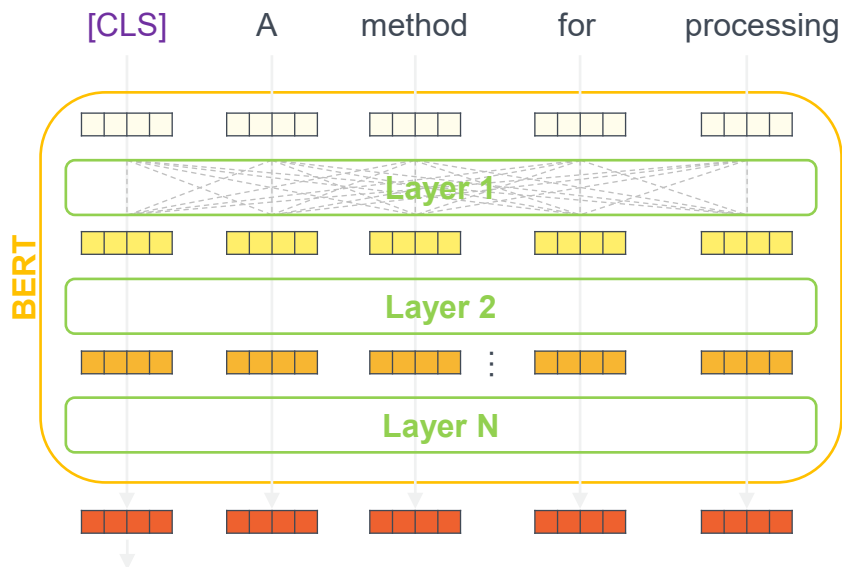
TRAINING THE BASE LANGUAGE MODEL



1. One token is masked i.e. literally replaced by a [MASK] token
2. The BERT model (combined with a language modeling head) is trained to predict the missing token
A large amount of text data is required for this pre-training to be beneficial
3. Repeat that millions/billions of times, and you have trained a language model

editing	14%
processing	22%
reading	11%
...	...

TRANSFER LEARNING STEP



1. A [CLS] token is prepended to the input to be classified
The embedding of the CLS token is devoid of any useful signal before going through each layer
2. The pre-trained BERT model (now combined with a classification head) is further trained to predict the given symbols
The classification head uses the CLS embedding as input. This forces the model to encode the meaning of the whole text into one embedding.
3. Repeat that thousands/millions of times, and your language model is now fine-tuned on a classification task



H04L67/12	62%
H04L41/0853	34%
H04L67/34	22%
...	...

PERFORMANCE CURRENT MODEL

	Model	maingroup	aggleaves	y0204
Parameters	CPC sections	A-H		Y02 & Y04
	Train dataset	7.2M		3.7M
	# symbols	8923	224097	347
Metrics	Soft Accuracy@5 ↑	0.95	0.81	0.97
	Recall@10 ↑	0.85	0.51	0.98

It is the right direction

sometimes different focus

DATA CHALLENGES

"It is about a drawer in a fridge which can be locked in an upper position and in a lower position. AI proposes E05B65/46 (67.4%) as first symbol, which corresponds to the locks. Yet, here we are not really talking about a lock in the sense of E05B, but more of a latch. Because the fact that it is disclosed for a fridge or household appliance is not really relevant for the locking/latching"

AI proposes E05B65/46 (67.4%)

Locks {or fastenings} with special st

E05B 65/00

Locks {or fastenings} for special use

E05B 65/46

• for drawers

LOCKING ASSEMBLY, DRAWER ASSEMBLY AND STORAGE CABINET

Abstract

The present application relates to the field of household appliances, and in particular to a locking assembly, a drawer assembly and a storage cabinet. The locking assembly includes: a mounting member, a locking member rotatably connected to the mounting member and configured to be switchable between a locked state and an unlocked state, and the locking member includes a locking portion and an unlocking portion; in the locked state, at least part of the locking portion is located at a motion path of a to-be-locked member and the unlocking portion is located at an avoidance path of the to-be-locked member; and in the unlocked state, the locking portion is located at the avoidance path and at least part of the unlocking portion is located at the motion path. According to the locking assembly of the present application, it can ensure both the suspending of the to-be-locked member and the automatic reset of the locking member for the next use in case of power off without relying on a driving member, with simple structure, low cost, small space occupation and wide application range, and the to-be-locked member can be suspended for a long time without consuming energy.

(19)  (11)  EP 4 147 606 A1

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(72) Inv:
And

(74) Rep:
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Art
Ts
Lor

(54) LOCKING ASSEMBLY, DRAWER ASSEMBLY AND

EP 4 147 606 A1

GIVE IT A TRY!

Single Access Portal

Home > CPC Text Categoriser


CPC Text Categoriser

The CPC text categoriser is a CPC symbol predictor which suggests CPC symbols based on the text entered in the window below.

Technology description

1. A balloon comprising a body and a neck characterised in that at least a portion of the neck is turned inside out and at least an outer annular part of said portion is coated with a contact adhesive.
2. A balloon as claimed in claim 1 having a tube received within the neck of the balloon.
3. A balloon as claimed in claim 2 wherein the tube extends out of the neck of the balloon.
4. A balloon as claimed in claim 3 wherein said tube is provided with means adapted to form a substantially gas-tight connection with a gas source.
5. A balloon as claimed in claim 4 wherein said means is one part of a bayonet fitting.
6. A balloon as claimed in any one of claims 1 to 4 wherein said outer annular part is provided with a removeable protective strip.
7. An assembly comprising a plurality of balloons as claimed in any one of claims 3 to 5 wherein the tubes are attached to, or integral with, a common member at spaced apart intervals.

☒ Main group ☐ Subgroup



 I am human

FriendlyCaptcha

This verification confirms you are a human visitor and prevents automated spam submissions.

Classify

Clear

  Advanced settings

<https://epn.epo.org/cpc-text-categoriser>



GIVE IT A TRY!

Top 5 results at Subgroup level

1

A HUMAN NECESSITIES

HEALTH; AMUSEMENT

A63 SPORTS; GAMES; AMUSEMENTS

A63H TOYS, e.g. TOPS, DOLLS, HOOPS OR BUILDING BLOCKS

A63H 27/00 Toy aircraft; Other flying toys (toys with parachutes A63H33/20)

A63H 27/10 • Balloons (connection of valves to inflatable elastic bodies B60C29/00; {other than toy aspects B64B1/40})



THANK YOU.