

# Automatic Ad Optimization and Budget Estimation with Artificial Intelligence, Health Service

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With the developing and rapidly changing technology, marketing strategies have necessarily changed in order to meet the demands and needs of consumers. The inability of businesses to keep up with this changing system pushes them out of the process. In daily life, where consumption never ends, marketing strategies are also consumed very quickly. Although the name changes according to age, the main goal is always more profitability. Digitalization of sales and marketing has made shopping in virtual environments widespread. Most customer services are performed by chatbots. It is seen that these studies are also carried out in the field of health services. From Siri to augmented reality applications, they are in our lives. These intelligent systems date back to the 1970s. So, where are the artificial intelligence and intelligent robots that have taken their place in almost every sector, from health to defense, which has been the favorite of recent years? Although the answer to this question has only recently begun to be researched, it seems that it will be one of the most important issues in the near future. In this study, which seeks a definitive answer to this question, the place and future of artificial intelligence in marketing strategies are discussed. In addition to contributing to the academic world, the study is thought to be useful in artificial intelligence studies.

*Keywords:* artificial intelligence, automated advertising, optimization, budget estimation

## Introduction

Artificial intelligence technologies appear in every aspect of our lives and make our lives easier. The inevitable development of artificial intelligence has started to manifest itself in marketing strategies, brand management and sustainable customer relationship management. In today's world where approximately 4 billion people are internet users, it is almost impossible to ignore artificial intelligence. Humanity, which made the first, second and third industrial revolutions with the invention of the steam engine, electricity and computer respectively, is now experiencing the "Industry 4.0 revolution, in which cyber-physical systems that connect the physical world and the virtual information world with the help of sensors and actuators are the indispensable artificial intelligence of our age" (Kurt, 2019). This situation of artificial intelligence means its application to marketing. It means continuously following the next purchasing decisions of target consumers, predicting and presenting products accordingly. In this way, businesses will be able to realize effective, efficient and profitable sales. Artificial intelligence and machine learning are new technologies (Milgrom, & Tadelis, 2018). It is a new agenda by people. Artificial intelligence, which is still in the incubation stage, is one of the issues that occupy

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the world agenda. It can even be said that each of the studies on artificial intelligence raises more questions than answers. In this context, Marvin Minsky, the pioneer of studies on artificial intelligence in the MIT (Massachusetts Technical University) research group, states that artificial intelligence is a moving horizon (McCorduck, & Cfe, 2004). According to some, it is thought that in practice the need for manpower will decrease and many things that are done by human hands will be done through artificial intelligence, thus leading to massive unemployment. So, questions such as “Will artificial intelligence replace humans?” and “Will it destroy humanity?” often come to mind (Afza, & Kumar, 2018). With the rapid progress of artificial intelligence (AI) technology in recent years, it is witnessed that its applications in various fields are expanding, bringing significant transformations to advertising, media, e-commerce, education and many other sectors (Turban et al., 2015). The emergence and growth of AI has created a technical foundation for intelligent operations in the advertising industry. In particular, AI is increasingly being used in the areas of ad Targeting, Personalization, Content Creation and Ad Optimization. By analyzing consumer behavior, AI technology provides valuable insights that help advertisers create more effective strategies. This increases the efficiency of advertising information processing and decision-making. In the field of Ad Targeting, various machine learning techniques can be used to improve targeted online advertising. Especially in optimizing the target audience coverage, target users in significantly improving the ability to segment. McDonald’s, for example, has adopted advanced AI decision-making techniques to optimize its Ad Targeting strategies. Analyzing real-time data on weather, time, popular menu items and current restaurant traffic, McDonald’s AI system dynamically adapts the menu board presentation in ads to ensure that the most appropriate menu options are precisely communicated to target users. With the help of advanced AI technologies, personalized recommendation systems have become indispensable tools for internet giants such as Amazon, YouTube, Netflix, Yahoo and Facebook. This allows them to provide users with personalized ad content that better matches their needs and interests.

Generative AI technologies can help creative teams analyze large amounts of data and information to create diverse and rich advertising content. For example, Lexus cars have created “intuition-based” ad copy. Ad content can be optimized in real time based on location, time and various customer profiles (Huang, & Rust, 2021). Incorporating generative AI into ad campaigns and content creation processes can improve creative quality and advertising impact. Moreover, Ad Optimization with Deep Learning and Reinforcement Learning techniques can bring ads closer to users’ real needs, increasing ad effectiveness and user purchase conversion rates. For example, eBay supports AI initiatives by building descriptive and predictive models that can provide users with precise or near-precise ad content based on price points and other requirements. Targeting, Personalization, Content Creation and Ad Optimization can be seen as the four pillars of AI advertising based on Computational Advertising. Each covers important parts of Computational Advertising and aims to maximize advertising effectiveness and return on investment (ROI) by working collaboratively across the entire advertising ecosystem.

*The theoretical foundations of Computational Advertising primarily focus on four main concepts and provide a theoretical framework for this study (Khanna et al., 2017).*

- First, user modeling, a common approach in Computational Advertising, is to build user models that predict a user’s response to specific advertising content, usually based on the user’s browsing and purchase history, social media engagement and demographics. This analysis can identify patterns and trends in consumer behavior.
- Second, Targeting, personalized recommendation systems are specialized information filtering systems that can predict a user’s liking for a particular product or product. They can present consumers’ emotional state

towards the advertisement in a measurable form and provide reference information for the advertising message and tone. Thus, recommendation systems can push ads to users that may be of interest to them. These personalized ads can increase emotional resonance with consumers. This concept forms the theoretical basis of Personalization.

- Third, the theoretical basis of Content Creation comes from Natural Language Processing (NLP), Generative Artificial Intelligence, etc. Its methods and tools can be used to create or optimize ad texts, images and videos (McGregor et al., 2018).

- Fourth, Ad Optimization, as a core problem in Computational Advertising, is about how to effectively show ads to the most relevant users within a limited budget, and using AI technology to improve the effectiveness and efficiency of advertising.

*The theoretical basis of this element comes from concepts such as:*

- The Many-Armed Bandit Problem,
- Deep Learning,
- Reinforced Learning,
- Real Time Bidding (RTB).

Based on Computational Advertising, the four pillars of AI advertising (Targeting, Personalization, Content Creation and Ad Optimization) have attracted wide academic interest and have been extensively studied. For example, one group of researchers studied Targeting. Another group has explored Personalization. Some researchers have also studied content creation. Researchers have also explored the area of Ad Optimization. However, the relationships between these elements and how they can be better integrated into the context of AI advertising have not been systematically examined. In addition, existing studies have also highlighted some of the challenges and ethical issues associated with digital advertising, including potential Algorithmic Bias, Data Privacy Issues and Ethical Considerations. Overall, however, how to address the challenges and Ethical Considerations that come with applying AI in advertising is an important issue that has yet to be fully discussed. For all these reasons, the traditional medical healthcare model that focuses on (Derin, 2024, December).

*Against this background, this study raises a number of research questions:*

- First, how can AI technology be integrated to understand the interplay between Targeting, Personalization and Content Creation in Computerized Advertising?
- Second, how can the understanding of the interplay between Targeting, Personalization and Content Creation be used to further improve Ad Optimization through AI technology?
- Third, what challenges and ethical issues are likely to be encountered in the process of applying AI in advertising?

### **Artificial Intelligence**

The term artificial intelligence, which dates back to Turing machines in the 1940s, was first used by Minsky and McCarthy at a Machine Intelligence conference in the United States in 1956 and has since been used in thousands of academic publications, research projects and doctoral studies, especially in computer hardware and software, vision, recognition, image and speech perception in robots, learning, cognitive modeling, information access, information search, game theory (Gere, & MacDonald, 2010).

These studies generally aim to analyze human thinking methods and develop similar artificial instructions. In other words, computers equipped with intelligence and software to solve problems that require intelligence solve complex problems in a way similar to humans and think like humans and perform tasks performed by

humans. AI programs need human knowledge to recognize patterns in complex data, draw on their experience and implement decisions made by humans. AI systems observe something and then try to recognize it based on predetermined parameters. Therefore, according to a certain situation, AI systems work and respond to the problem.

Artificial intelligence, sometimes a robot, sometimes a phone, can automate repetitive human tasks, remember forgotten things, intelligently summarize complex data, learn from people, and even advise people (Gilbert, 1997).

The power of AI is based on big data, machine learning and powerful solutions.

The concept of “big data” here; It offers businesses the opportunity to use more assimilated data by enabling businesses to collect and divide large and complex amounts of data with less effort. Based on this customer self-data, it ensures that products suitable for the wishes and needs of customers are delivered to them at the right time and place, with the right distribution methods. Businesses that want to seize this important opportunity, which will affect the decision-making and purchasing emotions of businesses, should use new technologies with artificial intelligence that can analyze consumer orientation faster, deeper and easier instead of past practices (Oke, 2008).

Big data is explained by the 3V model (Laney, 2001). Volume, which refers to the size of the data, the variety of unstructured and semi-structured data, which describes complex data, the time to analyze big data and the most important phenomenon of today is speed.

*Machine learning (deep learning)* is another important *concept* that enables marketers to understand the logical conclusions from big data collections and strengthen their hand against competitors in the market to have the power to attract consumers to their brands. Most importantly, thanks to this AI concept, businesses that incorporate AI into their marketing strategies are able to predict customer trends, track and analyze purchase behavior, and predict the consumer’s next purchase behavior.

The third core concept is “powerful solutions”. In the 21st century, where machines and humans understand the world in the same way, machines can easily identify concepts and themes with a set of data, interpret emotions and human communication and provide adequate responses to consumers, predict consumers’ behavior and decisions, and use this data to solve future problems (Dimitrieska, Stankovska, & Efremova, 2018).

### **Artificial Intelligence in Marketing Strategies**

Over the last 60 years, marketing has shifted from product-centricity to consumer-centricity and then from consumer to humanity (Kotler et al., 2010). Marketing 4.0 is an effort to look at marketing from different dimensions. While traditional marketing is dominated by one-way communication, Marketing 4.0, which enables consumers to participate in marketing by changing the connections and technology marketing approach, embraces the changing roles of traditional and digital marketing (Kotler et al., 2003; Ertuğrul, & Deniz, 2018).

Artificial intelligence is known to be very good at searching, scanning and learning data. From this perspective, it is clear that many basic steps of marketing are done by artificial intelligence (Sterne, 2017).

- Market research and understanding the customer
- Segmentation and targeting
- Offer management

Today, brands are competing in the digital world and are trying to investigate how they can integrate artificial intelligence technologies, which have become the most basic requirement of digital marketing, into their

marketing strategies. This is because AI technologies ensure a smoother customer experience, reduce costs and provide the opportunity to analyze the entire experience process in real time (Cannella, 2018). They spend a lot of time developing chatbot services and AI applications to engage customers, increase return rates, and provide a personalized customer experience. It is undeniable that artificial intelligence, including voice recognition, dictation technology, and communication technologies, will increase productivity in almost all business areas. Therefore, brand managers offer personalized search engine services and virtual assistants for their potential customers (Chung et al., 2018).

The necessary and correct use of artificial intelligence is a very useful tool and resource for all retail sectors where marketing is most intensive. AI is the perfect solution for retail companies that collect and store customer data to deliver personalized experiences. With the data it collects, they can segment many different topics from website design to the products they sell, from audience interaction to the content they share, and have the opportunity to improve them with artificial intelligence analysis. In this way, companies that have the opportunity to get to know their customers better have the opportunity to take their brands and customers one step further by designing experiences that meet the expectations of their customers. Ultimately, artificial intelligence applied to the marketing strategies of the business paves the way for efficient, profitable and effective sales (Kotler et al., 2003). In today's retail sector, most of the customer interaction tools are supported by artificial intelligence technologies and smart customer experience campaigns based on long-term customer relationships are created and managed. Thus, supporting user experiences in both digital and physical life with artificial intelligence enables businesses to communicate more effectively and efficiently with their customers (Yılmaz, 2018). In the future, with the development of machine learning, businesses that implement artificial intelligence that will provide mutually beneficial interactions to customers and brands are developing artificial intelligence in their marketing strategies to be one step ahead of their competitors.

In addition to all these; introducing artificial intelligence in the business and increasing the effectiveness and efficiency of department employees such as marketing, customer relations, accounting, production, audit and finance. All units of the business should follow the work of artificial intelligence and unit managers should ensure that the steps taken in the direction of development are implemented by the unit employees. The IT department, which will become one of the indispensable departments of the organization chart, should work in constant communication with the marketing department, and this situation should be accepted from the lowest to the highest level and acted on the whole enterprise. For example, while the personnel of the department that carries out promotional activities turn from conventional advertising activities to active advertising activities in the social environment, the employees who provide customer relationship management of the enterprise should use artificial intelligence applications based on customer satisfaction (Morgan et al., 2005); they should benefit from artificial intelligence.

### **Artificial Intelligence Technologies**

It is no longer impossible to encounter artificial intelligence almost everywhere from daily life to the health sector, from the defense industry to the banking sector, from law to human resources selection. In many international academic studies, the subject of artificial intelligence inevitably takes place in our lives.

Smart assistants, which are also known as virtual assistants, digital assistants or artificial intelligence assistants, are applications that have the ability to process natural language, understand voice commands and perform related tasks within commands. For example, Alexa, a voice assistant with artificial intelligence

infrastructure, is seen as a very important platform for today's marketers and personalized campaign experiences are managed through this platform (Brill, Munoz, & Miller, 2019).

Online chat is also one of the areas where marketers are working and investing. Because online chat offers customers a personalized experience. Since most customers ask questions about their main needs, instead of hiring salaried employees, using a chatbot with all the details and solutions about the product or brand is a smart solution to both reduce operating costs and strengthen communication with customers. In the near future, thanks to artificial intelligence, chatbots will be able to communicate with customers and provide smarter and more strategic answers to incoming questions, which will greatly increase the purchase rate (Chung et al., 2018).

On the other hand, AI technologies can be applied to businesses' websites (Bharat, 2017), mobile applications or kiosks in stores to create new marketing strategies and realize more profitable sales by increasing communication channels with customers and strengthening businesses against competitors in the marketplace. Today, it is not used directly as a personal assistant, but in some way or another, everyone benefits from smart assistant solutions. Utilizing AI-powered solutions such as reminder services, voice reading of messages, location services, voice calls and message writing processes make our lives easier. Most of us carry out our daily operations with AI-powered solutions such as Siri, Alexa or Google Now. We even get advice from these assistants on where to go on vacation, what music to listen to and much more. Smart assistants can be utilized at any time, communicate continuously and in real time, and make our lives easier with these advantages. The places covered by artificial intelligence technologies in the marketing world are given as titles respectively (Gökce, & Pehlivan, 2019).

#### **Augmented reality.**

While communicating with the customer using augmented realism technology, there is a transition to the next level in customer communication. Customers share their favorite opinions and experience the highest level of personalization (Köse, 2017). Population structure, body structure, weight and many specific data means new figures for companies to attract points for advertising or advice. Whether visual, auditory or conversational, it means more data that the software can process. The more data they process, the more they can achieve their goals. In marketing, it is important to be able to identify and understand personal preferences in order to reach the target audience at a high rate (Köse, 2017). Smartphones, social media, and objects are devices that are connected with more data than ever before. It is necessary to use artificial intelligence tools to transform this data into valuable products. Augmented Reality (AR), one of today's most popular solutions, is the name given to virtual objects on real images using the object recognition feature of devices. Augmented reality (AR) is one of the biggest tech trends right now and will only improve as AR-ready smartphones and other devices around the world become more accessible. The easiest way to understand AR technology is that it is already available on smartphones like Snapchat, Instagram and Facebook lenses that everyone in the world and in our country uses. It is also used in apps that help you find your car in a crowded parking lot and even in various shopping apps that let you try on clothes without clothes (Liao, 2015).

#### **Fashion and textiles for digital shelves.**

With the help of artificial intelligence and machine learning technologies, the traditional store experience in textiles can be taken to a very different level. By creating digital booths on touch screens, users can wear the clothes they want, inquire about the colors they are looking for and even share the clothes they wear on social media as soon as possible. The imagination here is up to you, but as a result, both in-store clothing fitting problems and the expectations of unhappy customers waiting in booth queues will be solved (Luce, 2018).

**Digital or physical store assistants.**

Using AI, intelligent analytics and natural language processing, retail stores can provide instant support to customers in-store. Kiosks, robots or touch panels can enhance in-store experiences by answering questions, finding products, discovering deals and more. In addition, AI-powered customer service intelligent assistants can reduce labor costs and provide 24/7 support to customers (Williams, 2002).

**Artificial intelligence supported customer behavior analysis.**

Using image sensing technologies, retailers can track customer movements in-store and determine store design and where to display their featured products based on customer movements. In-store image processing can prevent shoplifting and improve store security.

**Efficient customer support with chatbot.**

Today, chatbots providing customer support on social media and other channels are quite common. Chatbots answer our questions and help us get acquainted with relevant content and interact 24 hours a day.

In the retail sector, brands that want to improve customer engagement and continue with a structure that makes it lasting should create their own chatbots. Above all, digital marketing is one of the biggest beneficiaries of AI development, as it has taken many leaps and bounds since the advent of AI, transforming it from primitive forms to a means of disseminating purified and calculated content (Chung et al., 2018).

Depending on how central AI is to their business, there are many companies working in AI fields. One of them, Google's heavy investment in AI algorithms has helped automate all online marketing contracts for organic and paid marketing. With the latest updates, the Google AdWords manager will not need human-created campaigns, but will automatically create ads and publish them live without any intervention (Cannella, 2018).

**Artificial Intelligence by Marketing Strategy Types**

As a result of the use of computer and communication technologies in the field of marketing; internet marketing, digital marketing, social media marketing and similar marketing methods have emerged (Tantawy, & George, 2016).

**Artificial Intelligence in Digital Marketing**

In previous years, marketers were reluctant to use AI when planning their strategies, but in recent years, many successful brands such as Amazon and Spotify have integrated it into their work and are actively using it. Amazon, for example, uses this system to provide the most relevant product based on users' interest in their search, purchase and viewing history. In this way, customized options allow users to instantly review the most relevant products and guide their purchasing behavior (Kaput, 2022). The most important element of this transformation is the collection, analysis and interpretation of data. As the amount of data about potential users increases, the importance of AI in improving the speed and accuracy of data-driven decision making is growing.

**Artificial Intelligence in Content Marketing**

In the world of digital marketing, every business that wants to attract potential customers and be the first choice of its customers should provide as much quality content as possible and work regularly to improve it. If businesses do not prepare for future-oriented content development channels today, they will become powerless against their competitors over time. It is not possible to resist technologies that advance faster than time. Therefore, it is of great importance to keep up with the transformation in order not to fall behind the system in this order (Kose, & Sert, 2017).

*Content marketing stages:*

- Preparation,
- Application
- Revision

It is possible to use artificial intelligence techniques in each of these stages. Some of them are forecasting, optimization, expert support, adaptive guidance (for customers/users) and correction of errors detected during the marketing process (Mitchell, 1998).

When we focus on the details of the content marketing process, it becomes possible to diversify solutions with artificial intelligence. The important point here is to customize content marketing and processes according to the needs and interests of consumers with artificial intelligence technology (Klir, & Yuan, 1995). Since there are different types of content marketing environments and approaches, it is possible to design many combinations of intelligent content marketing processes (Köse, & Sert, 2017).

### **Email Marketing with Artificial Intelligence**

E-mails, which are electronic communication techniques between two or more people using the Internet, are now used by businesses as a marketing tool that includes their products or services and campaigns (Turban et al., 2017). In this marketing strategy, called email marketing, artificial intelligence takes advantage of the personalization feature and sends the right campaigns to the right person according to the customer's wishes and needs instead of sending any email to customers and turning it into a spa. They increase their email efficiency by using AI automation tools (IBM Watson Campaign Automation, Intercom, Crystal, Conversica) that can also optimize issues such as content structure, design, delivery frequency, delivery time and interest usage (Alghoul et al., 2018).

AI tracks each user's past behavior and informs marketing experts about the ideal delivery time. Thanks to AI technology, businesses can monitor customer behavior to determine which discount rate is valuable for which customer and send promotional campaigns to the relevant customers (Kumar et al., 2019).

### **Artificial Intelligence in Social Media Marketing**

In the last quarter of 2019, when the number of social media users reached 3.72 billion, 48% of the world's social media users and mobile social media users reached 3.66 billion. In this sense, the impact of social media on consumers is undeniable. Social media is an active advertising and virtual sales venue to boost the marketing initiatives of the business throughout the sales process. Therefore, social media is a critical component of every marketer's strategic tools that should be integrated with artificial intelligence. Billions of images are shared and hashtags are used on social media every day. On the social media side, the following three aspects are important regarding the use of artificial intelligence (Gökce, & Pehlivan, 2019):

- *Better CRM:* Messages, voice or video calls, media feeds, time spent on various pages, comments and more may be overlooked for now; however, with the help of machine learning solutions, artificial intelligence will be able to provide more valuable data in the future, and brands that take advantage of this data will be able to approach user expectations with much better targeting than today.

- *More efficient personalization:* When a better CRM is created, it is thought that AI will meet user expectations with better solutions. When it comes to AI users, it will not only offer branded products; it will also offer brand blog posts, white papers or training videos to interested users. Perhaps each brand will have its own more detailed media program. Thus, the brand loyalty of users who come together with relevant content will



increase much more than today.

- *Social sentiment analysis*: If you want to know your customers better, it is important to know what interests not only them but also the people around them. However, it is not possible to work with one person to access and evaluate this data.

Artificial intelligence is indispensable for these operations today. It is not difficult to predict that brands that will know their customers much better will benefit from this data in the future and offer unique offers to their users.

### **Artificial Intelligence in Affiliate Marketing**

Affiliate marketing is generating revenue from the sale of brands or customers. Affiliate marketing is a type of digital marketing where a user or website in the digital environment that promotes and advertises a business that wants to promote products or services online earns commissions based on sales or leads generated for that business.

It is possible to use AI technologies in the use of automation, big data and mutual trustworthiness of partners to leverage customer decision-making processes.

Artificial intelligence technologies provide insight into the business' customers and enable prediction of consumer behavior based on data.

*Where interviewees receive AI assistance in the form of relevant data selection and presentation:*

- Selection of proposals for Commission deliberations,
- Joint portfolio analysis
- Trend analysis.

### **Development of Artificial Intelligence in Marketing**

The field of sales and marketing is being influenced by advanced technologies and artificial intelligence, robotics and machine learning will undoubtedly accelerate the impact. Robots are expected to replace salespeople and marketers in the near future. Websites will be automatically updated based on usage and web pages will be automatically reformatted based on eye-tracking data.

*In the future, marketers can expect the following impacts from AI (Dimitrieska et al., 2018):*

- *Smarter Calls*: It is important to remember that as technological solutions become smarter and more perfect, consumers are becoming more sophisticated in their needs. Thanks to the internet and fast search engines, consumers find what they need in a short time. With artificial intelligence technology, these customer searches are analyzed by businesses and in the next step, they offer appropriate solutions to customers and provide more focused search results (Trifu, & Ivan, 2014).

- *Smarter Ads*: Traditional ads are reaching a wider consumer audience with digitalization. Businesses that integrate digital ads with artificial intelligence should make it faster and more efficient (Perkins, & Rao, 1990).

- *Refined Content Distribution*: Thanks to AI, marketers can identify their target audience and analyze their targeted consumers, marketers can understand consumers and demographics on an individual basis. Developers are now using AI, big data, machine learning and using them in a combination of two levels: easier identification to potential customers and delivering the most relevant content for brands.

- *Trusting Bots*: Consumer capture and retention is the most important future role of AI. Very soon, conversational functions and other direct customer loyalty can be performed by AI bots (Sterne, 2000). AI will

save time and reduce costs for businesses and employees. Artificial boots will be more effective than people with access to all data and search history.

- *Continuous Learning*: AI not only uncovers some hidden data, but also incorporates it into new promotional campaigns and optimizes the most relevant messages to users. Over time, AI solutions will become smarter, more efficient and promote real-time decision-making.

Many executives are optimistic that this shift in their AI-driven business will create more jobs than it loses.

*Artificial intelligence while developing innovative technologies:*

- It will have a positive impact on our economy by creating jobs that require the skills needed to implement new systems.

- AI will soon replace jobs that involve repetitive or basic problem-solving tasks and are likely to go beyond current human capabilities.

- AI systems will make decisions in place of humans in industrial settings, customer service roles and financial institutions.

- Automated decision-making will be responsible for tasks such as credit approval, deciding whether to involve a customer or not, or detecting corruption and financial crimes (Trifu, & Ivan, 2014).

As AI continues to be a buzzword in 2019, businesses need to realize that self-learning and black box capabilities are not a panacea. Many organizations are beginning to see the incredible capabilities of AI, using these advantages to enhance human intelligence and extract real value from their data (Drosou et al., 2017).

It doesn't take a futurist to see that AI will be increasingly involved in marketing over the next 10-15 years. In this era, AI is enabling marketers to do their jobs much better; management will have great pictures and initiative people. AI will help marketers make healthier decisions by looking at more people and data than ever before, ensuring that nothing is overlooked. Anticipating this shift, brands are rapidly investing in this area. Driverless cars, kitchens that meet their own needs, kitchens that allow you to bring you the content you will love shaped according to your preferences, platforms that make personalized movies are now in our lives.

So the future has already arrived. An era of less human intervention in marketing begins. In the recent past, the coolest agency heads have driven the marketing world. But in the future, they may be replaced by IT managers who make good AI software. It is no longer the era of those who create the most interesting ads, but of those who manage the best data with software. In other words, we are entering an era where consumers will ask whether red, blue or more attractive 001100 or 110011 codes are more effective (Burgess, 2018).

In a slightly more distant future, say 20-25 years from now, there will be talk about AI that can single-handedly manage a brand with millions of customers, write a movie script, listen to customer conversations in the cloud, develop products on its own, or even run millions of campaigns without needing approval from each customer.

### **Automatic Ad Optimization and Budget Estimation with Artificial Intelligence**

Significant changes in the market with the advancement of information technology have opened new ways to learn about and create barriers to the expansion of the internet, paid online learning platforms and information technology. Marketing methods were still mostly simple before the emergence of the internet trend. Surveys, interviews or data on sales volume were used in marketing research to track changes in the market and infer trends in consumer behavior. Customer feedback is provided directly to researchers, allowing them to develop hypotheses about consumer beliefs, intentions, determinants and behaviors. Predictive analytics is a powerful

technology that enables organizations to use big data to predict future events, trends and behaviors (Burgess, 2018).

Big data is defined as the ever-increasing volume, variety, velocity and complexity of data created in today's digital ecosystem. Customers' online buying behavior, website clicks, social media activity logs, smart connected devices, geolocation features and other information are used to generate large datasets about them. The proliferation of digital data and the internet has enabled organizations to leverage big data to gain a deeper understanding of consumer behavior and preferences. Consumer behavior is the study of how individuals, groups or organizations choose, acquire, use and reject products, services, encounters or concepts. In the context of this study, consumer behavior includes customer churn and loyalty. Consumer loyalty is defined as recurring patronage behavior that is a mixture of attitude and behavior. Brand retention is a term used to describe behavioral loyalty in industrial and service marketing. Customer churn, customer loss or customer turnover are terms used to describe the loss of existing customers to another business or service provider.

Predictive analytics uses statistical algorithms and machine learning approaches to predict likely future patterns, events and behaviors based on historical data. Predictive analytics is used by an increasing variety of industries, including marketing, finance, retail and healthcare, to better understand consumer behavior and preferences. In marketing research, machine learning (ML) is increasingly used to explore consumer behavior analysis problems. ML makes it possible to build predictive models and identify non-linear patterns in data. In ML, problems can be viewed as supervised or unsupervised models. Models can include decision trees, random forests, support vector machines, neural networks, logistic regression, and clustering or regression models (Drosou et al., 2017).

The most common keywords in the Green Cluster include big data, prediction and targeting. This suggests that areas such as Big Data Analytics (Sun et al., 2018), Machine Learning Algorithms and Behavioral Prediction are related to the vital element of Targeting in the advertising industry. Literature analysis shows that advertisers can use AI to identify target audiences, predict consumer behavior and control the content, frequency and timing of ad placements and create more effective advertising campaigns.

*In the Yellow Cluster*, the keywords Personalization, personalized recommendation and Virtual Assistant are strongly associated. The keywords in this Cluster indicate that personalized advertising is closely related to personalized recommendations, Virtual Assistants and consumer preferences. With the help of AI technology, personalized advertising can increase consumer engagement in advertising campaigns (Marinchak et al., 2018).

The most frequently used keywords *in the Red Cluster* are artificial intelligence, content and algorithms. In this Cluster, areas such as NLP, data analytics and Content Creation are associated

with AI and advertising content. The literature suggests that AI is a vital tool for Content Creation advertising. Advertisers use NLP and Generative AI to analyze consumer information and help create more personalized and engaging ad content (Dimitrieska et al., 2018).

*In the Blue Cluster*, the most frequent keywords related to Ad Optimization are advertising, optimization, optimized audience, and keywords related to data mining and analysis, such as data mining, data collection and predictive model. This Cluster corresponds to the Ad Optimization element, which is closely related to machine learning algorithms in advertising industry practice. Literature analysis shows that advertisers can use algorithms to analyze user data, optimize user metrics, track ad user trends, design ad optimization strategies and improve ad effectiveness.

Moreover, the Clusters above include keywords such as challenge, privacy and ethical questions, suggesting

that scientists are drawing attention to the challenges and ethical issues facing AI applications in advertising.

### **Automatic Ad Optimization and Budget Estimation**

Artificial intelligence (AI) technologies offer tools with great potential in ad optimization and budget forecasting. By analyzing large data sets, these technologies can automate ad campaigns and make them more effective. Below, we describe the main AI techniques and methods used in these processes.

#### **Automatic ad optimization.**

- *Machine Learning Models:* Machine learning algorithms are used to optimize the performance of advertising campaigns. The most commonly used algorithms include regression models, decision trees, random forest and deep learning. These models analyze user behavior and campaign metrics to predict which ads will be more successful.

- *Personalized Advertising:* AI can personalize ads by analyzing data such as users' demographics, interests and past behavior. This ensures more relevant ads are shown to the user and increases conversion rates.

- *Real-Time Optimization:* AI can monitor the performance of ad campaigns in real-time and make necessary adjustments on the fly. This ensures the most efficient use of the budget and increases the effectiveness of the campaign.

- *A/B Testing Automation:* AI can automatically test different ad variations and identify the best performing variation. This speeds up manual testing processes and ensures more accurate results.

#### **Budget estimation.**

- *Time Series Analysis:* By analyzing historical data, AI can forecast future budget needs. Time series analysis models make future expenditure and revenue forecasts, taking into account trends and seasonality.

- *Simulation and Scenario Analysis:* AI can simulate various scenarios and evaluate various possibilities that can be used in budget forecasts. This helps identify the most likely budget requirements.

- *Optimization Algorithms:* Optimization algorithms used for budget estimation can help determine the best budget allocation under certain constraints (for example, a maximum spending limit). These algorithms suggest various strategies to use the budget of advertising campaigns in the most effective way.

- *Data Integration to Improve Forecast Accuracy:* AI can make more accurate and comprehensive budget forecasts by integrating information from different data sources. This includes combining both internal and external data sources (e.g., market trends, economic indicators).

#### **Implementation steps.**

- *Data Collection and Preparation:*

Collecting data on advertising campaigns (click-through rates, conversion rates, spend data, etc.).

Data cleaning and pre-processing stages.

- *Model Selection and Training:*

Selecting and training machine learning models.

Evaluate the accuracy and performance of the model.

- *Implementation of the Model:*

Application of the trained model in advertising optimization and budget estimation processes.

Integration of real-time data flow.

- *Monitoring and Adjusting Results:*

Regular monitoring of the model's performance.

Retraining and tuning the model when necessary.

Artificial intelligence offers powerful tools for ad optimization and budget forecasting. These technologies allow ad campaigns to be made more efficient, increase conversion rates and make the best use of budget. AI-based solutions can help businesses gain an edge in a competitive market.

The growing prosperity of search advertising markets is largely due to the influx of millions of advertisers. However, most search engine companies currently provide a limited number of advertising spaces on search engine results pages (SERPs). More and more advertisers are forced to promote their products or services on several search engines simultaneously in order to increase the impressions of their ads and the expected profits and thus survive fierce competition. As a result, many ads compete for a place in SERPs on any given timing horizon. So much so that how to rationally allocate limited advertising budget is a critical issue in search auctions even before running advertising campaigns.

Search auctions fall into the category of complex systems that can evolve with feeds from external environments and internal interactions due to several factors, such as the diversity of search auctions, the unprecedented complexity and dynamics of auction processes, and the strong coupling and unpredictability of markets under conditions of incomplete information. There are also many uncertainties in the mapping from budget to ad performance. Therefore, search advertisers have to face major challenges and difficulties when making budget decisions.

An offer is triggered when a request for information is sent. High volumes of search requests make bidding a continuous and endless process. When any advertiser changes their keywords and/or bids at any time, the ranking results and prices will be different, such that an efficient advertising strategy, for example for budget allocation, should be able to dynamically allocate and adjust advertising budgets on the fly according to the states of the marketing environment.

In the entire lifecycle of advertising campaigns in search auctions, there are basically three different budget decision scenarios.

- First, an advertiser should allocate search advertising budgets to various markets, assuming that the overall bidding for search auctions is determined (Dimitrieska et al., 2018).
- Second, an advertiser needs to set budget constraints for a number of temporary spaces (e.g., daily budgets) during a given promotional period of search advertising campaigns, assuming that the budget allocated in a search marketplace is set. If necessary, the advertiser should adjust the budget constraints for future spaces in a rough way according to the advertising performance in their space.
- Third, in the realm of an ongoing advertising campaign, an advertiser should dynamically adjust the remaining budget according to real-time advertising effects to avoid wasting their budget too quickly or missing golden opportunities in the future. For example, if search requests are relatively higher than usual but lead to a large number of invalid clicks when detected, keeping the remaining budget carefully low is a reasonable strategy.

Many studies have shown that targeting is an important element of the application of AI in the advertising industry. Targeting represents a critical application area of AI in the advertising industry. With the help of AI, advertisers can effectively reach the right target audience at the right time with appropriate (Gao et al., 2023).

Machine Learning forms the technological basis for achieving this type of Targeting. Machine Learning plays an important role in the application of AI technology in the advertising industry, especially in Targeting to identify target audiences.

By segmenting customer data, advertisers can more accurately target their audience and tailor a personalized

advertising experience based on consumer habits, interests and needs. This precise Targeting significantly increases the effectiveness of advertising campaigns.

The second point to pay attention to is Target Analysis. By applying AI algorithms, advertisers can identify consumers with similar characteristics to their existing customers, effectively expanding their reach and locking in new groups of potential users. While no two consumers are exactly the same, AI's precise analysis can identify common traits or behavioral patterns between them. This allows advertisers to more accurately predict consumer needs, so they can create more personalized advertising strategies and more effectively meet the specific needs of different consumer groups.

Finally, contextual targeting deserves consideration. AI technology can deeply analyze content on websites and social media platforms, understanding and grasping its background and context (Catalin, 2018). This capability allows it to calculate automatic ad pushes in combination with user scenarios, precisely determining the best background for ad placement to ensure relevance and adaptability of the content to the placement environment and target audience. This targeting strategy not only increases ad adaptability and effectiveness, but also increases user acceptance by reducing user antipathy and interference. As a result, advertisers can get optimal ad placement recommendations such as the best placement time, placement location, and ad style and content that best fits the target audience.

Targeting and Personalization are two complementary and closely related links in an AI advertising strategy. On the one hand, targeting uses AI technology to analyze a user's demographics, behavioral habits and preferences and determine precisely which users are most likely to respond positively to a particular ad. This step provides in-depth insights into potential audiences, allowing advertisers to deliver their information more specifically to interested users. Then, based on these insights, personalized advertising strategies are applied to deliver the most relevant ad content based on each user's characteristics and needs, increasing ad appeal and acceptance. These two steps complement each other and together ensure precise delivery of ad content, significantly increasing ad effectiveness.

Many reviewed studies focus on the personalization element of AI advertising. It is recognized as a vital component in increasing users' responsiveness to ads. AI technology allows advertisers to deliver personalized content at scale, increasing consumer engagement throughout the advertising process. Technologies such as recommendation systems based on consumers' online reviews and ratings help advertisers create more effective advertising campaigns that resonate with consumers.

Many publications under review see personalized advertising as a primary focus. Using AI technologies such as Recommender Systems and Virtual Assistants, advertisers can deliver advertising content tailored to individual consumer interests. This Personalization strategy allows advertisers to engage more deeply with each consumer, cater to their personalized needs and ultimately increase the overall effectiveness of advertising. In this context, we will discuss in more detail how technologies such as Recommendation Systems and Virtual Assistants work in practice in Personalization.

- First, recommendation engines use AI algorithms to analyze user behavioral data, recommend products and services in line with consumer interests, provide consumers with a tailored experience and produce more persuasive results, thereby increasing the relevance and effectiveness of advertising messages. For example, platforms such as Facebook, Google and Instagram use AI to assess user needs or interests to deliver appropriate personalized ads based on additional user information (such as gender, age and interests).

- Second, AI-powered Virtual Assistants facilitate personalized consumer recommendations and support, such as analyzing user data, recommending complementary products or services, increasing user engagement and satisfaction, thus increasing the added value the system provides to users. Virtual Assistants use NLP technology to simulate dialogues between systems and users, accurately analyze and understand user intentions and respond accordingly. Devices such as Amazon's "Alexa" smart speaker, an AI wireless device activated by voice commands, interact with users in the form of a Virtual Assistant.

Some of the studies reviewed explored the various ways in which AI is being used to create advertising content. AI is playing an increasingly important role in advertising content creation. For example, Lexus used AI to script its ads, and McCann Worldgroup Japan created its first AI Creative Director position after discovering consumers' preferences for AI-generated ads.

Generative AI is an AI technique that aims to generate new, original content by learning data distribution patterns. Vital to generative AI is NLP technology, which offers the ability to understand and produce natural language text, making it easier to interact with human language and enabling machines to analyze and comprehend human language. By using NLP to analyze vast data on consumer behavior and preferences, advertisers can create personalized advertising messages spanning various media forms such as images, videos and written text, and interact directly with individual users.

Dynamic Content Creation and creative optimization allow for the real-time creation of personalized advertising messages based on consumer behavior and preferences, leading to more personalized ad content. Advertisers can use Dynamic Creative Optimization (DCO) to create various ad combinations, as different combinations can appeal to different audience groups.

Specific applications of AI in ad content creation mainly cover three modules: image/video creation, copywriting and content planning. First, in image and video creation, AI can deliver a more personalized and engaging experience to consumers by generating custom images and videos in real time based on individual user data and preferences. Second, in copywriting, AI can analyze consumer behavior and preference data to tailor ad copy to individual users. Finally, AI in content planning can use NLP for sentiment analysis of consumer behavior and preference data, meaning it can help identify and analyze data-driven preferences by analyzing consumer feedback on online platforms such as social media. This data helps adjust advertising messages to enable better dynamic Content Creation. NLP-based sentiment analysis helps overcome the high costs of acquiring labeled data (Miikkulainen et al., 2018).

The roles of Personalization and Content Creation in advertising are complementary. AI-powered Content Creation plays a crucial role in the ad personalization process. This content creation process is not limited to the generation of textual information that aligns with the user's interests and preferences; it encompasses various forms of media, including images, audio and video. With a deep understanding of consumer data and preferences, AI can produce more innovative and captivating content. When content is generated for ads in real time, AI technology creates an ad experience customized to each user's data and preferences. This results in more personalized and engaging ads. By blending Personalization with Content Creation, this strategy strengthens the impact of ads, increases user engagement and satisfaction, and ultimately significantly improves ad effectiveness.

A number of the reviewed studies delve deeper into the ad optimization element of AI advertising, primarily covering core technologies such as Machine Learning and Reinforcement Learning. Machine Learning algorithms play an important role in optimizing ad campaigns. They can predict user performance on an ad and select the most appropriate ad based on the interests and characteristics of the target audience. This effectively

explores the famous riddle posed by advertising magnate John Wanamaker: “I know that half the money I spend on advertising is wasted, but I don’t know which half”. Machine Learning algorithms identify trends and patterns by running existing customer databases. As external data on consumer activities or interests grows, advertisers can build more reliable user profiles as a reference. With Machine Learning algorithms, advertisers can improve investment efficiency in areas such as ad content design, distribution and targeting, thereby gaining a competitive advantage in the industry. By leveraging this technology, advertisers can optimize ad campaigns by analyzing comprehensive consumer behavior and preference data, increasing ad effectiveness

In particular, there are four main ways in which AI technology can optimize advertising campaigns. First, RTB is used in new platforms called ad exchanges. When a user creates an Ad Impression, it is auctioned to advertisers in real time. AI algorithms can make automated bidding decisions by analyzing real-time consumer behavior and ad performance data. This optimizes ad spend and increases ROI by ensuring ads reach the most relevant target audience.

Secondly, A/B testing should be emphasized. AI can automate the A/B testing process to test different ad formats, messages and targets. A/B testing allows advertisers to understand which primary format or content on a website is most appealing, determining the most effective combination. AI technology can efficiently ingest, analyze and present data through this testing, thus helping advertisers formulate specific marketing plans.

Third, programmatic advertising deserves attention. AI automates the ad buying and placement process, allowing advertisers to precisely and effectively target specific audiences. By analyzing ad performance data, it controls the content, frequency and timing of ad placements. This helps advertisers optimize their campaigns to achieve maximum engagement and conversion rates by identifying which ads and messages are most effective. This approach helps maximize Click Through Rate (CTR) and ad campaign revenue, and provides advertisers with a direct and effective way to identify the most effective ads.

Finally, optimizing ad placement is crucial. AI has the ability to analyze performance across various channels and ad placements to determine which paths effectively reach and engage the target audience. Additionally, Machine Learning algorithms evaluate ad performance data to identify the most effective creatives and optimize future ad placements by tailoring future ads as a result.

Ad Optimization is a data-driven strategy aimed at maximizing ad effectiveness and ROI. The optimization process is intricately linked to the previously mentioned elements such as Targeting, Personalization and Content Creation. Once you understand the target users, precisely convey personalized ads and prepare engaging ad content, Ad Optimization plays the role of the perfect result. It digs deep into user data accumulated from previous stages, adjusts ad strategies in real-time, further refines the display methods, frequency and timing of ads, and even improves ad performance by detailing feedback patterns of each individual user. This holistic Ad Optimization strategy leveraging AI technology dramatically increases the effectiveness and ROI of ads, making it an indispensable aspect of AI advertising.

### **Conclusion and Recommendations**

Online advertising plays a crucial role in maintaining accessibility to free content on the Internet and serves as the primary source of revenue for websites and online services. In this dynamic market, advertisers allocate budgets and compete for the opportunity to serve ads to users interacting with web pages, online services and mobile applications. Modern online advertising often uses first-price auctions to determine ad placements. However, greedily running auctions as isolated events can lead to sub-optimal results and require some form of



budget adjustment. Traditionally, budget pacing is achieved through hard throttling, where ads or campaigns are selectively qualified for each auction using a biased coin toss with a given probability (or pacing signal). More recently, the pacing signal has been used to soften ads and used as a multiplicative factor in their bids so that it is possible to participate in all auctions only with potentially modified bids.

Thanks to artificial intelligence, big data, machine learning and excellent solutions, the company is changing technological fields. Marketing strategies are striving to be more responsive, more productive and more competitive. Technological advances have always created new opportunities for marketing. Just like the invention of radio, the emergence of television has changed the way people interact with brands and services, facilitating access to consumer leadership through data collection and development involving artificial intelligence, the internet and smartphones as introductions for businesses to run their operations.

Artificial intelligence is a technology capable of solving problems, not as humans with a machine that learns. In essence, it is a new way of creating problem-solving systems by learning the machine, i.e. being smart. For years, programmers have developed software to provide output through data input. In this case, thanks to AI technology coupled with machine learning, computers have been forced to program with strict rules. For these marketers; the real world paving the way for greater integration of technology is creating new interactions with consumers more simply and instantly. Today's expectation is a new opportunity for brands and marketers that appeal to a wide range of customers.

AI helps marketers gain product development and full personalization based on customer data. Browsing programs like Google, platforms like Facebook, YouTube and Instagram reach billions of people and advertise every day. These intermediaries should replace traditional promotional activities. These platforms are coming in the near future, made possible by artificial intelligence. campaigns personalized brand tools can be adapted to fit the whole world. For example; a video of the brand reaches the world via Youtube in seconds with less cost.

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