



Standing Committee on the Law of Patents Thirtieth Session

Geneva, June 24 to 27, 2019

Presentation by the Secretariat

BACKGROUND DOCUMENT ON PATENTS AND EMERGING TECHNOLOGIES

- Requested at twenty-ninth session of the Standing Committee on the Law of Patents (SCP)
- The document consists of three parts: **first part** of the document provides background information about the AI technology; the **second part** looks at the AI technology (or AI-related inventions) as the subject of patent protection, and the **third part** discusses use of the AI technology as a tool for the authorities and users of the patent systems.
- The Secretariat greatly benefitted from the contribution of Mr. Patrice Lopez (Science-Miner)

BACKGROUND DOCUMENT ON PATENTS AND EMERGING TECHNOLOGIES

- “emerging technologies” have broad meaning, covering various new technologies, including artificial intelligence (AI) and machine learning, blockchain, synthetic biology, gene editing, etc.
- However, **AI** and blockchain, for example, are, from the technology point of view, different technologies that may involve different issues in relation to patents

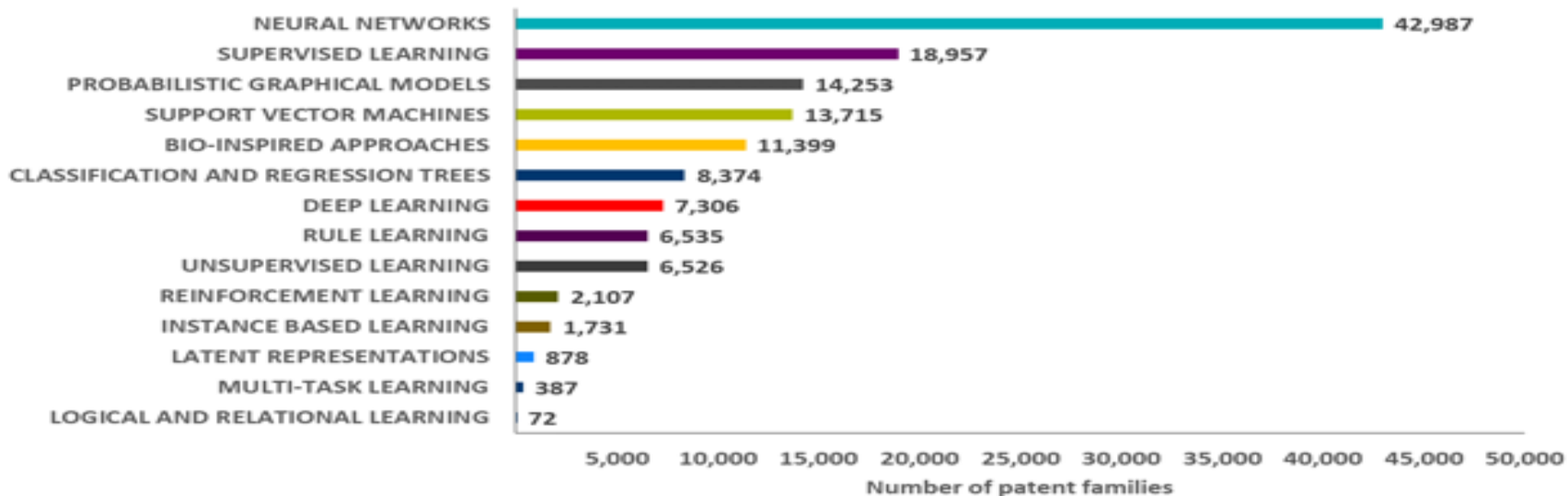
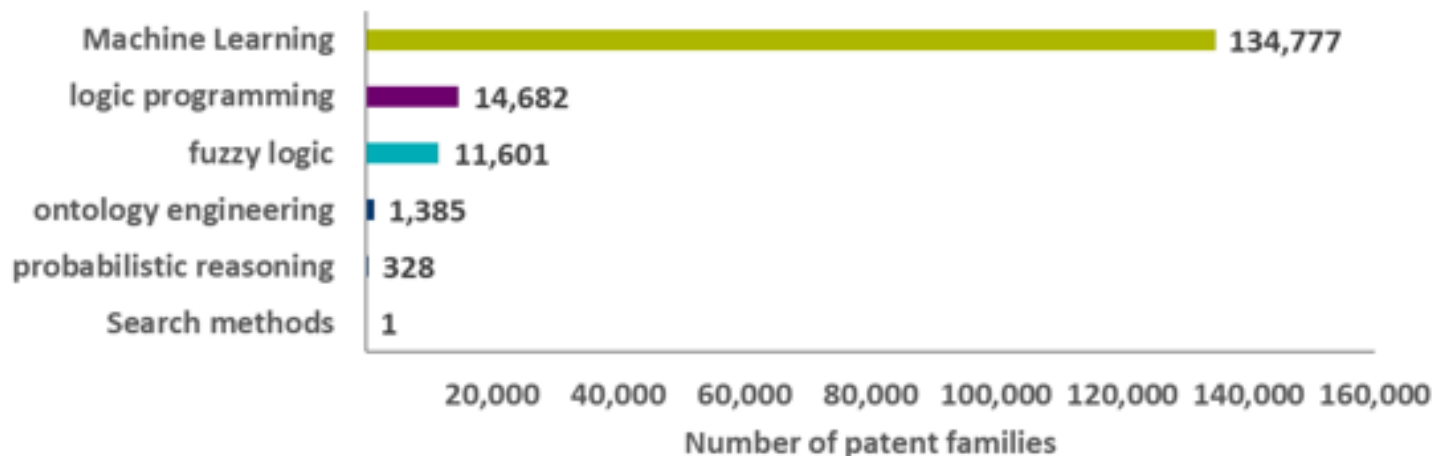
The SCP on Quality and the AI

- Two main concepts arose from the earlier activities of the SCP REGARDING “quality of patents”: (i) the quality of a patent itself; and (ii) the quality of patent procedures before patent offices and beyond (document SCP/27/4 Rev.).
- AI-related inventions touch upon the first aspect of patent quality, while the issues about improvement of patent procedures using AI technology relate to the second aspect of patent quality.

Background information about the AI

- AI systems can be viewed primarily as learning systems
- Machine Learning (ML): how a machine can learn to solve a task from examples of input and expected output, without being explicitly programmed how to do so in a step-by-step sequence of instructions (vs the traditional work to program a machine)
- The two main areas: Neural Network (NN) and Deep Learning (DL)

AI techniques and Patents

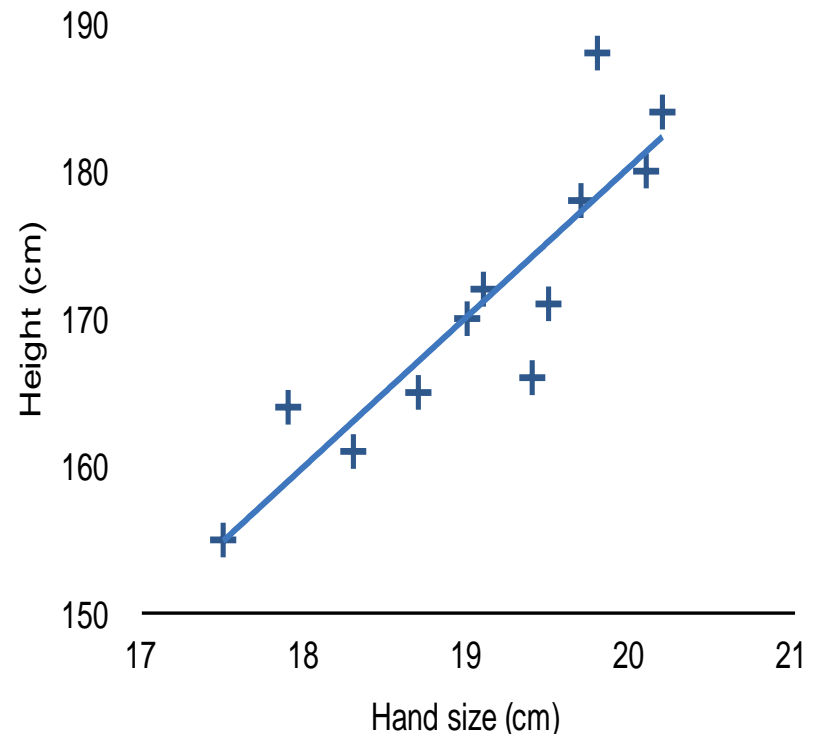


MACHINE LEARNING

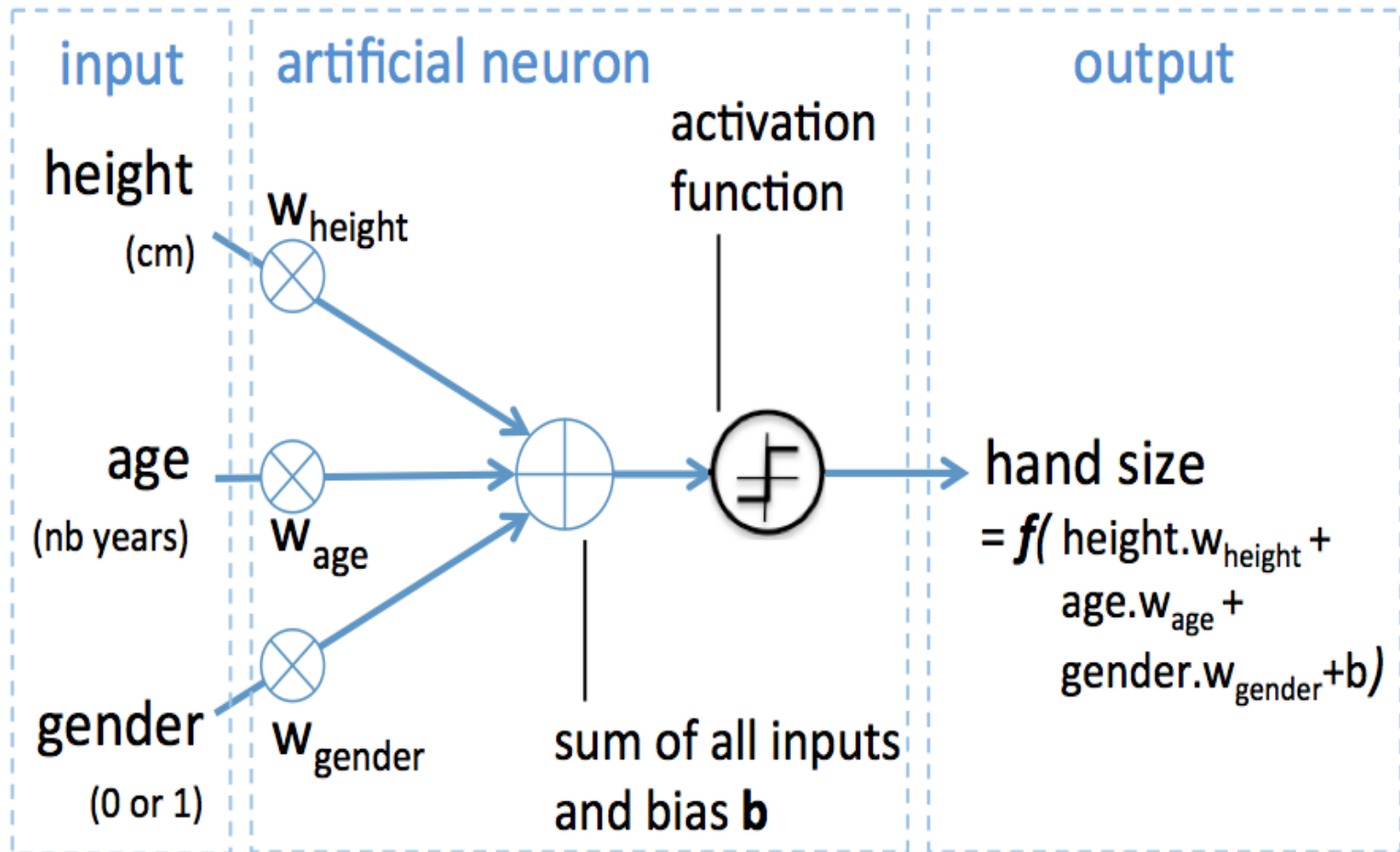
observations of height and hand size pairs

height (cm)	hand size (cm)
170	19.0
155	17.5
184	20.2
188	19.8
178	19.7
172	19.1
165	18.7
180	20.1
161	18.3
171	19.5
164	17.9
166	19.4

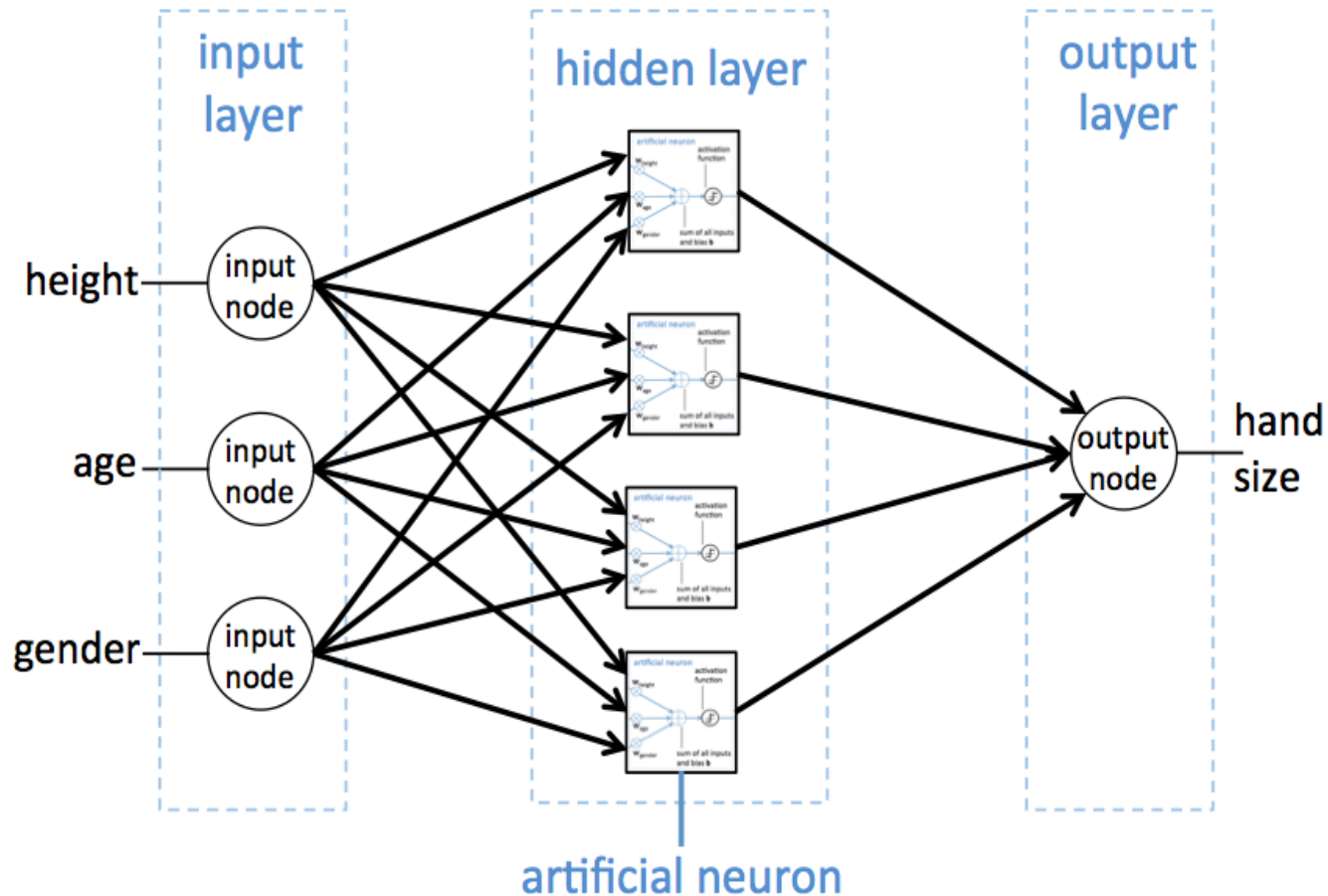
Linear regression technique



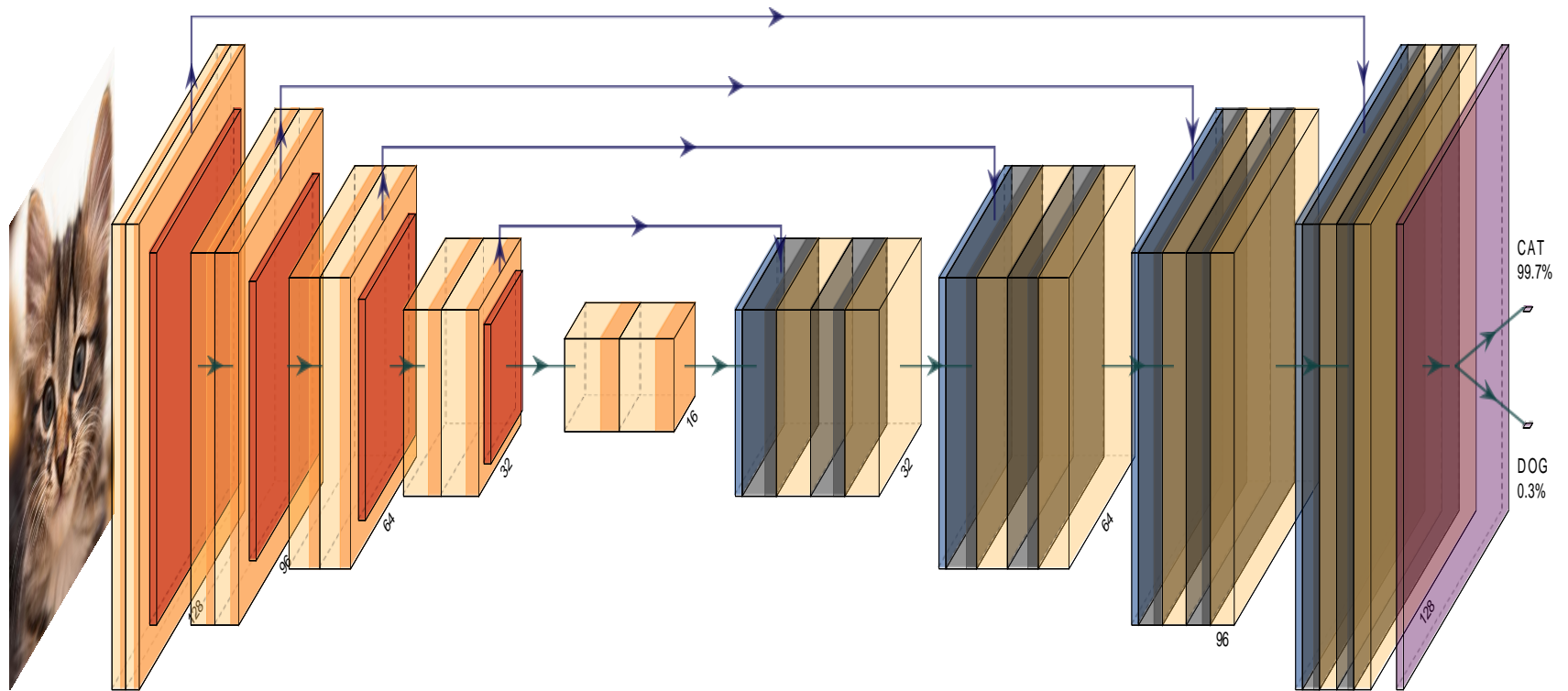
NEURAL NETWORKS



Full neural network (composed of at least three layers)



DEEP LEARNING



DEEP LEARNING

how a human perceives an image



how a computer perceives an image

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5 4 6 5 5 5 6 6 7 9 8 9 8 4 6 11 40 136
6 8 5 5 5 5 5 5 6 7 8 8 9 4 65 27 18 61
5 9 7 4 4 4 4 5 5 6 6 7 7 70 123 86 9 26
4 82 107 6 5 4 4 4 4 5 6 7 5 85 90 111 6 10
4 103 132 77 4 3 4 4 5 5 6 10 26 91 98 127 5 7
8 140 139 93 18 11 5 3 5 5 6 6 66 92 133 149 4 9
10 149 102 78 73 6 10 4 5 5 11 8 91 120 122 160 9 16
15 155 149 85 94 5 10 5 6 8 17 30 86 115 143 121 9 28
22 147 149 142 80 101 27 18 23 7 140 85 119 137 157 129 13 46
15 144 146 126 113 126 135 68 156 97 182 129 121 158 95 152 18 61
10 150 149 99 135 144 217 212 176 119 190 174 112 83 94 142 36 81
16 144 147 85 101 135 179 223 196 187 201 151 131 87 161 123 41 185
43 110 114 115 68 93 147 187 218 197 229 165 102 136 99 98 74 117
27 114 133 83 75 117 179 168 168 184 234 161 181 142 149 86 95 112
11 84 105 121 84 153 188 183 215 171 228 198 169 161 124 56 84 109
3 66 110 112 116 135 136 233 235 218 127 196 174 97 110 164 144 110
2 48 84 105 113 148 149 238 183 146 74 195 187 150 173 204 160 102
6 21 136 129 114 153 98 192 144 172 61 124 120 138 189 188 176 181
9 11 180 140 121 122 92 244 133 207 107 70 102 117 192 147 172 112
6 9 179 168 121 53 40 141 116 154 119 141 230 135 216 189 180 138
8 9 165 185 100 125 242 184 133 117 138 193 204 126 223 191 193 175
8 33 183 176 139 212 171 231 123 132 63 208 192 65 195 195 205 203
7 12 181 233 209 127 210 188 51 164 40 197 192 184 200 217 211 216
6 14 191 229 150 42 195 206 82 132 189 74 187 212 161 223 211 216
8 22 202 191 185 139 181 65 170 185 136 78 187 199 174 170 207 218
10 29 160 163 178 193 211 62 211 75 188 110 171 200 217 173 213 195
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21 35 98 195 234 163 86 111 131 112 156 72 68 139 172 168 206 201
31 46 101 161 159 155 106 151 53 197 195 93 67 114 198 167 197 204
32 29 87 188 124 87 30 192 49 225 112 57 60 133 148 154 195 142
40 26 66 104 194 67 36 97 48 152 127 106 119 203 178 72 185 181
55 39 72 145 166 190 103 114 91 174 147 114 176 125 179 109 194 220
97 72 89 173 163 185 163 91 102 114 94 98 164 156 163 114 184 224
135 111 111 187 160 143 169 94 63 76 84 115 144 155 169 89 128 215
163 151 115 164 184 174 126 135 74 86 90 132 150 143 123 150 187 216
195 173 88 131 193 183 112 109 106 104 120 128 114 131 158 175 191 213
199 177 178 185 158 127 112 114 101 104 112 123 167 166 163 197 187 207
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97 104 181 170 153 114 106 95 88 96 84 129 217 221 157 156 178 205
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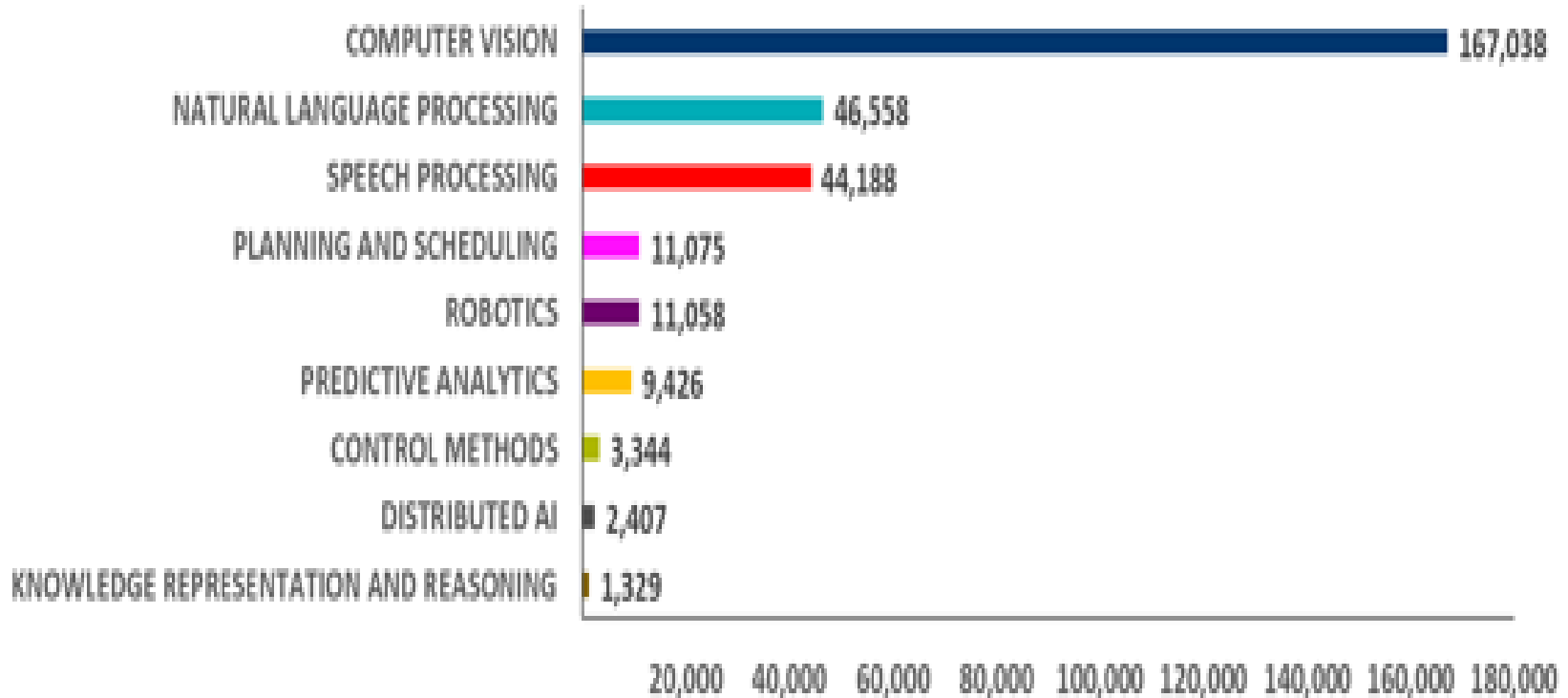
Deep neural networks. key properties

- ***Discovery of features representations*** (practical ability to discover automatically such features from raw data)
- ***Data scale and deep learning performance*** (performance continuously increases with an increase in the training data)

WHERE DOES INNOVATION TAKE PLACE TODAY IN DEEP NEURAL NETWORKS?

- *Training data*
- *Computational power*
- *Application*
- *Neural network architecture*
- *Robustness*

AI functional applications and Patents



High-profile examples of AI



PATENT PROTECTION OF AI-RELATED INVENTIONS



It is worth considering how the patent system might impact advances in AI:

- new inventions on the core AI technology itself
- new inventions that incorporate the AI technology (for example, a translation device incorporating AI deep learning, and a medical device for diagnosing a specific disease) and
- new inventions created with the assistance of the AI technology (for example, a new material found with the assistance of the AI technology).

AI and Patents: Patentability exclusions

- AI involves, at its core, computer implemented inventions and algorithms so patents for inventions incorporating AI will likely face patent eligibility issues.
- Inventions on AI may fall in:
 - Algorithms
 - Computer programs - Software
 - Plans, rules and methods for intellectual activities - the playing of games- methods for economic and business activities;
 - Therapeutic, diagnosis and surgical methods.

AI and Patents: Patentability exclusions United States

The decisions in Mayo, Myriad and Alice stated the two step test for patent eligibility of an invention, namely:

- i) is the invention directed to a patent-ineligible concept, such as a law of nature, a natural phenomenon or an abstract idea; and if the answer to i) is yes;
- ii) do the claims define 'something significantly more' than the judicial exception.

AI and Patents: Patentability exclusions

Europe

- The European Patent Convention (EPC) excludes from patentability: discoveries, scientific theories and **mathematical methods**; schemes, rules and methods for performing mental acts, playing games or doing business, and **programs for computers**, “as such”.
- However, as long as there is some other technical subject matter defined in the claim then this exclusion can be avoided.
- This means that features incorporating technical computer implementation of software, such as a computer (hardware), computer network or any tangible technical element such as an AI equipped surgical robot system will pass this test.

PATENT PROTECTION OF AI-RELATED INVENTIONS



It is worth considering how AI might impact the patent system:

- The cognitive characteristics of the AI technology and on its implication to the assumption of “human-made” inventions under the patent system and patent law
- The inherent technical limitations in fully reproducing and describing the processes carried out in the deep learning neural network and its potential impact on one of the fundamental principles of the patent system (dissemination of new technological knowledge).

It is worth considering how AI might impact the patent system:

- **PATENTABLE SUBJECT MATTER**
- **NOVELTY AND INVENTIVE STEP**
- **SUFFICIENCY OF DISCLOSURE AND CLAIMS**
- **INDUSTRIAL APPLICABILITY**
- **INVENTORSHIP AND OWNERSHIP**

AI and Patents – Inventorship

- In patent law, an **inventor** is the person or persons who contribute to the claims of a patentable invention.
- Paris Convention states in Article 4ter- the obligation of mentioning the Inventor in the Patent: *“The inventor shall have the right to be mentioned as such in the patent”*.
- In order to apply for a patent, the application needs to identify one or more named inventors, with the common understanding that the inventor(s) are human beings.

AI and Patents – Ownership

- With AI systems already being used to generate content capable of attracting IP protection, determining exactly who owns the IP rights in this content will become increasingly important.
- The best way to manage the potential uncertainties regarding ownership of IP rights/patents is to clearly identify who is going to own the IP in commercial agreements and terms of use for the system- Given the number of parties which could be involved in the design, training, and use of an AI system, these issues will need to be addressed right from the beginning of an AI project and reviewed at each stage as the project develops.

TOOLS FOR THE IP AUTHORITIES

- The WIPO Index of AI Initiatives in IP Offices: (i) digitization and process automation; (ii) examination; (iii) helpdesk services; (iv) image search; (v) machine translation; (vi) patent classification; (vii) patent prior art search; and (viii) trademark classification.
- WIPO dedicated web page on AI (an electronic forum for the discussion of ICT strategies and AI for IP Administration)
- Committee on WIPO Standards (CWS) established a Task Force on ICT Strategy and Standards

Artificial intelligence at WIPO

WIPO's research on AI is led by the Advanced Technology Applications Center (ATAC), which works on enhancing functions and processes at the Organization. WIPO currently uses AI in three main areas:



Machine translation: WIPO Translate

WIPO Translate is a world-leading instant translation tool, specially designed for patent documents. It's available through the [PATENTSCOPE database](#) and can also be integrated within IPO systems upon request.



Image search: Global Brand Database

Image search within the [Global Brand Database](#) allows trademark owners to identify visually-similar trademarks, as well as other brand-information records from among the millions of images in the collection.



Automatic Patent Classification

IPCCAT helps patent filers and examiners in IPOs to automatically categorize patent applications into technical units according to their [International Patent Classification \(IPC\)](#) class, subclass, main group or sub-group.

TOOLS FOR APPLICANTS, THIRD PARTIES AND IP PROFESSIONALS

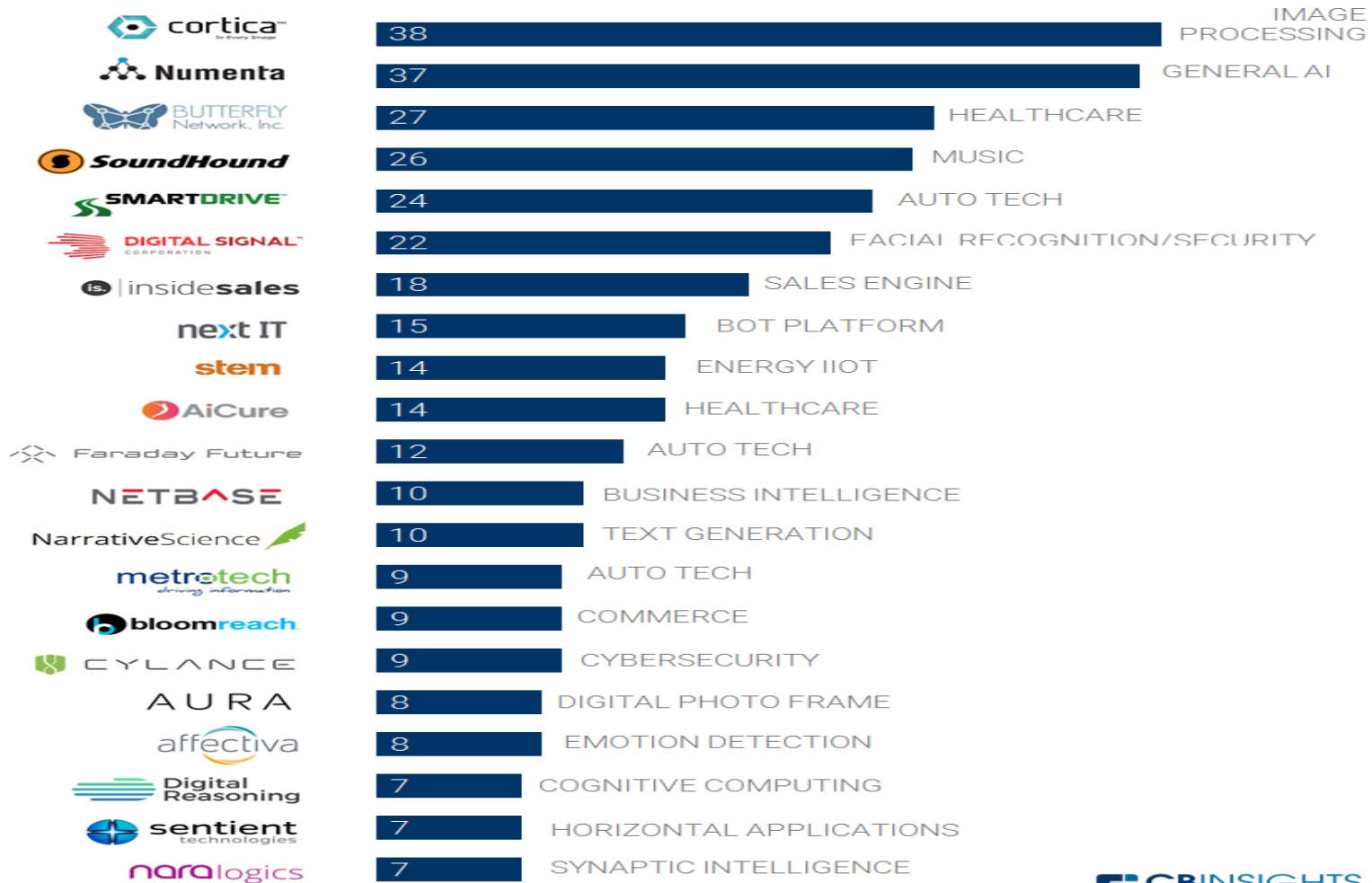
- AI technology may assist applicants, third parties and IP professionals for achieving higher quality and efficiency in their respective activities
- AIPPI, AIPLA and FICPI consider that the applications of AI in IP practices can be grouped into three categories: (i) document automation; (ii) process automation; and (iii) AI-enabled insights

AI and Patents – Statistics



AI STARTUPS: TOP PATENT HOLDERS

2009-2017 (as of 4/17/17)



CBINSIGHTS

WIPO

WORLD
INTELLECTUAL PROPERTY
ORGANIZATION

Thank You !