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)
“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: 134,777
- Logic programming: 14,682
- Fuzzy logic: 11,601
- Ontology engineering: 1,385
- Probabilistic reasoning: 328
- Search methods: 1

Number of patent families

- Neural networks: 42,987
- Supervised learning: 18,957
- Probabilistic graphical models: 14,253
- Support vector machines: 13,715
- Bio-inspired approaches: 11,399
- Classification and regression trees: 8,374
- Deep learning: 7,306
- Rule learning: 6,535
- Unsupervised learning: 6,526
- Reinforcement learning: 2,107
- Instance based learning: 1,731
- Latent representations: 878
- Multi-task learning: 387
- Logical and relational learning: 72

WIPO
WORLD INTELLECTUAL PROPERTY ORGANIZATION
MACHINE LEARNING

observations of height and hand size pairs

<table>
<thead>
<tr>
<th>height (cm)</th>
<th>hand size (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>170</td>
<td>19.0</td>
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<tr>
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<td>164</td>
<td>17.9</td>
</tr>
<tr>
<td>166</td>
<td>19.4</td>
</tr>
</tbody>
</table>

Linear regression technique
NEURAL NETWORKS

Output function:

\[ \text{hand size} = f(\text{height}.w_{\text{height}} + \text{age}.w_{\text{age}} + \text{gender}.w_{\text{gender}} + b) \]
Full neural network (composed of at least three layers)
DEEP LEARNING

how a human perceives an image  how a computer perceives an image
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

- COMPUTER VISION: 167,038
- NATURAL LANGUAGE PROCESSING: 46,558
- SPEECH PROCESSING: 44,188
- PLANNING AND SCHEDULING: 11,075
- ROBOTICS: 11,058
- PREDICTIVE ANALYTICS: 9,426
- CONTROL METHODS: 3,344
- DISTRIBUTED AI: 2,407
- KNOWLEDGE REPRESENTATION AND REASONING: 1,329
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.
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
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)

- Image Processing: 38
- General AI: 37
- Healthcare: 27
- Music: 26
- Auto Tech: 24
- Facial Recognition/Security: 22
- Sales Engine: 18
- Bot Platform: 15
- Energy IOT: 14
- Healthcare: 14
- Auto Tech: 12
- Business Intelligence: 10
- Text Generation: 10
- Auto Tech: 9
- Commerce: 9
- Cybersecurity: 9
- Digital Photo Frame: 8
- Emotion Detection: 8
- Cognitive Computing: 7
- Horizontal Applications: 7
- Synaptic Intelligence: 7

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Thank You !