Augmented Human Research (2020) 5:19
https://doi.org/10.1007/s41133-020-00038-8

ORIGINAL PAPER

Research Trends on the Usage of Machine Learning and Artificial Intelligence in Advertising

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Received: 11 July 2020 / Accepted: 21 October 2020 / Published online: 25 November 2020

Abstract
Advertising is a way in which a company introduces possible customers to a company's product/service, the main objective is possibly to convince them to buy their product or use their service. The significance of Advertising is critical for the company, as this alone can make people aware of the company's product and in doing so can generate a good possibility of it being sold to the customers. It is inevitable for companies to face changes and one such change is the evolution in the way of doing Advertisement. Advertisement is now done with the help of not so newfound helping hand that is Artificial Intelligence and Machine Learning. The answer to the question as to why the change in the process of Advertising is important lies in the before-after statistical observations of companies using this technology. The results themselves are reasonable motivating factors for companies who are yet to acknowledge the change. The serious challenge to this new version of Advertising is to make sure to not allow the usage of it to such a great extent where ordinary person is concerned about his/her privacy. Implementing Advertisements this way, we are quite sure that making laws, enforcing the laws or even having its own governing body can ensure righteous use of deploying this technology. The future of Advertising is going to be even better than before as Artificial Intelligence and Machine Learning will bring more control of Advertising to companies. Summing up, we feel confident that Advertising with Artificial Intelligence and Machine Learning are here for a noticeable and a significant change.

Keywords Artificial intelligence · Machine learning · Advertising

Introduction

To advertise is to show, to display, but for a company, to Advertise would mean to bring public (potential customer's) attention toward their product or a service. Still there could be many other objectives like to generate a need for their product, making customer enlighten of the new features and benefits of their product [1], and thus, Advertisements are a blessing for the companies because it directly aims in generating more revenues and to attract a large volume of target audience in one shot. People still have contradictory opinions, its practitioners claim for it to be the cause of good things in life; however, the people against it blame it as the cause of obnoxious thing in life [2, 3]. The entire selection of the Advertisement strategy of the company depends upon what kind of recognition the company wants to build on the mind of their targeted audience. One of the advantages of Advertising is its flexibility to reach out a large group of targeted audience, while, on the other hand, it can also be directed to a small and precisely targeted segment of audience, depending on the objectives to be attained and the medium used to catch the audience [4].

Advertisement has been with us much longer than we know. It is quite difficult to pinpoint when this concept first came into existence, and since its beginning, it has always evolved. At first, the Advertisement was through the word of mouth. Since the branding did not come into existence, products were generally announced when they were made

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available. As concluded in [5] later in the fifteenth and sixteenth century print media came into existence. The Advertising industry was booming with the print media at that time. Moving onto the 1700 s, the first Ads were published in the newspaper. And from there it is on top in the Advertising industry. The first newspaper Advertising agency was started in 1875 by Richards et al. [6]. By the end of the nineteenth century, Advertisements started to engage customers with products by slogans and pictures causing the inception of an idea, persuading the public to not only engage but also buy the product as described (Gross and Sheth [7]). Many Advertising agencies came into existence and started to produce Ads for their clients which caused a revolution in the Advertising industry. The twentieth century saw the era for radio. In early 1920s, radio was established and soon it became the highest medium of Advertising. The late 1980s and early 1990s were when the cable television got introduced. The Ads were displayed on the television channels. In the 1990s, marketing through internet opened new frontiers for the Advertising industries.

In the beginning of twenty-first century, we saw a rise of a new form of Advertising, that is, Digital Marketing [8–10]. Companies have access to newspapers, radio, television and also to social media. The Digital Marketing/Web Advertising has taken the Advertising industry at its peak [11–13]. Digital Advertising makes customers not only passive receivers but also makes them active distributors, contributors and even creators of the content. It provides the companies with a magnificent window of opportunity link with the audience and builds a close link with them [14]. Online Advertising, thus lessens the Advertising cost, increases efficiency and supplements the flexibility indirectly generating more revenue and building a wide-reaching customer base. Then, the late 2010s marks down the use of Artificial Intelligence and Machine Learning for target Advertisements.

Pannu [15] revealed that Artificial Intelligence lasts lifelong, is consistent, is less expensive; also it can be easily duplicated and disseminated. At times it can even perform faster and better than normal human activities, and hence, it has gained superiority over natural intelligence. A subdivision of Artificial Intelligence is ML, which stands for Machine Learning [16–18]. The name itself is quite self-explanatory; the machine tries to understand the decision making over a careful observation of the output and the process of over a considerable amount of simulations [19–21]. Cornerstone of our paper would be targeting Display Advertising with the help of Machine Learning. Kietzmann et al. [22] discussed how companies are opting Machine Learning to convert data flow to worthwhile consumer insight. It is obvious that this thing can have a downside consequence like Cambridge Analytica's privacy invasion claims. The Advertisements seen on the website are actually an outcome of a bid won by the respective company. The real-time bidding exchanges in return have helped the companies target their Ads to particular potential consumers as described in Perlich et al. [23] 's paper. But the catch is that the displayed advertisement on the webpage depends not only on the bids but also the scores computed by statistical Machine Learning systems as pointed out by [24]. This exact same thing is practiced by Google AdWords. This all helps in converging our focus on the escalation of the use of Machine Learning/Artificial Intelligence as a tool for gaining maximum rewards for minimum investments [25–27].

Technological Advancements in Advertising

Advertising has been extant for a long time, and comprehensive research literature is prevalent in the subjects of consumer psychology as well as marketing (Yadati et al. [28]). Artificial Intelligence plays a great role in the modern-day Advertising. Artificial Intelligence (AI) is the ability of an algorithmic digital computer or computer-controlled machine, or a robot to perform tasks commonly related with intelligent beings [29–32]. The term is generally applied to the project of expanding and advancing systems endowed with the intellectual and rational aspect of humans, such as the ability to reason, comprehend, discover meaning, discern, generalize or to study from the past experiences. Machine Learning is a subset or a part of Artificial Intelligence. It is a comprehensive concept of machines being able to implement tasks in a way that one would consider "smart".

A myriad of present-day technologies is used in Advertising. Big Data allows advanced and digital advertisers and marketers to gain indispensable insights and observations into their target demographics. By using vast Big Data analytics platforms, enterprises are now able to acquire, store and investigate collected data both unstructured and structured. Big Data supports both online and offline Advertising operations in which the specified analytics techniques are used to assign Advertising recommendations on the basis of collected Big Data on mobile users' access behaviors, profiles and mobility patterns (Jin et al. [33]). However, there are various drawbacks associated with it such as violation of client privacy, unstructured pattern of data, no direct presentation of user level results, no easy access and transfer of data, and manipulation of consumer records.

Internet of things (IoT) plays a chief role in the world of online Advertising. IoT is defined as a concept of connecting any gadget or device with an on and off switch to the cyberspace or internet. IoT assures personalized and

exceptional marketing and Advertising in predilection to one-size-fits-all strategy. Nonetheless, there are some of the security challenges that need to overcome. Firstly, due to the high range of gadgets or devices and communication protocols in IoT, there exists an endless need for controlling and detecting new attacks and vulnerabilities in changing environment. Secondly, confidential and sensitive user data need to be secured not only from malicious and hostile corporations but also from outsiders that can exploit and misuse it. Thirdly, the high level of interdependence and interconnection in the IoT creates opportunities for worms and malware to propagate over the network [34].

Cloud computing is a prototype for enabling pervasive, on-demand and convenient network access to a shared pool of consignable computing resources. Cloud Computing has many aspects which can yield improved Advertising system. Real-time response is of prime importance for Advertising system, while user is searching for information. Also Cloud Computing enables shared architecture which is crucial for an Advertising system, and information can be shared amidst the users after meeting the privacy issues [35]. Despite the hype on the subject matter across the IT world, there can be certain disadvantages to it. Most perceived disadvantages of cloud computing are its downtime, vulnerability to attack, limited flexibility as well as control and vendor lock-in.

Machine Learning which is a subset of Artificial Intelligence is capable to overcome the drawbacks of the above stated technologies. Machine Learning is a vast domain in science and technology that gives computers the potential to learn without being principally programmed. Machine Learning is one of the most intriguing technologies that one would have ever come across. The complex ecosystem asks Machine Learning to play a lead role in the ad escalation process, because of the concurrent availability of enormous concrete data on consumer behavior, data concerning the brand-oriented tasks of the purchaser through instrumentation of purchase organization and the ability to make Advertising choices as well as to deliver Ads in the actual time [23]. Machine Learning focuses on the advancement of computer programs that can access and retrieve data and then use it to learn for itself. Machine Learning in Advertising adverts to the means by which Ad science and technology takes in data, interprets it and formulates outcome to improve a certain task. In transparent terms, it is the way Ad tech learns. What it learns depends on more of the tech. It could be anything associated with Advertising: media buying, audience segmentation, customer journey mapping, etc. The more data a Machine Learning tech processes, the more it reviews about that task and the better it gets at accomplishing it, just as similar as a human. Hence, Machine Learning which is an application of Artificial Intelligence plays a great role in prototyping our project.

Our paper is based on virtual audience segmentation which is a marketing strategy that is based on analyzing and classifying subgroups within the intended and target audience in order to deliver customized messaging for stronger connections. The subgroups can be positioned on demographics such as geographic location, gender identity, ethnicity, age, income or level of formal education. Subgroups can also be based on acts and behavior such as purchases made in the past. Due to certain volumes of online users, the broad and great number of Advertisements and different backgrounds and areas of interests, finding the interest of users is the key to figure out whether a user is responsive in a certain type of Ad [36]. Psychographics come into role when one has access to insights about one's audience's personality characters, values, notions, attitudes and beliefs. Segmentation will allow to better develop and market products because there will be a more precise correspondence between the product and each and every segment's requirements.

The New Age of Advertising

Advertising with Artificial Intelligence

James Cannella [37] made it clear that in this time of Artificial Intelligence in Marketing, it is rapidly approaching and carries with it, its vast implications. As Artificial Intelligence quickly becomes more advanced and widely taken on in marketing, the ability for marketers to effectively use and manage Artificial Intelligence solutions will become an ever more necessary skill set. Despite the serious concerns that need to be solved before omnipresent adoption of Artificial Intelligence, it still offers benefits to marketers, customers, and society at large by facilitating advertisers' ability to create and distribute value at scale to the right people at the right time in the right way. As Artificial Intelligence starts automating repetitive tasks, marketers can increasingly place their efforts toward value-generating activities that improve the lives of consumers, allow for higher workplace target completion, and empower creative thinking for combined benefit of both buyers and sellers. James Cannella has made it quite clear from the observations that Artificial Intelligence in Marketing age will have fundamental changes to the manner in which marketers interact with customers and ways in which they achieve their goals.

Artificial Intelligence (AI) is rapidly becoming more advanced in the digital world, and the marketing and Advertising world is no exception [38]. This research paper focuses on the transformation of Digital Advertising with

the help of Artificial intelligence. In this paper, the relationship between Artificial intelligence and Digital Marketing is described and the former is regarded as the next frontier in marketing. They made a point that it will change the marketing scenario by changing the strategies and approaches. It also changes the way marketers carry out their campaigns, to the way the campaigns themselves are measured and run. Artificial Intelligence will define how Digital Marketing will be conducted presently and in the near future. Thus, Artificial Intelligence will be creating a buzz in the digital space.

The influence of Artificial Intelligence on Advertising and marketing industry has been made quite evident in Davenport et al. [39] where they have stressed on the rise in the usage of Artificial Intelligence in marketing strategy. Their paper has shown how the change will force on looking into matters like change in the approach from the customers, change in the strategies for marketing firms and also, they address the elephant in the room where they discuss about ethics and morale. They have also made it a point on how Machine Learning and Artificial Intelligence will alter every aspect and stage of the sales process. They also alert the readers in realizing that the future may have better prospects, provided companies do not start manipulating the market and the customers.

In this paper, [40] have described some of the ways in which AI will overcome computational barriers, reduce search frictions, and distinguish reliable partners. These are among the most important causes of inefficiency in traditional techniques. They have mentioned much on the FCC acquiring the TV rights and radio rights and have posted all the figures in billions of dollars, and then, they have discussed the impact of Machine Learning and Artificial Intelligence in the market which has shown a direct way in which NLP (Natural Language Processing) that is used to mine data from the messages from eBay and other platforms to understand what the customer values the most. They have showed that they use words such as "poor-indicator", "neutral indicator" or "good indicator" meaning they employ words like "annoyed", "dissatisfied", "happy", "excellent", "okay" and so on to predict whether the consumers are having a good, bad or neutral reaction toward the product.

Shahid and Li [41] stated that around 98% of different marketers are preparing to execute Artificial Intelligence soon, whereas in 2017 only 20% of the marketers adopted the Artificial Intelligence solutions in their businesses. A large number of different software and services are used, and as a result, Artificial Intelligence in the field of marketing is developing quickly. The researchers have predicted that post-2017 will be the turning point in the development of Artificial Intelligence in the marketing field. They stated that with the help of Artificial Intelligence, the companies can analyze the data and they can be successful in creating customized marketing campaign. Artificial Intelligence can give excellent customer service and help in improving the yield management by presenting dynamic pricing. They also showed the analysis from the data collected from ten different organizations in Pakistan. Marketing Management Support System (MMSS) has been highly recognized which allows the manager to make powerful decisions, analyze and present the data and information with the help of Artificial Intelligence. Their aim was to determine the impact of Artificial Intelligence on marketing and also it highlighted the importance of Artificial Intelligence in the marketing of business. They concluded that the major benefits of Artificial Intelligence are: increased efficiency, improved conversion rates, better understanding of customer information, insights, enhanced services and customer satisfaction.

Moving on to the near future possibilities of using Artificial Intelligence to personalize an emotionally appealing Advertisement [42], has depicted it as something which is not yet openly being used, as a way of marketing products for sales. They too have pointed out [43] an observation which suggests that customer analytics make up for 48% of Big Data use which gives an opportunity for advertisers to judge the behavior of the customers and get closer in predicting their likes and dislikes, hence adjusting Ads accordingly. Chandrashekar et al. [44] has given an example of this being put into practice, where Netflix uses the customer data to get an insight of their customers preferences and suggests shows and movies accordingly. It is therefore predicted that artificial Intelligence will be employed in the near future for targeted Advertising.

Malpani and Nisha [45] captured the role of Artificial Intelligence in Marketing since 1998 to till date with some case studies and a glimpse of future in brief. They presented how the Artificial Intelligence in Advertising has evolved from recommendation of Machine Learning and Neural Network in the year 1998 to Augmented Reality in the year 2017. In this paper, they have mentioned how Machine Learning is improving the marketing scenario and the Artificial Intelligence strategies in marketing campaigns as well as they gave an insight of some applications of Artificial Intelligence in marketing.

Chen and Tan [46] presented a framework for multi-screen marketing through analysis, and their main aim was to explore the application of Artificial Intelligence in cross-screen marketing. The study analyzed the new applications of Artificial Intelligence in Marketing, Sales and Service, Automating Marketing and Applications of Artificial Intelligence in Marketing Decision Making. Moreover, they also presented a framework for multi-screen marketing platform that allows the companies to deliver

personalized and targeted Ads. The framework mainly includes Integrated Inventory Management, Integrated Ad Management, Integrated Analysis and benefits of multi-screen marketing. At the end, they came up with a case study of Artificial Intelligence in a technological company and examined how they used Artificial Intelligence to grow and succeed in cross screen era.

Kaličanin et al. [47] examine the current and the future application and also make use of comprehensive analysis of Artificial Intelligence in marketing field by giving the comprehensive overview of already existing academic research. Besides the academic research, the major benefits of Artificial Intelligence in the marketing field were also discussed. Marketing Intelligence means the everyday information that the companies collect about a specific market in which it wishes to enter. They categorized Marketing Intelligence as 'Competitor Intelligence', 'Product Intelligence', 'Market Understanding' and 'Customer Understanding'. Today, the Machine Language algorithms make the marketing successful. Through Artificial Intelligence all the customers' digital actions can be predicted and thus the right customer can be targeted with the best content at the best time. With the new versions of artificial neural network algorithms, the applications in the marketing become smarter and more personalized.

Adams [48] introduces us with Intelligent Advertising. The paper starts with mentioning the changing trend in Advertising and how Advertising now is more effective than what it was before, and he gives all the credit to Digital Advertising. He further describes Digital Advertising to be the best thing that has happened to the Advertising community, and also mentions the most crucial change that knowingly or unknowingly advertisers have started to use, that is they focus more on targeting customers as individuals and people of same interest rather than employing census or survey. It majorly focuses in smart and intelligent ways of promoting and also details how behavior pattern can be new and promising way of targeting new customers.

Khokhar and Chitsimran [49] stated that although there has been major increase toward the use of Artificial Intelligence, but it will still take time for proper adoption of Artificial Intelligence on the level of companies and their customers. Their study was mainly structured in 4 different parts: (1) Introduction to Artificial Intelligence, (2) Vast literature review, (3) Evolution of Artificial Intelligence, (4) The result of data collected for the study of the factors affecting the adoption of Artificial Intelligence. Their literature review was made in two parts, i.e., Artificial Intelligence marketing and Traditional Marketing. They also predicted that Artificial Intelligence adoption in marketing will be more than ever in 2019. They reached to the conclusion that Artificial Intelligence based marketing provides much better efficiency then the traditional marketing.

Karimova and Shirkhanbeik [50] have suggested that the Artificial Intelligence itself is not yet fully developed and lacks structure. Although they are talking about marketing the tool which is used to market the products, meaning that yet the awareness of the Artificial Intelligence as a tool for marketing is not realized as an option to many companies. They talk about the marketing mix and how over a brief period of time its definition has changed and have finally stumbled upon the 4Ps which are Product, Price, Promotion and Place. They describe that the reason to promote a product/service is to communicate with the company's target groups and stakeholders, to spread a message about the product/service as well as to build an image of the company as a whole. Advertising, public relations, and sales promotion are among a few instruments used for promotional purposes. These help to make the public understand the benefits of the product and persuade target audiences to buy it.

Artificial Intelligence has become very important in this era and it is playing a huge role in Digital Marketing [51]. In this paper, they have discussed about the digital marketing trends and have showed us the impact of Artificial Intelligence on Digital Marketing. They explained how the Marketers in Digital Marketing have the opportunity to understand and build relationships with their own customers. With the help of Artificial Intelligence, the information would be structured in a correct way which will eventually lead us in clearly identifying and knowing what the customer wants from the brand which subsequently will have a positive impact in making life more convenient. There are three roles of Artificial Intelligence in Digital Marketing which are discussed in this paper, they are: (1) auctioning for keyworks or Advertising space; (2) identifying targeted customers; (3) sending a message or preparing content. Moreover, they discussed that Artificial Intelligence is a digital revolutionary tool that helps create emerging digital market which has been proven with a variety of innovations. Artificial Intelligence can be used for developing algorithms to be more innovative in creating content. Through this paper they concluded that due to the continuous advancement of Artificial Intelligence in technology, marketers will have the opportunity to understand and build relationships with their own customers at a higher level which will eventually help them in developing more advanced shopping experience according to the needs of customers.

Kose and Sert [52] brief us about how content marketing is today's one of the most remarkable approaches in the context of marketing processes of companies. The main aim of this paper is to discuss about the potentials, to help improving the content marketing with the use of Artificial

Intelligence. The main objective of their study is to focus on intelligent content marketing with Artificial Intelligence. Artificial Intelligence in content marketing can be used by choosing appropriate approaches, methods and techniques. They have shown some example models for Artificial Intelligence in content marketing, namely: (1) intelligent scenario—target customer/determining users; (2) optimized scenario; (3) intelligent evaluation of social media; (4) self-learning digital content; (5) intelligent customers/user tracers; (6) intelligent strategy path determiner. Through these examples they have shown how Artificial Intelligence can help in content marketing. Their future scope is to develop the related models in a real manner, run them for a while and evaluate the obtained results to understand effectiveness and success of intelligent content marketing processes.

Jarek and Mazurek [53] discussed the areas in which Artificial Intelligence is used in marketing and how deeply Artificial Intelligence is applied in marketing. Their research was mainly divided in 4 parts, namely key definition of ideas related to Artificial Intelligence, examples of Artificial Intelligence implemented in marketing, a description of areas of Artificial Intelligence's impact on marketing and opportunities as well as risks with the application of Artificial Intelligence in marketing activity. The main aim of the research was to deliver the ideas about implementing Artificial Intelligence into marketing. The secondary data with Artificial Intelligence examples used for marketing purpose were gathered, and these gathered examples showed that the Artificial Intelligence is extensively used in the marketing field, but the applications were at operational level. The collected examples also showed that Artificial Intelligence offers a new standard and quality to the consumer's life.

Casillas and Martínez-López [54] (Van Bruggen et al. [55]) have made us familiar with the marketing problem solving technique Optimizing, Reasoning, Analogizing, Creating (ORAC). Optimizing implies that there is an objectively best solution that can be reached by proper use of the marketing tools and current technology. Reasoning would mean finding a sensible and a logical solution instead of a hasty better option. Analogizing means comparing the solutions for better understanding and Creating is the good old way of always coming up with new solutions for new problems. This just makes our point even stronger because Artificial Intelligence offers a complete package of the above. It optimizes and compares two or more solutions, comes up with logical solutions and offers a new perspective to the existing scenario.

Effendi and Ali [56] presented an innovative way to solve the Advertisement prediction problem. Their research put up a new technique for predicting the Click Through Rate (CTR) using the Linear Regression and some dynamically added feature known as keywork. The main goal of the research was to enhance the CTR of the online Advertisements using Linear Regression. Their research was based on 4 steps namely data collection, feature extraction, CTR prediction and lastly Advertisement serving. The statistical results obtained from this technique showed an effective outcome by fitting data flawlessly for the Linear Regression technique using optimization. They came up with the conclusion that using Machine Learning along with some dynamically converted keyword can lead us to obtain the best possible results.

Bowersox et al. [57] has given a good insight of how company representatives seek competitive advantage through customer responses. It is evident that this paper is quite old in comparison to the papers that we have discussed before, but the idea is to use customer's feedback for improving or targeting potential customers who possibly have more chances of buying the products. Artificial Intelligence tends to know the user through its likes and preferences and only then it starts showing things which might spark the notions of whether he/she wants the product and hence converting a user to a potential customer. This way a company invests a little sum on targeted customers with a higher probability of them purchasing the products.

Tanase [58] studied the aspects of optimizing and enhancing the experience of Digital Marketing through Artificial Intelligence. The objective was to provide a further insight and to reiterate marketing stack, and to state the factors as to why digital technology has complicated the work performance of the marketers. The study also discussed about Artificial Intelligence which must connect to diverse data streams to identify and recognize user groups, and to target certain user groups for messaging. Additionally, Product Information Management (PIM) software was taken into account which is the key component of marketing tech stack. The study concluded that the results of implementing marketing stack were reduced costs and an increase in time for marketers to focus on the creativity that attracted users toward their brand, all of which is being provided by Artificial Intelligence.

Siau and Yang [59] have focused on the impact of this not so new technology which is showing promising results. They have focused on the fact where Artificial Intelligence is also replacing marketing professionals and salesperson, one such concern of whether a practice should be continued where people's jobs are in question is still a vacillating thing. They also mention a concern where human salesperson and robots are compared and robotic interface is eventually preferred instead and they discuss that this may not be a huge hurdle as customers would like to be shown options of what they like and eventually what is on the other side will not matter. People are susceptible to changes and they are even more susceptible when people are

shown what they like at a certain point in their life, as smart software tend to gather user information and only show likeable products and services.

The combination of marketing information, computer technology and changing managerial consciousness for time and cost-effectiveness together form a dynamic system known as Marketing Information Systems (MkIS) [60]. The concept of MkIs is to process and supply information. The utilization of MkIS resources is crucial to the success of an organization and should be an integral part of the strategic planning process [61]. Here in this paper the authors have introduced Intelligent MkIS as decision making aid for managers. An MkIS addresses the need to share marketing expertise in a competitive marketing environment [62]. Here they have discussed about how to make use of Artificial Intelligence technology to represent and process assorted marketing knowledge. They have also stated that the MkIS is a method of supporting marketing decisions making. Marketing managers have to have correct deviations from plans as well as change plans when market conditions change, therefore the MkIS can be used for supporting marketing decisions. The MkIS can help in analyzing product features with customer data, evaluating channel and pricing options, creating and testing promotion plans, gaining instant feedback on concepts and plans, and moving marketing plans rapidly into production. It also helps marketing expertise to be accessed and shared easily. This system effectively helps in making strategic decisions.

Advertising with Machine Learning

Perlich et al. [23] designed and presented a transfer learning system for targeted display Advertising. They carried out a brief experimental evaluation of various transfer stages. They identified potential online customers who were most likely to purchase a particular product for the first time in the coming future after seeing the Advertisement. The target of the system was to build predictive models automatically for myriad of various concurrent display Ad targeting campaigns. For that they presented the Media6Degrees (M6D) display Advertising that delivered targeted display Advertisements to online users. They also made use of two-stage transfer learning approach to determine multiple candidate measures and mappings and then weighted and merged it. The two-step process yielded two sets of models that were used in sequence to analyze the best browsers for targeting. The system reviewed the models with various source sampling distributions and training labels, and then transmitted that knowledge to the target task. The experimental results showed that multi-stage approach where the different source models combined were engaging in production settings where new modeling methods could be combined more easily. Adjusting correctly to the target distribution could improve the performance in constructing Machine Learning applications. Their research demonstrated how transfer learning can bring about measurable and upgraded improvements in Advertising.

Targeted display Ads can be improved significantly with the help of Machine Learning methods [63]. The paper presents a combination of strategies, deployed by the online Advertising firm Dstillery, for learning many models from extremely high-dimensional data efficiently and without human intervention. They have also experimentally analyzed around 100 Ad campaigns that transfer learning improvements of the performance of the Ad campaigns. It is presented by set of techniques that when applied together they present a robust and scalable solution that challenges the odds in Display Advertising. Their transfer learning approach shares intuition with their former work, in which one can look outside of the target data set for sources of signal that can be passed on to the target problem. The main focus here is to produce scalable, robust and accurate system. They have showcased a straightforward mechanism for transferring more sophisticated methods that could increase the advantages from the initiative transfer.

Over the past 15 years online Advertising, a $65 billion industry worldwide in 2009, has been pivotal to the success of the World Wide Web [64]. The author stated that the digital Online Advertising is a form of promotion that uses the Internet and the World Wide Web for the express purpose of delivering marketing messages to attract customers. They have provided a clear and detailed overview of the technologies and business models that are transforming the field of Online Advertising primarily from statistical Machine Learning and Information Science perspectives. Their primary focus is on Information Science aspects of Online Advertising. They have also mentioned that one of the technologies behind the display Advertising is the Behavioral Targeting (BT). This technology focuses on targeting Ads based on user's browsing behavior. This type of technology is mostly used by e-commerce websites, which will basically transform the perspective of Online Advertising with the help of Machine Learning. They have also researched and discussed about different areas of technology that will bring a revolution to the way of Advertising which will eventually enhance the marketing experience. Through this paper they have concluded that with the help of Machine Learning and Information Science viewpoint, the field of online Advertising is hyperactive in terms of research and development and the need for better ways to optimize the consumers Advertising experience through personalization will become more significant.

Saraswathi et al. [65] presented the Ad-click prediction system through Machine Learning. The main objective of the research was to predict and anticipate an add click through various Machine Learning methods and to contrast their accuracy rates. The projected Ad-click prediction model was positioned on human characteristics. To adapt to that, certain human relevant features like constant time spent on website, frequent usage of Internet, and gender were considered in the model. Then, the assessment of the use of Click Through Rate (CTR) prediction was performed. The CTR prediction was used to predict if the website viewers would be interested in a particular Advertisement or not. The human attributes were then passed to logical algorithms to predict CTR. Experimental results found that the model was employed in Ad-click prediction system for an iOS application. The accuracy rates of different Machine Learning algorithms for the prediction system were recorded and compared with the custom model. It was found that as the data kept on increasing with the system, the accuracy and certainty of the Ad-click prediction system increased to 96%, whereas the existing models gave an accuracy rate of only 92%.

Sharma et al. [66] presented a hybrid system for cost productive Digital Advertising using Machine Learning. The objective of the system was to display certain Ads to a certain group of people or audience so as to profit the publisher as well as the audience, as by doing so there were high chances of the audience buying that particular product displayed in Advertisement. The process started with data collection for each Advertisement. Click Through Rate (CTR) was predicted for each Advertisement. Then after, system selected top Advertisements which got high CTR. The audience categorization was performed to classify users in different categories. Whenever a new user visited publisher's site, a user profile got created. Subsequently class of new user was predicted based on agile and trained Machine Learning model. The presented system combined predictive data and analytics for CTR prediction, targeting of audience and cost optimization. The outcome was such that Ads which comprised of high CTR were displayed to the most appropriate audience group, also end users acquired most relevant products with least efforts.

Avila and Vijaya [67] demonstrated the modeling and implementation of Click Through Rate (CTR) prediction for display Advertisement. They proposed a predictive model that provoked the CTR using different Machine Learning regression techniques. Many experiments were carried out to build the CTR models for display Advertisement in R environment by Machine Learning techniques. They also stated the supervised Machine Learning paradigms namely Linear Regression (LR), Support Vector Regression (SVR) and Poisson Regression (PR) to construct the models. The experiment shows that the SVR-based click model outperforms in predicting CTR compared to the other two click models and hence its implementation could be more beneficial for Display Advertisement.

Ren et al. [68] proposed a bidding machine that aims to maximize the profit of the advertiser for display Advertising in real-time bidding (RTB). The bidding machine paradigm was made using recent bidding logs and optimizes 3 components that is user response prediction, bid landscape forecasting and bidding strategy. The model was also tested with other state-of-the-art bidding algorithms under various market settings in a unified objective function. They also discussed about the bid optimization using click-through rate (CTR) estimation, cost estimation that is formulated as a binary regression problem, which can be solved by Machine Learning models. At the end, to verify the practical efficiency of their bidding machine, they performed the empirical study which includes both offline experiments and online A/B testing on a commercial RTB platform.

Clickthrough and Conversation rates estimation are two prominent tasks in Display Advertising [69]. The paper is presented with Machine Learning framework which is based on logistic regression that is specifically designed to tackle the specifics of Display Advertising. In this paper they proposed a simple Machine Learning framework that can scale to billions of samples in hundreds of millions of parameters, and that addresses the issues that are faced. The popular models that are used in computational Advertising literature are logistic regression and decision trees. There are some experimental results provided and are compared to other methods for distributed learning, Although the entire set of results can be found in [70], they have studied the running time as the function of number of nodes. The results are graphically represented for click-through and conversation rates. There is a framework for modeling response prediction presented for display Advertising. The advantages for this approach are (1) simplicity: easy to implement; (2) scalability: easy to parallelize; (3) efficiency: the results provided through this paper is better than state-of-the-art alternatives.

Provost et al. [71] characterized and evaluated privacy friendly methods for obtaining quasi-social networks from web browser behavior on user generated content sites, for the objective of finding good audiences for Brand Advertising. The main goal of the research was a framework for figuring out online brand audiences. On visitations to social networking pages, methods were introduced for obtaining quasi-social networks from data, without gathering any information on the identities of the browsers or the data of the social-networking pages. Measures of brand proximity were introduced in the network to present that audiences and public with high brand proximity undeniably showed

substantially higher brand affinity. Results proved unambiguously that one can build high brand affinity audiences by choosing the social network neighbors of prevailing brand actors identified through co-visitation of social networking pages, without saving any data about the identities of the web browsers or content of the pages. He provided an insight on Machine Learning in Display Advertisement and explains Display Advertising's two main goals namely Drive Conversions and Brand Advertising. Drive Conversion refers to the time when people actually see the Advertisement and are buying the product. Brand Advertising is when the goal is brand exposure, making people aware of the brand, due to which they can easily familiarize with it. He concluded that Machine Learning can be the reason for high throughput. Privacy friendly targeting for Online Advertising is only possible when it is viewed from several different angles and obviously it improves with more data.

Dentsu proposed the consumption behavior model called as Attention, Interest, Search, Action, Share (AISAS). Kachamas et al. [72] developed an analytic tool that can support online vendors to predict and analyze the behaviors of the patrons as per Dentsu's AISAS perspective. The objective of the research was to conduct a study of customer behavior probability from marketing communication on Facebook by using Machine Learning. The research used the Data Mining technique to examine consumer behavior probability from marketing communication by reviewing messages and comments posted on Facebook. The data was also used in Machine Learning to be an advantage to Facebook marketers. The first step consisted of the collection of Facebook posts. The next step was to select messages by ordering and ranking them with respect to the number of shares and comments. The subsequent step consisted of classification on messages and then verification and validation of model quality was performed. The results measured consumer sentiment toward the service or product in the form of negative, positive and neutral opinion. The research hence established the objective to analyze message that is posted by brands communicating to consumers to predict consumer behavior and to determine if it follows online consumer behavior theory with respect to Dentsu's AISAS model.

Wang et al. [73] reviewed the application of Machine Learning in marketing. The objective was to brief the field's origins as a tool for academics and also to practicing marketers. The approach of Machine Learning toward analysis of data was made. Furthermore, it was discussed how the field of Machine Learning is used in the academic marketing, research process and the way researchers use it to study various forms of unstructured data. Future scope of research in marketing through Machine Learning was presented with competitor identification and the marketing metrics which involved traditional marketing metrics and market share. It was concluded that Machine Learning is assuredly making an impact on the academic market research and it also has a potential to solve myriads of problems involving research. Therefore, implementing it does bring countless benefits.

Mahajan et al. [74] showed that Marketing Intelligence Approach with the help of Machine Learning is a new initiative for marketing management. The paper is conceptual which is based on 10–30 years of technology, management and research experience. They have discussed about the potential benefits associated with the application of Machine Learning techniques to the field of marketing management. They have also described about the fundamental techniques and have introduced relevant marketing fields to which Machine Learning approach can be applied. Additionally, they have focused on the objectives such as (1) stressing on the concept of Marketing Intelligence system for Machine Learning techniques and (2) considering appropriate suggestions and modeling them for effective use of Artificial Intelligence for marketing. They have concluded that with this method, there was a significant increase in the number of the possibilities for researchers and marketers to gain new insights into consumer preferences, at the same time improving the accuracy on the prospective and predictive models to attract audiences to the performing products. A model (Fig. 1) was presented to depict the blend of different Marketing Intelligence factors and Machine Learning techniques for better Digital Analysis.

Machine Learning aims to develop computer algorithms that improves with experience and holds the promise to enable computers to assist humans in the analysis of large, complex data sets [75]. The paper proposes techniques that automatically distinguishes dissimilarities and remarks at the first glance what the problem is, as well as aims to undertake the corrective measures concerning the traffic operations in Digital Advertising with the help of Machine Learning. Process mining is the key feature of this paper. The process discovery algorithm presented here uses Machine Learning as Process Mining. This paper uses the Linear Temporal Logic (LTL) which is used to specify constraints on the ordering of activities. They have intended to test calibration procedure on a more serious note. Through this paper Mr. MD Mas has built a stimulation model reproducing the behavior of an event with Machine Learning.

Dimitrieska et al. [76] provided an insight into various applications and implementations of Artificial Intelligence. The objective was to explore the future relationship among the marketers and Artificial Intelligence machines. They analyzed the core elements of Artificial Intelligence which are Big Data, Machine Learning as well as Deep Learning.

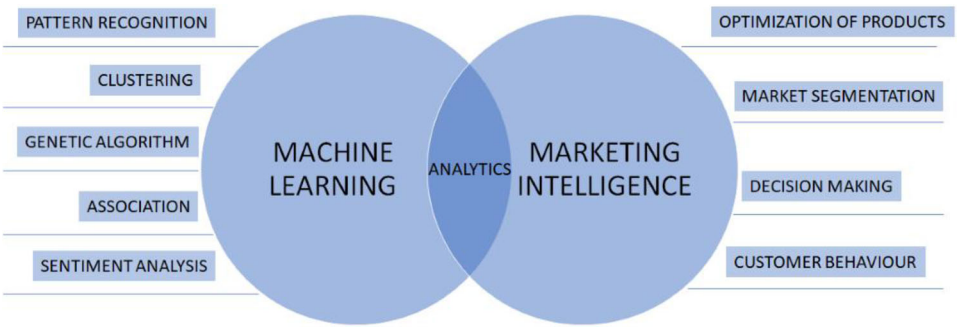

Fig. 1 Machine learning based marketing intelligence

They presented the concept of Big Data through 3 V dimensions which are Volume—the large amounts of data produced by companies, Velocity—the speed of the generation of data and Variety—the diversity and vastness of data. Machine Learning algorithms were figured out and also powerful solutions were studied which dealt with decision making process of data. They concluded that the vibrant future of Artificial Intelligence is marketing which was explained by laying out points such as intelligent searches, smarter Advertisements, refined and precise content delivery, dependence on Artificial Intelligence bots and also progressive learning.

Kadyrov and Ignatov [77] Implemented a study which took into account various Machine Learning methods such as Hidden Markov Chains, Bagged Logistic Regression, Survival Analysis, Shapely value approach and many other approaches to solve the problems of multichannel attribution, of which Gradient Boosting was considered and proven to be one of the most efficient algorithms. The study consisted of mathematical and analytical formalization of the problem, which described as to how the problem should be addressed with Gradient Boosting Machine Learning technique. Both data-driven and heuristic-based approaches were outlined. Experiments were carried out with the data consisting of three Internet Advertising campaigns. The study concluded that to boost the certainty of redirecting the probability of the conversion action by a consumer, the classical algorithms and the Gradient Boosting method of Machine Learning were the most appropriate.

Spann et al. [78] studied on how to use location data to enhance marketing decisions. Their objective was to apply location-based Advertising to target the consumers who happen to be in a certain region at a certain time through mobile Advertisements. The study presented on how location data should be obtained through smartphone applications, how it should be analyzed and how demographics play a role to improve marketing decisions. They discussed about how a user's physical location is a certain indicator of his or her choices or preferences in the "real" world. The study concluded that advancements in Machine Learning will enable more dynamic and real-time use of location data and hence create competitive benefits and advantages for companies that make in use of these technologies.

Nengroo and Kuppusamy [79] crafted a Machine Learning based Advertisement detection system using a diverse feature set which can distinguish Advertisement blocks from non-Advertisement blocks. This method can act as a base to provide various accessibility-related features like smooth browsing and text summarization for people having impairments and epilepsies. They have shown the results from a classifier trained on the proposed feature set achieve 98.6% accuracy in identifying Advertisements. They have kept an extraction of Advertisement from the web pages in the Machine Learning setting and have introduced a supervised learning approach for the detection of Advertisements. Moreover, they have gathered a collection of training examples which contains both Advertisements and non-Advertisements blocks and also have created a feature set to discriminate Advertisement from non-Advertisement. A random forest classifier is trained on feature set and is later used to predict the Ads. There are three modules in this paper, viz (a) to devise a Machine Learning-based classifier build on a diverse feature set which can label Ads and non-Ads; (b) to equip the classifier with the capabilities to identify heterogeneous Advertising formats viz. banner Ads, JavaScript Ads, and iframe Ads; (c) to propose the classifier which can be adopted to improve the accessibility of web pages by removing the unnecessary content. The proposed feature can detect the dynamic Advertisements with fairly good accuracy as compared to related works which focus on specific Advertisements formats lacking heterogeneity. They have also proposed the system as an accessible browser extension to remove unwanted Advertisements. In future they are looking forward to harness the classifier in providing smooth browsing experience to people with disabilities across multiple devices and web applications.

Diapouli et al. [80] conveyed that online behavioral targeting is among the best popular business strategies in the Display Advertising recently. It is based on web user

behavioral data with the usage of Machine Learning techniques which aims to improve Web Advertising. He explains that identifying the "unknown" and "First time customers" is important as we can make a correct assumption on who could be more inclined to buy an advertiser's product. By identifying prospective customers, the advertisers are able to optimize campaign performance, maximize their revenue as well as deliver Advertisements tailored to a variety of user interests. The author talks about online Advertising platform in which he includes the discussion of Ad network and Ad exchange. Ad network is a network where people want to advertise and then introduce it with websites. Also, the network comprises of the ones who are ready to provide webspace for their Advertising. Ad-exchange, on the other hand, is a platform where people can buy or sell Advertising space from multiple Ad networks.

The marketers espouse that Machine Learning will be a progressively dominant technology for further use across the Advertising supply chain (Gerry [81]. Machine Learning enhances the accuracy of targeting over time by learning from the previous responses to Advertisements by individual user and by constantly monitoring their online behavior. In 2016, IDC predicted that the amount spent on Artificial Intelligence software for marketing will grow rapidly. The cumulative average growth rate (CAGR) will upsurge from approximately $360 million to more than $2 billion in 2020. 459 marketing executives with different roles in marketing were interviewed between January and February 2017. Moreover, the companies that conducted the interviews were of relatively even regional split. The research showed that out of 459 marketing executives, 10% used digital marketing, while only 2% of the companies did not rely on digital marketing. When considering interviews, IDC concluded that the Machine Learning will play a prominent role in Advertising by augmenting the human creativity and it can and will reach the scale that humans alone cannot achieve.

Fan and Chang [82] address the mechanism of contextual Advertising that refers to assignment of relevant Advertisements to a web page. In the paper, they proposed an idea of utilization of sentiment detection to enhance web-based contextual Advertising. They evaluated a novel framework for associating Ads with blog pages based on sentiment analysis. By using Machine Learning algorithms and simple linear models they tried to classify their positive and negative sentiment categories. The sentiments of the blog pages were investigated, and the information was utilized to demonstrate Sentiment Oriented Contextual Advertising (SOCA). The result of the study showed that linear algorithms can outperform the linear models by approximately 15% and their proposed method can identify the Advertisements that are correlated with the given blog pages.

Table 1 is a representation of various companies that invested on certain platforms like Facebook, Twitter and YouTube which uses Artificial Intelligence and Machine Learning techniques in Advertisement. These techniques of advertising used by numerous companies have produced satisfactory results and has achieved substantial growth in gaining potential customers.

Future Scope and Challenges

While this paper has been implemented with great accuracy and detailed research, there are certain challenges that can be looked upon for the future development of this work. The increasing role of Artificial Intelligence and Machine Learning in the economy and the society presents both practical and conceptual challenges in Advertisement industry. The primary problem faced in implementing Artificial Intelligence and Machine Learning is high error susceptibility, as there can be mistakes in algorithms and implementing those algorithms can cause a major conflict. Machine Learning has the major challenge called Acquisition. On different algorithms, the data needs to be processed. Also, it must be processed before providing as input to respective algorithms. Thus, it has a significant impact on results. We currently must rely on individual solutions to perform certain Artificial Intelligence tasks like using the same to optimize, personalize the content, target audience and so on. Other major challenge with Machine Learning is interpretability, and it is a paramount quality that Machine Learning methods should aim to achieve if they are to be applied in practice. These are some crucial challenges should be looked upon and investigated further.

There is immense scope for Artificial Intelligence in Advertising. By using algorithms for targeted Display Advertising, there can be a significant change in Advertising. Employing the algorithms of Machine Learning can substantially impact the overall performance of the marketing campaign for the small-scale companies as well as the large-scale companies. Predictive analytics techniques help to make the campaign more notable and creative. Machine Learning and Artificial Intelligence techniques aids to narrow down the targeted customers and achieve fruitful results through Digital Advertising ranging from a company producing nano-fibbers to large machineries. Besides, it will have a major impact in changing the marketing strategies of the companies as well as changing the customer's perspective on Digital Advertising. Companies will invest more in Artificial Intelligence and Machine Learning technologies for their Advertising budget

Table 1 Substantial growth of numerous companies over various platforms using machine learning and artificial intelligence

Platform	Company	Product/service	Campaign/goal	Result	References
Facebook	BMW Latin America	Car manufacturer	BMW 1 series launch awareness and sales	The promotion engaged 90,000 consumers at a relatively low cost and was able to convert 900 campaign participants into potential customers (Microsoft, 2012)	Mbwette [83]
Facebook	Itronic	Apple Premium Reseller	To use Pay Per Click (PPC) to market and promote their website and brand on Facebook	Garnered great attention from customers which included online Facebook promotion between February and March 2012 that gathered over 1000 Facebook friends	Odhiambo [84]
Facebook, Twitter	Dove	Beauty Care brand	Dove's Campaign for Real Beauty (CFRB) intended to define the real meaning of beauty which served as a societal change.	Women espoused the idea and much positive feedback was received for the brand. The brand received much appreciation at Cannes Lions International Festival of Creativity 2012	Sriram [85]
Facebook, Twitter, YouTube	SAAB Automobile AB	Production of Cars	To target customers globally and To create a stronger integration between the sites	As a result of involvement of social media, direct marketing was more in focus than before leading to increased brand awareness	Fridolf and Arnautovic [86]
Twitter	Whole Foods	Selling of food products	To set up niche accounts, to answer people who have questions regarding the product, and to provide different links to the company's blog that has editorial content	The brand had 2 million followers on Twitter and it also gathered great engagement with its customers	Patnaik et al. [87]
Facebook and Twitter	Italian SME luxury fashion brand	SME which produces and markets luxurious bags and other accessories	To implement main SMM strategic activities and actions	Increased sales and promotions. It also engaged key influencers	Ananda et al. [88]
Facebook	VirWoX	To trade virtual currencies in real world money and vice versa	To use Facebook for social networking-based campaign for marketing	One of the campaigns for Facebook generated more than 730 likes and Ads. It also resulted in average visits of 143 per month and an average monthly gain of 35 EUR	Trattner and Kappe [89]
Facebook	IKEA Forsman and Bodenfors	Swedish agency which provides furniture and merchandise	To create great brand engagement and awareness by introducing a photo tagging fun game	Conquered all social media networking sites with the help of photo tagging competition	Curran et al. [90]
Twitter	Dell	Multinational Company for Computer Technology	To have people visit a brands page in social media to create more traffic and to boost online sales	Earned three million dollars growth in sales through Twitter in 2012	Tsimonis and Dimitriadis [91]
Twitter	Starbucks	Multinational chain of Coffeehouses	To connect with customers, increase popularity and awareness for brand	A total of 11.4 million supporters were generated till January 2020	Subramaniam [92]

compared to print media like Magazines and Flyers. Through targeted Display Advertising it is possible to control the scale of the expenditure in Advertising budget and as this is an efficient way, as it attracts small-scale businesses and companies toward using these technologies. Although Artificial Intelligence and Machine Learning have had made some impact in Advertising, yet there is so much to learn, and it will seek more impact in future.

Conclusion

Advertising is a promotional activity which aims to sell a product or service to a target audience. This paper outlines the framework to understand how Machine Learning and Artificial Intelligence will impact the future of Advertising, and specifically how Artificial Intelligence and Machine Learning will dominate the marketing strategies and customer behaviors. Although with the technological advancement there are many more technologies like cloud computing, big data, and so on, but Machine Learning and Artificial Intelligence has produced more effective results compared to other technologies. Machine Learning and Artificial Intelligence enhances the marketing strategies of the companies. With Machine Learning and Artificial Intelligence techniques being implemented, the targeted Advertising, building creative Ads, performance optimization will become much easier compared as it was when compared to earlier times. Nevertheless, there are some challenges faced in implementing Machine Learning and Artificial Intelligence in Advertising that seem to get overcome in the near future. Observing the results with Artificial Intelligence and Machine Learning has had made worthwhile impact in Advertising, yet there is so much to pursue and to address though. Henceforth, we can explore more constructive ways of Advertising by implementing these eminent technologies like Machine Learning and Artificial Intelligence in Advertising which will leave behind a benchmark and bring about the revolution in the Advertising industry.

Acknowledgements The authors are grateful to Department of Computer Engineering, Sal Institute of College and Engineering and Department of Chemical Engineering, School of Technology, Pandit Deendayal Petroleum University, for the permission to publish this research.

Authors contribution All the authors make a substantial contribution to this manuscript. NS, SE, NB, HC and MS participated in drafting the manuscript. NS, SE, NB, HC and MS wrote the main manuscript. All the authors discussed the results and implication on the manuscript at all stages.

Funding Not applicable.

Availability of Data and Material All relevant data and material are presented in the main paper.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no competing interest.

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