

Name of student:

Thi Loan LITOT

Name of your Level 1:

Anissat MOHAMED

Source:

Google Scholars

Paper title:

AI-Based Modeling: Techniques, Applications and Research Issues Towards Automation, Intelligent and Smart Systems

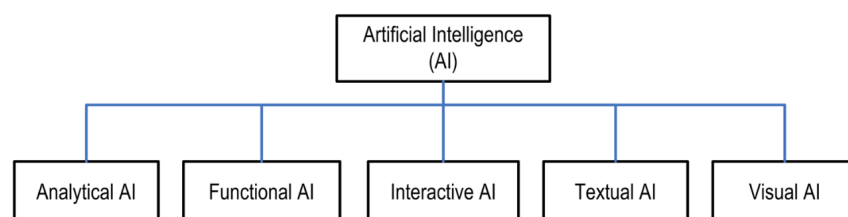
Keywords specific to the paper:

artificial intelligence, machine learning, data science, advanced analytics, intelligent computing, automation, smart systems, industry 4.0 applications

Summary of the main contributions:

This research paper focuses on the understanding of AI-based modeling in today's technology-driven age. As today's context of the Fourth Industrial Revolution is characterized by fast technological advancement and smart automation, AI is becoming more and more impactful. AI-driven technologies are aimed to create smart and intelligent machines, which are able to make decisions, solve problems and improve themselves. This leads to greater automation and the creation of smart systems able to facilitate everyday's needs and more specifically business processes through AI-bases modeling. This paper's main goals are to establish a comprehensive guide for both professionals and academics to understand the landscape of AI techniques that can be used in the creation of AI models, as well as define possibilities for these AI models to assist researchers and developers in real-life domains such as business, healthcare or finance. The author is looking for a better understanding of conceptions of AI-based solutions to broaden further research. To do so, they first analyze the characteristics of different AI types, divided in five categories represented below.

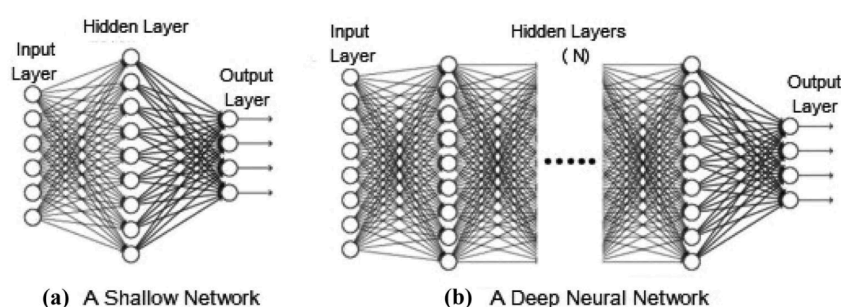
Fig. 1 Various types of artificial intelligence (AI) considering the variations of real-world issues



The papers identify the characteristics of each of these AI types. Analytical AI is defined by the identification and interpretation of patterns in data, as well as communicating its results in order to help one solve problems and make decisions ; an analytical AI-based model can be used by business companies to understand data-driven issues, such as financial risks for example. Functional AI is very similar to analytical AI as it analyzes data but is used to make automatic decisions. Interactive AI is mostly found in our daily lives, with chatbots for example ; it is characterized by communication automation and daily assistance. Textual AI covers speech-to-text conversion and speech recognition for example ; it could be needed to fasten some communication processes. Visual AI is basically visual recognition of objects or persons and the analysis of this visual data. The author describes these five AI types as potentially very useful in real-life situations and solutions for daily or global issues when developed with the potential AI techniques, mainly machine learning and deep learning. Machine learning and deep learning are taken as the most influential and important technologies in the AI field. This paper describes two main categories of machine learning, which are supervised learning and unsupervised learning. While supervised learning is used for classification and regression and is developed by a preset of goals and inputs, unsupervised learning is meant to discover and analyze unlabeled data's patterns and is mainly used for anomaly detection. Other machine learning techniques exist, such as semi-supervised learning but are less common. This research paper emphasizes machine learning as essential in the development of technology in today's society, thanks to its ability to create predictive models.

The author also talks about deep learning (DL) and neural networks (ANN). Deep learning is based on artificial neural networks and has become a hot topic due to its layer-wise learning capability from data. A deep neural network is usually made of multiple hidden layers, as shown in the figure below.

Fig. 4 A general architecture of **a** a shallow network with one hidden layer and **b** a deep neural network with multiple hidden layers



Deep neural networks can be divided into three major categories, just like machine learning: deep networks for supervised/discriminative learning, deep networks for unsupervised/generative learning, and deep networks for hybrid learning.

Other potential AI techniques described are knowledge discovery, reasoning, natural language processing, expert systems, case-based reasoning etc. The author outlines the significance of various AI techniques in building different models like analytical, functional, interactive, textual, and visual models, based on the problem and application. It discusses real-world applications of AI across sectors like healthcare, cybersecurity, business, social media, virtual reality, robotics, etc., highlighting the diverse applications and the AI techniques utilized in each domain. The text emphasizes the future prospects of AI and its impact on various sectors such as industrial automation, medical applications, agriculture and cybersecurity. It explores concepts like automation, intelligent computing, and smart computing, illustrating how AI technologies contribute to these areas and shape the fourth industrial revolution. The author concludes by emphasizing the transformative potential of AI across various industries and the need for policymakers to focus on public policies that promote AI innovation while addressing societal concerns. It also highlights the plethora of job opportunities in AI-related fields and underscores the importance of ensuring that AI systems are deliberate, intelligent, flexible, and secure to realize their full potential in real-world scenarios.

Supported by a software application? (If yes, provide more details)

Not supported by any software application