Digitalization and Management Innovation II
R.J. Dwyer (Ed.)

doi:10.3233/FAIA230716

Issues of Artificial Intelligence Application in Digital Marketing

Dimiter VELEV[a,1] and Plamena ZLATEVA[a,b]
[a] *University of National and World Economy, Sofia, Bulgaria*
[b] *Institute of Robotics, Bulgarian Academy of Sciences, Sofia, Bulgaria*

Abstract. Artificial intelligence (AI) and its ability to collect data, analyze it, apply it and then learn from it have become a mandatory part of any strategy for the development and use of digital technologies in modern business solutions. The relations between artificial intelligence, machine learning, neural network, and deep learning are considered. AI in marketing is the use of customer data, machine learning and other ICT concepts to predict customer action or inaction. AI can process huge amounts of data and help marketers easily segment them to create custom content for their audience. With the help of AI, businesses can create new marketing analysis techniques to target the right prospects. This will help digital marketers deliver the right content to their customers on the right channel at the right time. The aim of this conceptual paper is to present the general characteristics of AI as well as to discuss their application for successful marketing campaigns and to point out existing issues.

Keywords. Digitalization, Digital Marketing, Artificial Intelligence, Machine Learning, Deep Learning

1. Introduction

Artificial Intelligence (AI) has become increasingly important in recent years, and its applications could be found in various fields, such as healthcare, finance, transportation, entertainment, etc. The goal of AI is to make machines that can work and think like humans, and to solve complex problems that were previously thought to be impossible.

AI is the ability of a machine or a computer program to perform tasks that usually require human intelligence, such as recognizing speech or images, learning from data, making decisions, and even understanding and responding to human language [1]. AI is achieved through a combination of techniques and algorithms, including machine learning, deep learning, natural language processing, and computer vision. AI is very important for digital marketing with consequent significant effects. The AI capabilities revolutionize the marketing landscape, offering advanced opportunities to analyze data, automate processes, personalize experiences and optimize campaigns [2].

The aim of this conceptual paper is to present the general characteristics of AI as well as to discuss their application for successful marketing campaigns and to point out existing issues.

[1] Corresponding author: Dimiter Velev, University of National and World Economy, 19 December 8th Str., 1700 Sofia, Bulgaria; E-mail: dgvelev@unwe.bg. The author was supported by the Science Fund of the University of National and World Economy under the project "Development and Use of Artificial Intelligence in Education and Economy" (Grant No. NID NI 1/2021).

2. General Characteristics of Artificial Intelligence

Before creating and using AI applications, the first obligatory issue is to know what intelligence is composed of.

Perception and sensory processing are the ability to accurately perceive and process sensory information from the environment. This involves vision, hearing, touch, taste and smell, and the integration of all that sensory input to form a full and true understanding of the surrounding environment.

Cognitive flexibility represents the ability to switch between different tasks or problem-solving strategies. It involves mental agility and adaptability to changing demands and situations.

Memory and learning are directly linked to the ability to acquire, retain and retrieve information, to temporarily hold and manipulate information in mind to perform cognitive tasks It involves different processes, such as memory storage and retrieval, the capability to learn from past experiences and adapt behavior according to the situation. The working memory is of utmost importance for complex thinking, learning, and problem solving.

General knowledge about various subjects, including different fields of science, history, literature, etc. The general knowledge provides a foundation for understanding the world and making connections between different concepts and ideas.

Metacognition is the ability to reflect on the thinking processes and to monitor the learning process. The metacognitive skills enable individuals to plan, set goals, evaluate progress and make corrective actions to optimize the learning and performance.

Language and communication contains proficiency in language and effective communication. It involves the ability to understand and use language to express thoughts, convey information, and engage in meaningful interactions with others.

Reasoning and problem solving are the ability to reason logically, analyze information and effectively solve problems. It includes skills such as critical thinking, abstract reasoning, and the ability to identify patterns and to make inferences.

AI is not just a single or stand-alone part of computer science, but rather it is an interdisciplinary area of science, combing knowledge from mathematics, computer science, neuroscience, biology, philosophy, psychology, sociology, etc. [2]. This complex concept is shown in Figure 1.

The integration of these scientific fields shown in Fig. 1 enables the implementation of a multidisciplinary approach to AI research and development. Mathematics and computer science provide the AI technical foundation, enable the representation and manipulation of data, the design of learning algorithms and the evaluation of AI systems. Neuroscience brings significant insights how to develop computational models that mimic aspects of human cognition and behavior. Biology is used to study how to create efficient and adaptive solutions to problems. Both neuroscience and biology help the design of intelligent systems using algorithms and technologies based on the functioning of biological systems and on the progress of evolutionary processes. Philosophy explores the nature of intelligence, the definition of consciousness, the AI ethical implications and the limits its capabilities. Phycology in AI deals with human perception, learning, decision-making and emotions, which helps develop models simulating human behavior, understanding user preferences and creating personalized experiences. Sociology examines the social impact of AI systems on individuals, organizations and society, exploring the ethical, cultural and economic implications of AI adoption. The integration of knowledge and insights from these scientific fields helps AI researchers and

developers create more sophisticated and responsible AI systems. The multidisciplinary approach facilitates a deeper understanding of intelligence, human behavior and the societal implications of AI.

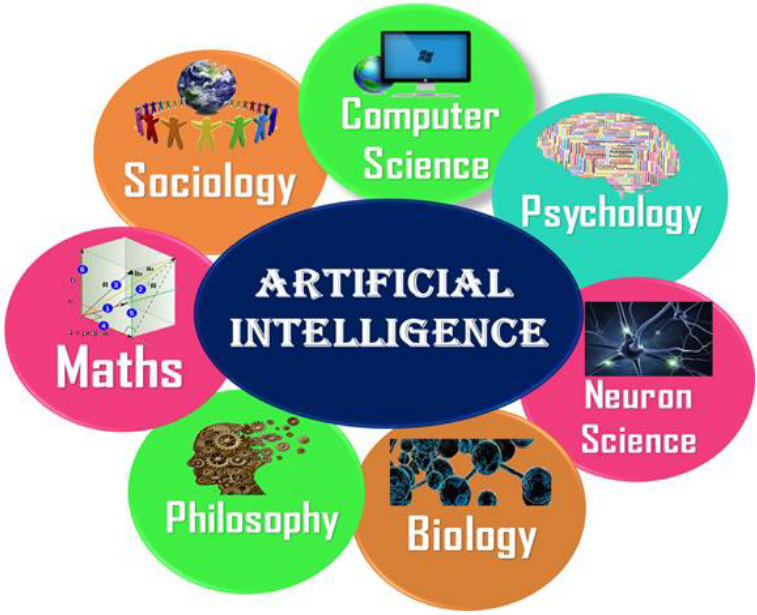

Figure 1. AI interdisciplinary field [5].

Artificial Intelligence has evolved during the years and different subsets of this technology have emerged.

Machine Learning (ML) is a subset of AI, which consists of algorithms and statistical models that enable computer systems to learn from data, improve performance over time, and make decisions. ML operates by using large amounts of data and advanced algorithms to enable computer systems to learn and improve their performance on specific tasks automatically. ML has a broad range of practical applications in various fields such as healthcare, finance, marketing, image and speech recognition, recommendation systems, fraud detection, autonomous vehicles, and natural language processing [3].

Deep Learning (DL) is a subset of ML that involves building artificial neural networks with many layers that can learn to recognize patterns and relationships in data [4]. DL models consist of multiple layers of interconnected nodes, each of which performs a mathematical operation on the data it receives. By passing data through multiple layers, a deep learning model can learn increasingly complex features and representations of the data. DL is applied to a wide range of tasks, including image and speech recognition, natural language processing, autonomous driving, and game playing. One of the key advantages of DL is its ability to learn from large and complex datasets without the need for extensive feature engineering or manual intervention. DL plays an important role in computer vision to natural language processing.

The relations between artificial intelligence, machine learning, neural network, and deep learning are presented in Figure 2.

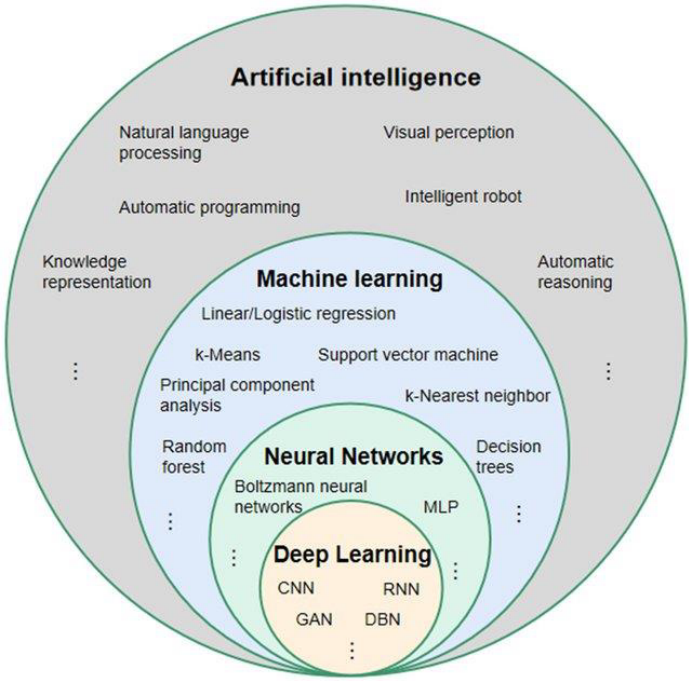

Figure 2. Relations between artificial intelligence, machine learning, neural network, and deep learning [5].

3. The AI Role in Digital Marketing

The role of AI in digital marketing becomes critical as consumers are expecting more personalization in their online experiences. AI technology can collect, analyze and interpret vast amounts of data, enabling marketers to better understand their customers and target them with relevant messages. AI algorithms can analyze a customer's online behavior and predict what they are most likely to buy next, allowing marketers to target them with personalized advertisements and offers. AI can be used in several typical ways in digital marketing [6, 7, 8].

Personalization - AI algorithms can analyze customer data, such as browsing history and purchasing patterns, to personalize marketing campaigns and website content to individual customers.

Customer segmentation - AI algorithms can be used to segment customers into different groups based on their characteristics and behavior, enabling marketers to tailor their campaigns to specific groups of customers.

Customer sentiment analysis - AI tools can analyze customer feedback, social media posts, and online reviews to understand the sentiment and opinions of customers towards a product or brand. This allows marketers to measure the customer satisfaction, to identify areas for improvement, and to address effectively potential issues.

Customer Lifetime Value (CLV) prediction - AI algorithms can predict the customer lifetime value. AI can identify high-value customers and optimize marketing strategies to maximize the CLV by analyzing historical data and customer behavior patterns. This

allows marketers to allocate resources efficiently and focus on retaining valuable customers.

Customer journey mapping - AI can help in mapping and understanding the customer journey across various touchpoints and channels. AI algorithms can identify problem points and improve the overall customer experience by analyzing customer interactions and behavior at each stage. This helps marketers tailor their strategies to meet customer needs at different stages of the journey.

Predictive analytics - AI algorithms can be used to predict customer behavior and preferences, such as which customers are likely to make a purchase or churn. This information can be used to inform marketing strategies and improve conversion rates.

Ad targeting - AI algorithms can analyze data about customer behavior, such as browsing history and search queries, to target advertisements to customers who are more likely to be interested in the products or services being advertised.

Email marketing - AI algorithms can be used to optimize email campaigns, such as by predicting which customers are more likely to open and click on emails, and when they are most likely to engage.

Chatbots - AI algorithms can be used to power chatbots, which can engage customers in real-time and provide personalized support and information. AI chatbots become increasingly used in digital marketing since they can provide customers with instant support and information, helping to improve customer satisfaction and reduce response times. Besides that, chatbots can be trained to understand the needs and preferences of the customers, which can help to enhance their shopping experience. A chatbot can offer a customer recommendations based on their past purchases and interests.

Dynamic pricing and revenue management - AI algorithms can analyze market dynamics, competitor pricing and customer behavior patterns to optimize pricing in real-time. Dynamic pricing helps maximize revenue and improve competitiveness.

Another aspect of AI in digital marketing is the use algorithms to optimize campaigns in which they can analyze vast amounts of data to determine the most effective strategies for reaching a target audience. This includes analyzing the performance of past campaigns, identifying the best times to reach customers, and determining the most effective messaging and creative. AI algorithms can analyze different variations of ads, Web pages or emails to identify the most effective elements that lead to higher conversion rates and to improve marketing campaign performance. Hence, AI algorithms can help marketers make more informed decisions, and reach their target audience more effectively.

The rise of voice search has also led to the increased use of AI in digital marketing since people look for more convenient ways to access information. AI algorithms can analyze voice search queries and respond with relevant information, helping marketers to better understand their target audience's needs and preferences. This can help to improve the overall customer experience and increase conversions.

4. Defining Issues of AI Application in Digital Marketing

Although AI has the potential to transform digital marketing and provide new opportunities for marketers, there are also critical issues that need to be considered when using AI as follows [8 - 12].

Data quality regarding ML and DL algorithms require large amounts of data to make predictions and decisions, and the quality and accuracy of this data is critical. However, the data used in digital marketing is often of poor quality, biased, or unethical, which can result in incorrect predictions and decisions. The quality of the data used in digital marketing can be affected by factors such as accuracy, completeness, consistency, and timeliness. Inaccurate or incomplete data can lead to incorrect marketing strategies, which can result in lower conversion rates and customer engagement.

Data quantity used in digital marketing can be a challenge, as large amounts of data are needed to train machine learning algorithms and make predictions. Without sufficient data, the accuracy of predictions can be affected, and the personalization of content may not be effective.

Data silos occur when data is stored in separate systems and is not integrated, resulting in a fragmented view of the customer. This can affect the accuracy of customer segmentation and personalization efforts, as well as the accuracy of predictions.

The risk of AI algorithms making mistakes or providing irrelevant information because of their dependency on the data they are fed, incorrect or biased data can result in incorrect results. This can lead to a poor customer experience and a loss of trust in the brand. To mitigate this risk, marketers must ensure that their AI algorithms are trained on high-quality data and are regularly audited and updated.

Customer privacy is a major concern in digital marketing, and ML algorithms that use customer data to make predictions or personalize content may violate customer privacy or trust.

Lack of interpretability since DL models are highly complex and difficult to interpret, making it challenging for marketers to understand how they are making predictions and decisions. This lack of interpretability can lead to mistrust and accountability issues.

Bias and discrimination since DL algorithms can preserve existing biases in the data they are trained on, leading to discrimination and unfair outcomes. For example, if a deep learning model is trained on biased data, it may make predictions that reinforce existing inequalities and stereotypes.

Lack of transparency since ML algorithms can be complex and difficult to understand, making it hard for marketers to understand how they are making predictions and decisions. This lack of transparency can lead to mistrust and accountability issues.

Bias and discrimination since ML algorithms can perpetuate existing biases in the data they are trained on, leading to discrimination and unfair outcomes. If an ML algorithm is trained on biased data, it may make predictions that reinforce existing inequalities and stereotypes.

Regulation since the ML application in digital marketing is regulated by several laws and regulations, such as the European General Data Protection Regulation (GDPR) and the California Consumer Privacy Act (CCPA). Marketers need to be aware of these regulations and ensure that they are using ML in a way that complies with these regulations.

Technical limitations since ML and DL algorithms can be computationally intensive. They require significant amounts of data and computational resources, making them challenging to implement and scale in practice. ML and DL algorithms can be difficult to interpret and understand, which is challenging to marketers to make informed decisions.

5. A Conceptual Framework for Solving AI Issues in Digital Marketing

In science and real life, it is a common practice to use different frameworks for a wide range of needs. They drive hypothesis generation, enhance research efficiency, contribute to theory development, facilitate testing and improvement, promote systematic research, help solving specific issues. The terms "theory," "theoretical framework," and "conceptual framework" are often used in research and academic contexts, and while they are related, they have distinct meanings and purposes. A theory is a comprehensive explanation or set of principles, while a theoretical framework or conceptual framework provides a structure for a specific research study. The theoretical framework encompasses broader theories and concepts that form the study, while the conceptual framework focuses on defining and organizing specific variables or concepts within the research context [13, 14, 15].

Developing a conceptual framework for solving AI issues in digital marketing can significantly help marketing efforts and improve outcomes. It could consist of the following integral parts:

Identification of AI issues in digital marketing by studying existing literature, case studies and industry reports.

Definition of key concepts and variables, which could include AI algorithms, digital marketing strategies and tactics, customer behavior and preferences, data collection and analysis and business performance metrics.

Exploration of data governance, data acquisition, data storage, data processing, data quality assurance, and data sharing practices, issues related to data privacy, security and compliance with existing regulations.

Evaluation of algorithm correctness by exploring strategies for mitigating biases, ensuring correctness in targeting and personalization and preventing discriminatory outcomes. Analysis of the potential benefits, risks and unintended consequences of AI integration including the effect on customer trust, brand reputation and market dynamics.

Assessment of human-AI interaction and roles to establish the level of human collaboration in AI-enabled digital marketing, human creativity, judgement, decision-making, impact on employment and workforce dynamics.

Establishment of relationships and interactions between AI and various aspects of digital marketing in which to examine how AI algorithms impact customer targeting and segmentation, content personalization, advertisement optimization, predictive analytics and campaign performance.

Assessment of impact and consequences by evaluating the impact of AI application on consumers, marketers, organizations and society.

Evaluation of performance metrics and KPIs to identify potential biases or limitations in measuring AI-generated outcomes and to propose alternative metrics or modified evaluation frameworks that take into account AI-specific factors.

Development of mitigation strategies by involving development of best practices, guidelines and policies for responsible AI use. Development of guidelines and recommendations from the findings and insights from the conceptual framework. Development of educational training programs to enhance AI literacy and ethical awareness are also recommended.

Test and validation by collecting relevant data, conducting experiments or simulations and analyzing the outcomes to validate the effectiveness and practicality of the proposed strategies. Framework application is recommended for specific AI use cases

or scenarios. The conceptual framework could be constantly refined on the inferences obtained from the empirical testing.

6. Conclusions

The AI application in digital marketing brings significant advancements and transformations in the field. AI revolutionizes the ways marketers analyze data, understand customer behavior, optimize campaigns and personalize experiences. The AI capabilities lead to new possibilities for targeting the right audience, delivering relevant content and maximizing marketing effectiveness. A key benefit of AI in digital marketing is its ability to process and analyze vast amounts of data with a great speed and accuracy. AI algorithms can derive meaningful insights from data sources like customer demographics, browsing patterns, social media interactions, purchasing history, etc. This data-driven approach enables marketers to better understand their audience, identify trends and make data-backed decisions to optimize marketing strategies. AI algorithms can analyze user preferences, behavior and past interactions in order to deliver personalized recommendations and product suggestions, improve the conversion rates and customer satisfaction. AI enables predictive analytics and forecasting, which allows the marketers to anticipate customer behavior and market trends. AI can help marketers identify patterns, predict future results and make proactive marketing decisions. Despite the possible benefits, the ethical considerations must be taken into account in digital marketing. Data privacy, transparency and fairness should be prioritized to ensure responsible use of AI technologies.

References

[1] Russel S, Norwig P. Artificial Intelligence – A modern approach. 4th edition, Pearson; 2021. 1166 p.
[2] JavaTpoint. Artificial Intelligence. 2023, https://www.javatpoint.com/artificial-intelligence-ai
[3] Serrano LG, Grokking Machine Learning. Manning Publications; 2021. 513p.
[4] Goodfellow I, Bengio Y, Courville A. Deep Learning. MIT Press; 2016. 986 p.
[5] Li S, Deng YQ, Zhu ZL, Hua HL, Tao ZZ. A Comprehensive review on Radiomics and Deep Learning for nasopharyngeal carcinoma imaging. Diagnostics. 2021; 11(9), article no. 1523, Published by MDPI.
[6] Syam N, Kaul R. Machine Learning and Artificial Intelligence in Marketing and Sales: Essential reference for practitioners and data scientists. Emerald Publishing; 2021. 225 p.
[7] Roetzer P, Kaput M. Marketing Artificial Intelligence: AI, Marketing, and the future of business. Matt Holt Books; 2022. 256 p.
[8] Venkatesan R, Lecinski J. The AI Marketing Canvas. Stanford University Press; 2021. 269 p.
[9] Baig MR, Govindan G, Shrimali VR. Data Science for Marketing Analytics. 2nd edition, Packt Publishing; 2021. 637 p.
[10] Penn C. AI for Marketers: An introduction and primer. 3rd edition, Independently Published; 2021. 239p.
[11] Daugherty PR, Wilson HJ. Human + Machine: Reimagining work in the age of AI. Harvard Business Review Press; 2018. 169 p.
[12] Lee Y-I, Trim PRJ, Enhancing marketing provision through increased online safety that imbues consumer confidence: Coupling AI and ML with the AIDA model. Big Data and Cognitive Computing. Special Issue: Artificial Intelligence for Online Safety 2022;6(3): article no. 78.
[13] Jansen D, Theoretical vs Conceptual Framework. Gradcoach; 2023 March' https://gradcoach.com/theoretical-framework-vs-conceptual-framework/
[14] Sachdeva V. What is a Conceptual Framework?. AJE, Part of Springer Nature; 2023 Apr. https://www.aje.com/arc/what-is-a-conceptual-framework/
[15] Swaen B, George T. What Is a Conceptual Framework? / Tips & Examples. Scribbr; 2022 Nov. https://www.scribbr.com/methodology/conceptual-framework/