# CPC COOPERATIVE PATENT CLASSIFICATION

## G PHYSICS
*(NOTES omitted)*

## INSTRUMENTS

## G06 COMPUTING; CALCULATING OR COUNTING
*(NOTES omitted)*

## G06N COMPUTING ARRANGEMENTS BASED ON SPECIFIC COMPUTATIONAL MODELS

### WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

| | |
|---|---|
| **3/00** | **Computing arrangements based on biological models** |
| 3/002 | . {Biomolecular computers, i.e. using biomolecules, proteins, cells (using DNA G06N 3/123; using neurons G06N 3/061)} |
| 3/004 | . Artificial life, i.e. computing arrangements simulating life |
| 3/006 | . . based on simulated virtual individual or collective life forms, e.g. social simulations or particle swarm optimisation [PSO] |
| 3/008 | . . based on physical entities controlled by simulated intelligence so as to replicate intelligent life forms, e.g. based on robots replicating pets or humans in their appearance or behaviour |
| 3/02 | . Neural networks |
| 3/04 | . . Architecture, e.g. interconnection topology |

### WARNING

Group G06N 3/04 is impacted by reclassification into groups G06N 3/0464, G06N 3/0475, G06N 3/0495 and G06N 3/0499.

All groups listed in this Warning should be considered in order to perform a complete search.

| | |
|---|---|
| 3/0409 | . . . {Adaptive resonance theory [ART] networks} |
| 3/0418 | . . . {using chaos or fractal principles} |
| 3/042 | . . . Knowledge-based neural networks; Logical representations of neural networks |
| 3/043 | . . . based on fuzzy logic, fuzzy membership or fuzzy inference, e.g. adaptive neuro-fuzzy inference systems [ANFIS] |
| 3/044 | . . . Recurrent networks, e.g. Hopfield networks |

### WARNING

Group G06N 3/044 is impacted by reclassification into group G06N 3/0442.

Groups G06N 3/044 and G06N 3/0442 should be considered in order to perform a complete search.

| | |
|---|---|
| 3/0442 | . . . . characterised by memory or gating, e.g. long short-term memory [LSTM] or gated recurrent units [GRU] |

### WARNING

Group G06N 3/0442 is incomplete pending reclassification of documents from group G06N 3/044.

Groups G06N 3/044 and G06N 3/0442 should be considered in order to perform a complete search.

| | |
|---|---|
| 3/045 | . . . Combinations of networks |

### WARNING

Group G06N 3/045 is impacted by reclassification into group G06N 3/0455.

Groups G06N 3/045 and G06N 3/0455 should be considered in order to perform a complete search.

| | |
|---|---|
| 3/0455 | . . . . Auto-encoder networks; Encoder-decoder networks |

### WARNING

Group G06N 3/0455 is incomplete pending reclassification of documents from group G06N 3/045.

Groups G06N 3/045 and G06N 3/0455 should be considered in order to perform a complete search.

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|---|---|
| 3/0463 | . . . {Neocognitrons} |
| 3/0464 | . . . Convolutional networks [CNN, ConvNet] |

### WARNING

Group G06N 3/0464 is incomplete pending reclassification of documents from group G06N 3/04.

Groups G06N 3/04 and G06N 3/0464 should be considered in order to perform a complete search.

3/047 • • • Probabilistic or stochastic networks

> **WARNING**
>
> Group G06N 3/047 is impacted by reclassification into group G06N 3/0475.
>
> Groups G06N 3/047 and G06N 3/0475 should be considered in order to perform a complete search.

3/0475 • • • Generative networks

> **WARNING**
>
> Group G06N 3/0475 is incomplete pending reclassification of documents from groups G06N 3/04 and G06N 3/047.
>
> Groups G06N 3/04, G06N 3/047, and G06N 3/0475 should be considered in order to perform a complete search.

3/048 • • • Activation functions

3/049 • • • Temporal neural networks, e.g. delay elements, oscillating neurons or pulsed inputs

3/0495 • • • Quantised networks; Sparse networks; Compressed networks

> **WARNING**
>
> Group G06N 3/0495 is incomplete pending reclassification of documents from group G06N 3/04.
>
> Groups G06N 3/04 and G06N 3/0495 should be considered in order to perform a complete search.

3/0499 • • • Feedforward networks

> **WARNING**
>
> Group G06N 3/0499 is incomplete pending reclassification of documents from group G06N 3/04.
>
> Groups G06N 3/04 and G06N 3/0499 should be considered in order to perform a complete search.

3/06 • • Physical realisation, i.e. hardware implementation of neural networks, neurons or parts of neurons

3/061 • • • {using biological neurons, e.g. biological neurons connected to an integrated circuit}

3/063 • • • using electronic means

3/065 • • • • Analogue means

3/067 • • • using optical means

3/0675 • • • • {using electro-optical, acousto-optical or opto-electronic means}

3/08 • • Learning methods

> **WARNING**
>
> Group G06N 3/08 is impacted by reclassification into groups G06N 3/0895, G06N 3/09, G06N 3/091, G06N 3/092, G06N 3/094, G06N 3/096, G06N 3/098 and G06N 3/0985.
>
> All groups listed in this Warning should be considered in order to perform a complete search.

3/082 • • • modifying the architecture, e.g. adding, deleting or silencing nodes or connections

3/084 • • • Backpropagation, e.g. using gradient descent

3/086 • • • using evolutionary algorithms, e.g. genetic algorithms or genetic programming

3/088 • • • Non-supervised learning, e.g. competitive learning

3/0895 • • • Weakly supervised learning, e.g. semi-supervised or self-supervised learning

> **WARNING**
>
> Group G06N 3/0895 is incomplete pending reclassification of documents from group G06N 3/08.
>
> Groups G06N 3/08 and G06N 3/0895 should be considered in order to perform a complete search.

3/09 • • • Supervised learning

> **WARNING**
>
> Group G06N 3/09 is incomplete pending reclassification of documents from group G06N 3/08.
>
> Groups G06N 3/08 and G06N 3/09 should be considered in order to perform a complete search.

3/091 • • • Active learning

> **WARNING**
>
> Group G06N 3/091 is incomplete pending reclassification of documents from group G06N 3/08.
>
> Groups G06N 3/08 and G06N 3/091 should be considered in order to perform a complete search.

3/092 • • • Reinforcement learning

> **WARNING**
>
> Group G06N 3/092 is incomplete pending reclassification of documents from group G06N 3/08.
>
> Groups G06N 3/08 and G06N 3/092 should be considered in order to perform a complete search.

3/094 • • • Adversarial learning

> **WARNING**
>
> Group G06N 3/094 is incomplete pending reclassification of documents from group G06N 3/08.
>
> Groups G06N 3/08 and G06N 3/094 should be considered in order to perform a complete search.

3/096 • • • Transfer learning

> **WARNING**
>
> Group G06N 3/096 is incomplete pending reclassification of documents from group G06N 3/08.
>
> Groups G06N 3/08 and G06N 3/096 should be considered in order to perform a complete search.

| | | |
|---|---|---|
| 3/098 | **. . .** | Distributed learning, e.g. federated learning |

> **WARNING**
>
> Group G06N 3/098 is incomplete pending reclassification of documents from group G06N 3/08.
>
> Groups G06N 3/08 and G06N 3/098 should be considered in order to perform a complete search.

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|---|---|---|
| 3/0985 | **. . .** | Hyperparameter optimisation; Meta-learning; Learning-to-learn |

> **WARNING**
>
> Group G06N 3/0985 is incomplete pending reclassification of documents from group G06N 3/08.
>
> Groups G06N 3/08 and G06N 3/0985 should be considered in order to perform a complete search.

| | | |
|---|---|---|
| 3/10 | **. .** | Interfaces, programming languages or software development kits, e.g. for simulating neural networks |
| 3/105 | **. . .** | {Shells for specifying net layout} |
| 3/12 | **.** | using genetic models |
| 3/123 | **. .** | DNA computing |
| 3/126 | **. .** | Evolutionary algorithms, e.g. genetic algorithms or genetic programming |

**5/00** **Computing arrangements using knowledge-based models**

| | | |
|---|---|---|
| 5/01 | **.** | Dynamic search techniques; Heuristics; Dynamic trees; Branch-and-bound |
| 5/013 | **. .** | {Automatic theorem proving} |
| 5/02 | **.** | Knowledge representation; Symbolic representation |
| 5/022 | **. .** | Knowledge engineering; Knowledge acquisition |
| 5/025 | **. . .** | Extracting rules from data |
| 5/027 | **. .** | {Frames} |
| 5/04 | **.** | Inference or reasoning models |
| 5/041 | **. .** | {Abduction} |
| 5/042 | **. .** | {Backward inferencing} |
| 5/043 | **. .** | Distributed expert systems; Blackboards |
| 5/045 | **. .** | Explanation of inference; Explainable artificial intelligence [XAI]; Interpretable artificial intelligence |
| 5/046 | **. .** | Forward inferencing; Production systems |
| 5/047 | **. . .** | Pattern matching networks; Rete networks |
| 5/048 | **. .** | Fuzzy inferencing |

**7/00** **Computing arrangements based on specific mathematical models**

| | | |
|---|---|---|
| 7/01 | **.** | Probabilistic graphical models, e.g. probabilistic networks |
| 7/02 | **.** | using fuzzy logic (computing arrangements based on biological models G06N 3/00; computing arrangements using knowledge-based models G06N 5/00) |
| 7/023 | **. .** | {Learning or tuning the parameters of a fuzzy system} |
| 7/026 | **. .** | {Development tools for entering the parameters of a fuzzy system} |
| 7/04 | **. .** | Physical realisation |
| 7/043 | **. . .** | {Analogue or partially analogue implementation} |
| 7/046 | **. . .** | {Implementation by means of a neural network (neural networks using fuzzy logic G06N 3/043)} |
| 7/06 | **. .** | Simulation on general purpose computers |
| 7/08 | **.** | using chaos models or non-linear system models |

**10/00** **Quantum computing, i.e. information processing based on quantum-mechanical phenomena**

> **WARNING**
>
> Group G06N 10/00 is impacted by reclassification into groups G06N 10/20, G06N 10/40, G06N 10/60, G06N 10/70 and G06N 10/80.
>
> All groups listed in this Warning should be considered in order to perform a complete search.

| | | |
|---|---|---|
| 10/20 | **.** | Models of quantum computing, e.g. quantum circuits or universal quantum computers |

> **WARNING**
>
> Group G06N 10/20 is incomplete pending reclassification of documents from group G06N 10/00.
>
> Groups G06N 10/00 and G06N 10/20 should be considered in order to perform a complete search.

| | | |
|---|---|---|
| 10/40 | **.** | Physical realisations or architectures of quantum processors or components for manipulating qubits, e.g. qubit coupling or qubit control |

> **WARNING**
>
> Group G06N 10/40 is incomplete pending reclassification of documents from group G06N 10/00.
>
> Groups G06N 10/00 and G06N 10/40 should be considered in order to perform a complete search.

| | | |
|---|---|---|
| 10/60 | **.** | Quantum algorithms, e.g. based on quantum optimisation, quantum Fourier or Hadamard transforms |

> **WARNING**
>
> Group G06N 10/60 is incomplete pending reclassification of documents from group G06N 10/00.
>
> Groups G06N 10/00 and G06N 10/60 should be considered in order to perform a complete search.

| | | |
|---|---|---|
| 10/70 | **.** | Quantum error correction, detection or prevention, e.g. surface codes or magic state distillation |

> **WARNING**
>
> Group G06N 10/70 is incomplete pending reclassification of documents from group G06N 10/00.
>
> Groups G06N 10/00 and G06N 10/70 should be considered in order to perform a complete search.

10/80   . Quantum programming, e.g. interfaces, languages or software-development kits for creating or handling programs capable of running on quantum computers; Platforms for simulating or accessing quantum computers, e.g. cloud-based quantum computing

> **WARNING**
>
> Group G06N 10/80 is incomplete pending reclassification of documents from group G06N 10/00.
>
> Groups G06N 10/00 and G06N 10/80 should be considered in order to perform a complete search.

**20/00    Machine learning**

20/10   . using kernel methods, e.g. support vector machines [SVM]

20/20   . Ensemble learning

**99/00    Subject matter not provided for in other groups of this subclass**

99/007  . {Molecular computers, i.e. using inorganic molecules (using biomolecules G06N 3/002)}