Artificial Intelligence and Patent Offices: Automation and Efficiency Implications

Lacey A. Weeks

1 Artificial Intelligence

1.1 What is artificial intelligence?

IBM states that "artificial intelligence, or AI, is technology that enables computers and machines to simulate human intelligence and problem-solving capabilities." [1] The Coursera website states that artificial intelligence "refers to computer systems capable of performing complex tasks that historically only a human could do, such as reasoning, making decisions, or solving problems." [2] The University of Illinois Chicago states that "artificial intelligence represents a branch of computer science that aims to create machines capable of performing tasks that typically require human intelligence. These tasks include learning from experience (machine learning), understanding natural language, recognizing patterns, solving problems, and making decisions." [3]

1.2 What are some subfields of artificial intelligence?

1.2.1 Machine Learning

According to IBM, machine learning "is a branch of artificial intelligence (AI) and computer science that focuses on the using data and algorithms to enable AI to imitate the way that humans learn, gradually improving its accuracy." [4] The Geeks for Geeks website define machine learning as "a branch of artificial intelligence that enables algorithms to uncover hidden patterns within datasets, allowing them to make predictions on new, similar data without explicit programming for each task. Traditional machine learning combines data with statistical tools to predict outputs, yielding actionable insights. This technology finds applications in diverse fields such as image and speech recognition, natural language processing, recommendation systems, fraud detection, portfolio optimization, and automating tasks." [5]

1.2.2 Deep Learning

According to IBM, deep learning "is a subset of machine learning that uses multi-layered neural networks, called deep neural networks, to stimulate the complex decision-making power of the human brain. [6] The Tech Target website states that deep learning "is a type of machine learning and artificial intelligence (AI) that imitates the way humans gain certain types of knowledge. Deep learning models can be taught to perform classification tasks and recognize patterns in photos, text, audio and other various data. It is also used to automate tasks that would normally need human intelligence, such as describing images or transcribing audio files." [7]

1.2.3 Neural Networks

IBM states that a neural network "is a machine learning program, or model, that makes decisions in a manner similar to the human brain, by using processes that mimic the way biological neurons work together to identify phenomena, weigh options and arrive at conclusions." [8] Amazon claims that a neural network "is a method in artificial intelligence that teaches computers to process data in a way that is inspired by the human brain. It is a type of machine learning process, called deep learning, that uses interconnected nodes or neurons in a layered structure that resembles the human brain. It creates an adaptive system that computers use to learn from their mistakes and improve continuously. Thus, artificial neural networks attempt to solve complicated problems, like summarizing documents or recognizing faces, with greater accuracy." [9]

1.2.4 Natural Language Processing

IBM claims that "natural language processing (NLP) is a subfield of computer science and artificial intelligence (AI) that uses machine learning to enable computers to understand and communicate with human language." [10] Amazon states that natural language processing "is a machine learning technology that gives computers the ability to interpret, manipulate, and comprehend human language. Organizations today have large volumes of voice and text data from various communication channels like emails, text messages, social media newsfeeds, video, audio, and more. They use NLP software to automatically process this data, analyze the intent or sentiment in the message, and respond in real time to human communication." [11]

1.2.5 Computer Vision

According to IBM, computer vision "is a field of artificial intelligence (AI) that uses machine learning and neural networks to teach computers and systems to derive meaningful information from digital images, videos and other visual inputs – and to make

recommendations or take actions when they see defects or issues." [12] Microsoft states that computer vision "is a field of computer science that focuses on enabling computers to identify and understand objects and people in images and videos. Like other types of AI, computer vision seeks to perform and automate tasks that replicate human capabilities. In this case, computer vision seeks to replicate both the way humans see, and the way humans make sense of what they see." [13]

1.2.6 Expert Systems

The Geeks for Geeks website claims that "an expert system is AI software that uses knowledge stored in a knowledge base to solve problems that would usually require a human expert thus preserving a human expert's knowledge in its knowledge base. They can advise users as well as provide explanations to them about how they reached a particular conclusion or advise." [14]

1.2.7 Speech Recognition

IBM states that "speech recognition, also known as automatic speech recognition (ASR), computer speech recognition or speech-to-text, is a capability that enables a program to process human speech into a written format" and that "while speech recognition is commonly confused with voice recognition, speech recognition focuses on the translation of speech from a verbal format to a text one whereas voice recognition just seeks to identify an individual user's voice." [15]

2 Artificial Intelligence and Patent Offices

Let's discuss what patent offices do before we dive into how artificial intelligence can be used for automation and efficiency in the patent office. For this discussion we will mainly be focusing on the United States Patent and Trademark Office.

What is the patent office and what are they responsible for? According to the United States Patent and Trademark Office (USPTO) website, USPTO is the federal agency responsible for granting patents and registering trademarks in the United States. [16]

2.0.1 Patents

Before we go any further, let's define what a patent is. Investopedia states that a patent "is the granting of a property right by a sovereign authority to an inventor. This grant provides the inventor exclusive rights to the patented process, design, or invention for a designated period in exchange for a comprehensive disclosure of the invention." [17]

2.0.2 Trademarks

Now that we know what a patent is, let's learn what a trademark is. According to the USPTO website, a trademark "can be any word, phrase, symbol, design, or a combination of these things that identifies your goods or services. It's how customers recognize you in the marketplace and distinguish you from your competitors." [18]

2.1 Automation & Efficency

Artificial intelligence can be used for automation and efficiency in patent offices, from using machine learning to natural language processing. While artificial intelligence is not the same as automation, it can be used in automation known as intelligent automation. IBM states that "intelligent automation (IA), sometimes called cognitive automation, is the use of automation technologies – artificial intelligence (AI), business process management (BPM) and robotic process automation (RPA) – to streamline and scale decision-making across organizations." The idea behind intelligent automation is to simplify processes, free up resources and improve operation efficiencies, according to IBM. [19] Because of this automation, patents and trademarks can now be streamline to a higher degree of efficiency.

References

[1] "What is AI?" Accessed June 7, 2024. https://www.ibm.com/topics/artificial-intelligence

[2] "What is Artificial Intelligence? Definition, Uses, and Types." Accessed June 7, 2024. https://www.coursera.org/articles/what-is-artificial-intelligence

[3] "What is (AI) Artificial Intelligence?" Accessed June 7, 2024. https://meng.uic.edu/news-stories/ai-artificial-intelligence-what-is-the-definition-of-ai-and-how-does-ai-work/

[4] "What is Machine Learning (ML)?" Accessed June 7, 2024. https://www.ibm.com/topics/machine-learning

[5] "What is Machine Learning?" Accessed June 7, 2024. https://www.geeksforgeeks.org/ml-machine-learning/

[6] "What is Deep Learning?" Accessed June 7, 2024. https://www.ibm.com/topics/deep-learning

[7] "Deep Learning." Accessed June 7, 2024. https://www.techtarget.com/searchenterpriseai/definition learning-deep-neural-network

[8] "What is a Neural Network?" Accessed June 7, 2024. https://www.ibm.com/topics/neural-networks

[9] "What is a Neural Network?" Accessed June 7, 2024. https://aws.amazon.com/what-is/neural-network/

[10] "What is NLP?" Accessed June 7, 2024. https://www.ibm.com/topics/natural-language-processing

[11] "What is Natural Language Processing (NLP)?" Accessed June 7, 2024. https://aws.amazon.com/what-is/nlp/

[12] "What is Computer Vision?" Accessed June 7, 2024. https://www.ibm.com/topics/computer-vision

[13] "What is Computer Vision?" Accessed June 7, 2024. https://azure.microsoft.com/en-us/resources/cloud-computing-dictionary/what-is-computer-vision#object-classification

[14] "Expert Systems." Accessed June 7, 2024. https://www.geeksforgeeks.org/expert-systems/

[15] "What is Speech Recognition?" Accessed June 7, 2024. https://www.ibm.com/topics/speech-recognition

[16] "United States Patent and Trademark Office." Accessed June 7, 2024. https://www.uspto.gov/about-us

[17] "What is a Patent in Simple Terms? With Examples." Accessed June 7, 2024. https://www.investopedia.com/terms/p/patent.asp

[18] "What is a Trademark?" Accessed June 7, 2024. https://www.uspto.gov/trademarks/basics/what-trademark

[19] "What is Intelligent Automation?" Accessed June 7, 2024. https://www.ibm.com/topics/intelligent-automation