TECHNICAL UNIVERSITY OF CRETE

SCHOOL OF PRODUCTION ENGINEERING

AND MANAGEMENT

MASTER IN TECHNOLOGY AND INNOVATION MANAGEMENT

(MTIM)

Postgraduate Dissertation

The Impact of AI-Powered Advertisements on Consumer Behavior: Understanding Personalization, Engagement, and Ethical Considerations

IOANNIS GAVALAS
(202015007)

SUPERVISING COMMITTEE

S. TSAFARAKIS

K. ZOPOUNIDIS

V. MOUSTAKIS

Abstract

The increased use of Artificial Intelligence (AI) in marketing has ushered in a new era of personalized advertising, changing how brands interact with consumers. This thesis aims to understand how AI-powered ads affect consumer behavior, focusing on personalization, engagement, and ethics. Our research explores this relatively new field. While previous studies have looked at AI's technical side, advertising metrics, and advantages over traditional methods, the unique nature of AI-driven advertising means there's more to learn about how it impacts consumers. We have several objectives: to understand how consumers view AI ads compared to traditional ones, to uncover feelings about personalized content and targeting, to explore how personalized ads affect consumer engagement and attention, to assess trust in AI ads, and to examine privacy concerns. We also study how AI-generated product recommendations influence buying intentions. Our research provides valuable insights for marketers, businesses, and academia. We shed light on AI's role in advertising and how it influences consumer behavior. Understanding how consumers react to AI ads helps with marketing strategies, improves customer experiences, and helps businesses allocate resources more effectively. The thesis is organized into sections, including a thorough review of existing literature, an exploration of AI's role in advertising, ethical considerations, and a detailed look at consumer behavior in the context of AI ads. We also include case studies and discussions on future trends in AI advertising. As we study the changing landscape of AI-powered advertising, we uncover emerging trends and challenges that affect consumer behavior. We address these trends, highlighting potential opportunities and concerns as AI technology evolves in advertising. In our quest for practical insights, we offer actionable recommendations for marketers and advertisers entering the world of AI advertising. These insights prioritize ethical and consumer-centered approaches, ensuring that AI ads are optimized while maintaining consumer trust. In summary, this thesis illuminates the intricate relationship between AI-powered ads and consumer behavior. By analyzing personalization, engagement, and ethical considerations, we offer valuable insights that contribute to the fields of AI advertising and consumer behavior, providing a robust foundation for future exploration and study.

Keywords: Artificial Intelligence; AI; marketing; advertising; consumer behavior; privacy.

"I would like to sincerely thank my supervisor, Prof. Stelios Tsafarakis, for giving me the opportunity to undertake this research and for his invaluable guidance and support throughout the completion of my thesis.

Moreover, I would like to extend my gratitude to all the professors of the Postgraduate Programme in Technology and Innovation Management (MTIM) at the Technical University of Crete. Their teachings have significantly expanded my horizons and enhanced my professional knowledge and skills.

Lastly, I am deeply grateful to my family and beloved ones for their unwavering support and encouragement throughout my studies."

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List of Abbreviations

AD=Advertisement

AI=Artificial Intelligence

API=Application Programming Interface

AR=Augmented Reality

CPC=Cost Per Click

CTR=Click Through Rate

GAN=Generative Adversarial Network

CCPA=California Consumer Privacy Act

GDPR=General Data Protection Regulation

CLBA=Gramm-Leach-Bliley Act

GMB=Gradient Boosting Machine

COPPA=Children's Online Privacy Protection Rule

CPC=Cost Per Click

CPRA= California Privacy Rights

FTC=Federal Trade Commission

GTB=Gradient Tree Boosting

HIPPA=Health Insurance Portability and Accountability Act

IR-Image Recognition

KPI=Key Performance Indicator

LLM=Large Language Model

MIL=Multiple Instance Learning

ML=Machine Learning

NIST=National Institute of Standards and Technology

NLG=Natural Language Generation

NLP=Natural Language Processing

OTA=Online Traveling Agency

PA=Personalized Advertising

PIPL=Personal Information Protection Law

RL=Reinforcement Learning

ROI=Return of Investment

SR=Speech Recognition

SME=Small-Medium Enterprise

VR=Virtual Reality

WTP=Want To Purchase

Chapter 1:

Introduction

1.1. History of Advertisement

Advertising has come a long way from its early incarnations. Initially, advertisements were primarily print-based, appearing in early newspapers and broadsheets as simple, text-based messages that were intended to inform rather than persuade. As the print industry evolved, so did the complexity and creativity of advertisements, which began to include illustrations and more persuasive language.

The advent of radio in the early 20th century marked a significant evolution in advertising by introducing an auditory medium that reached audiences in their homes, creating a more intimate connection with the listener. Radio ads leveraged catchy jingles and slogans that enhanced brand recall. The subsequent rise of television brought a visual dimension to advertising that radio could not offer. TV ads combined audio and visual elements, allowing advertisers to craft compelling narratives that showcased products in action, significantly enhancing consumer engagement.

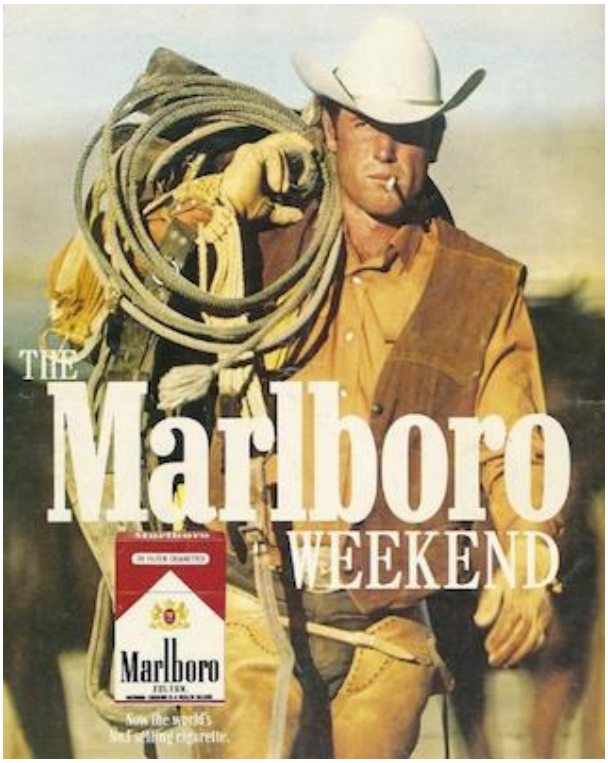

Figure 1: The iconic Marlboro Man ~ 1960s (Muhammad, 2023)

The digital revolution transformed advertising with the advent of the internet and mobile technology. Early digital advertisements were often direct transfers of print ads onto digital platforms, such as banner ads on websites and promotional emails. However, the capability to collect and analyze vast amounts of user data over time transformed these strategies, enabling unprecedented levels of personalization. Digital platforms could tailor advertisements to

individual user behaviors, preferences, and even geographic locations, making ads more relevant and increasing the likelihood of engagement.

With the integration of advanced technologies such as data analytics and later Artificial Intelligence (AI), advertising has entered a new era of hyper-personalization and automated content delivery. Artificial intelligence algorithms analyze consumer data in real-time to optimize ad targeting and content, further enhancing the effectiveness of campaigns. AI's ability to learn from interaction patterns allows advertisers to continuously refine their strategies to maximize user engagement and conversion rates.

The effectiveness of advertising has always been a crucial aspect of marketing strategies. Advertising effectiveness refers to how well an advertisement achieves its intended goals, such as increasing brand awareness, driving sales, or changing consumer attitudes. Traditional metrics for measuring advertising effectiveness included reach (the number of people exposed to the ad), frequency (how often they see it), and recall (how well they remember it).

In the early days of advertising, the impact on consumers was primarily informational. Print ads informed the public about new products or services, serving an educational role. As advertisements became more persuasive, they started to shape consumer desires and preferences. The introduction of emotional appeals and storytelling in radio and TV ads created stronger emotional connections with consumers, influencing their buying habits and brand affiliations.

The digital age brought about a paradigm shift in how advertisements affect people. The ability to track online behavior and preferences enabled advertisers to create highly targeted campaigns. Personalized ads could speak directly to individual needs and interests, making them more effective in driving consumer action. For example, an online shopper might receive ads for products similar to what they have previously searched for or purchased, enhancing the relevance and appeal of the ads.

Today, AI-powered advertisements take this personalization to the next level. By analyzing vast amounts of data, AI can predict consumer behavior and preferences with high accuracy, delivering ads that are not only personalized but also timely and contextually relevant. This level of precision in ad targeting increases the likelihood of consumer engagement and conversion, making advertising campaigns more effective than ever before.

However, this also raises ethical considerations and concerns about data privacy. The extensive data collection required for AI-driven ads can intrude on consumer privacy, leading to discomfort and distrust. There is a growing need for transparency and ethical guidelines to ensure that the benefits of AI in advertising do not come at the expense of consumer rights.

Building upon this historical context, the scope of this thesis is to explore the transformative impact of AI technologies on the advertising landscape. Specifically, it will examine how AI-driven tools not only alter traditional advertising strategies but also enhance the personalization and engagement of ads, leading to shifts in consumer behavior. Additionally, this study will address the ethical challenges and data privacy concerns that emerge with the use of sophisticated AI technologies in advertising. By delving into these areas, the thesis aims to provide a comprehensive

analysis of how artificial intelligence is reshaping the interactions between advertisers and consumers, highlighting both the opportunities and challenges within this dynamic field.

Figure 2: AI generated ads (Stewart, 2022)

1.2. Research Objectives & Methodology

Objective 1: Understanding the Impact of AI Technology in the Advertising Field

This thesis aims to thoroughly explore how AI technologies are reshaping the advertising landscape. We will focus on the specific AI technologies and techniques used in advertising examining how they function, what advertising aspects they enhance, and the industry trends they are influencing. This study will outline the transformed advertising landscape created by AI, including how these technologies improve processes like targeted advertising, content personalization, and customer interaction.

Objective 2: Examining the Influence of Personalization on Consumer Engagement

This thesis seeks to explore the impact of AI-driven personalization on consumer engagement. We will analyze several case studies to assess how AI-crafted personalized advertising affects consumer interactions, engagement levels, and attention towards ads. The effectiveness of these AI-personalized advertisements in enhancing engagement rates will be evaluated. We aim to provide insights into the best practices and challenges of advertising personalization, drawing evidence-based conclusions on the effectiveness of these strategies.

Objective 3: Examining Data Privacy and Ethical Concerns Arising from AI Use

Finally, we will examine the data privacy and ethical issues associated with using AI in advertising. This includes assessing consumer trust in AI-powered advertising systems, addressing data privacy concerns, and reviewing the regulatory frameworks governing AI use. By synthesizing findings

from existing research, we aim to highlight the main concerns regarding data privacy and ethics in AI-driven advertising. Additionally, we will discuss regulations such as the GDPR and the AI Act, proposing frameworks for the responsible operation of AI. Our goal is to suggest ways to ethically integrate AI in advertising, balancing innovation with the protection of consumer rights. Furthermore, this thesis will propose guidelines for organizations on the proper use of AI in advertising and offer recommendations for consumers on how to protect their data and privacy in this evolving landscape.

Methodology of Research

Our methodology for this study involved an extensive review of existing literature, including papers, journals, articles, and books from trusted sources. Rather than conducting original research, we focused on synthesizing and analyzing the findings of over 300 sources to gain a comprehensive understanding of AI-powered advertisements and their impact on consumer behavior and ethics. Given the relatively recent emergence of this field, we prioritized documents published after 2020 to ensure the inclusion of the latest developments and updates. Throughout the process, we frequently revised specific sections of the thesis to incorporate new insights and data, ensuring the study remained current and relevant. This approach allowed us to conduct a thorough examination of the topic, grounded in the most recent and reliable sources available. For Chapter Three, which discusses AI technologies and techniques used in advertising, we studied a range of papers, journals, and articles that describe various AI technologies and their applications in advertising. We made a concerted effort to include the newest possible documents to ensure we covered the latest technologies and techniques. Additionally, we explored company websites that develop AI technology to gain a better understanding of the field and its practical applications. In Chapter Four, focusing on consumer behavior, we primarily examined the results and conclusions of research studies on real audiences around the world related to the impact and perception of AI advertising. Since many of these studies investigate specific aspects of consumer behavior, we aimed to consolidate the best and most accurate findings. Where possible, we corroborated conclusions with multiple sources to ensure robustness and reliability. For Chapter Five, which addresses ethical considerations and legislation, we reviewed a combination of papers, journals, and articles. In addition, we consulted official websites of legislative bodies to gather information on data privacy and AI governance. This helped us understand the current state of ethical considerations, how these issues are being approached, and what additional measures might be necessary.

1.3. Significance of the Study

For Marketers and Businesses

This thesis aims to deepen the understanding of AI technologies in advertising, illustrating their potential to significantly enhance customer experiences, build trust, and optimize resource allocation. By exploring both the capabilities and the challenges associated with AI-driven advertising, this study will equip marketers and businesses with the knowledge needed to employ these technologies more effectively and responsibly. Additionally, it will highlight the importance of navigating data privacy issues and addressing ethical concerns associated with AI applications

in advertising. Understanding these aspects is crucial for businesses to not only improve their marketing strategies but also to ensure they are consumer-centric and ethically sound. This research seeks to provide businesses with the insights necessary to navigate the complexities of AI in advertising, fostering a more informed and cautious approach to integrating these powerful technologies.

For the Academic Community

This thesis aims to enhance the academic understanding of consumer behavior in the context of AI technologies and advertising, shedding light on the new landscape that has been shaped by these advancements. By delving into how AI influences consumer interactions and perceptions, this research will propose unexplored areas within this topic that present opportunities for future academic inquiry. Additionally, the study will identify weaknesses in the application of AI technologies in advertising, suggesting avenues for refinement and improvement. This contribution is vital for advancing academic discourse and encouraging further investigation into the nuanced relationship between technology and consumer psychology, ultimately fostering a deeper comprehension of this dynamic field.

For Policy-Makers

This study aims to provide policy makers with a comprehensive overview of the impact and power of AI technologies in advertising. By highlighting the significant capabilities of these technologies, the research will also shed light on the critical concerns surrounding data privacy and ethical considerations. The insights gained will equip policy makers with the necessary knowledge to develop more effective frameworks, policies, and legislations that govern the use of AI in advertising. This will ensure that regulations not only protect consumer interests but also support continued innovation in the field, balancing technological advancement with ethical responsibility and consumer protection.

1.4. Limitations and Risks of this thesis

Lack of Primary Data

By relying on secondary data and case studies, the research might not capture real-time or current consumer sentiments and behaviors as directly as primary research methods would. This approach might limit the ability to fully explore nuances in consumer behavior or the immediate impacts of recent AI advertising innovations.

Rapid Changes in AI Technology and Its Applications

The field of artificial intelligence is characterized by rapid technological advancements that may cause the findings of this thesis to become outdated shortly after publication. As AI technologies and their applications in advertising continue to evolve, some conclusions reached in this study may lose their relevance or accuracy over time. It is recommended that future research keeps pace with technological developments, updating and revising analyses to maintain the relevance and applicability of the research findings to current conditions.

Generalization of Findings

The conclusions drawn from this thesis may not be universally applicable across all demographics, industries, or AI technologies. Factors such as varying technology adoption rates, different regulatory landscapes, and distinct market dynamics can alter the impact of AI in advertising from one context to another. To address this limitation, future research should aim to conduct more localized studies that examine specific industries, demographics, or geographic regions to determine how broadly the findings of this thesis can be applied.

Concurrent Studies Covering Similar Topics

There is a possibility that other research studies addressing similar topics related to AI in advertising are being conducted concurrently but remain unpublished at the time of this thesis. This may lead to overlapping findings or contradictions that were not available for consideration in this study, potentially affecting its novelty and comprehensiveness. To mitigate this risk, we continuously monitor emerging research and updates in the field, allowing for the integration of new data and studies into the literature review even during the final stages of thesis preparation.

1.5. Structure of thesis

In Chapter One, the introduction sets the stage by discussing the significance of AI-powered advertisements, outlining the research objectives and methodology of research, highlighting the study's significance, and addressing the limitations and risks associated with the research. This chapter also provides a brief overview of the methodologies used, including literature review and case studies. Chapter Two conducts a comprehensive review of related work, analyzing existing research on AI's impact on advertising effectiveness and consumer behavior. It incorporates relevant theories from advertising and consumer decision-making to provide a solid theoretical foundation for the study. Chapter Three delves into the fundamental principles of AI and machine learning in advertising. It describes specific AI techniques and technologies used in ad targeting and personalization, and contrasts these AI-driven methods with traditional advertising approaches. In Chapter Four, the focus shifts to changes in consumer behavior, exploring how AI advertisements influence perceptions, attitudes, and decision-making processes. This chapter integrates psychological and sociological theories to analyze cognitive and emotional responses to AI-powered ads. Chapter Five addresses ethical considerations and relevant legislation, discussing the impact of data privacy and consumer consent in AI advertising. It also explores mitigation measures to address these ethical concerns, ensuring compliance with regulations and fostering ethical AI use. Chapter Six presents conclusions and synthesizes the findings from related work and case studies. This chapter evaluates the effectiveness of AI advertisements, drawing on the literature review and case study analyses to provide a comprehensive assessment.

Chapter 2:

Related work

2.1. Introduction

This chapter explores the related work in regards to the expansive terrain of AI-powered advertising, focusing on its integration into modern marketing strategies and its impact on consumer behavior. The surge of AI technologies in advertising has revolutionized how businesses engage with customers, making it imperative to understand the effects of these changes both from a technological and a consumer perspective.

The scope of this review spans several key areas: technological advancements in AI that enable personalized advertising; consumer reactions to AI-driven advertisements, including their perceptions, attitudes, and engagement levels; ethical considerations around the use of AI in advertising, particularly issues of privacy and data security; and the overall effectiveness of AI advertising compared to traditional methods.

The sources for this review have been selected to provide a robust analysis of the current state of AI in advertising. They include academic journals, industry reports, market analysis reports, and authoritative online resources.

2.2. AI Technologies in Advertising

The appearance and advancement of artificial intelligence have revolutionized the digital advertising landscape, evolving through various stages to what is now referred to as intelligent advertising (B. Gao et al., 2023; Lai, 2021; Muhammad, 2023). Intelligent advertising encompasses diverse forms of brand communication powered by advanced AI technologies, resulting in substantial shifts in industries such as advertising, media, e-commerce, education, and others (B. Gao, 2023; B. Gao & Huang, 2021; Murgai, 2018).

The capabilities of AI in this domain have extended from interactive advertising through programmatic advertising to today's intelligent advertising, reflecting a significant evolution in strategies since the 1990s (Hochbruck, 2023). Several studies have been conducted on various machine learning techniques and core technologies (Dwivedi et al., 2021; Mühlhoff & Willem, 2023) such as Natural Language Processing, Image Recognition, Machine Learning, Deep Learning, Semantic Reasoning, Natural Language Generation, and advanced Image and Speech generation techniques, which proved to be critical for consumer insight discovery and targeting, ad creation, media planning and buying, and ad impact evaluation (Huh & Malthouse, 2020; Neumann, 2019; Qin, 2019; Wu, 2021).

By combining different building blocks and applications, firms and organizations can leverage the full spectrum of AI's capabilities in all aspects of the marketing planning process (Ford, Jain, & Gupta, 2023; Boyko & Kholodetska, 2022; Paschen, Pitt, & Kietzmann, 2020). This integration allows for the creation of more personalized and targeted advertising campaigns, enhancing consumer engagement and driving higher conversion rates (C. Zhang et al., 2023; Chandra et al., 2022; Choi & Lim, 2020). Moreover, AI facilitates real-time data analysis and decision-making, enabling advertisers to optimize their strategies dynamically based on consumer responses and market trends (E. Malthouse & Copulsky, 2022; Mühlhoff & Willem, 2023).

Despite these advancements, several limitations persist. The implementation of AI in advertising often requires considerable time and cost, and faces interoperability issues due to a lack of standardized protocols and incompatible APIs (Soni, 2023; Zabala, 2023). These technical barriers can result in significant gaps in AI applications, impacting their integration and functionality across different platforms (Dwivedi et al., 2021). Additionally, the quality of training data is a critical concern; biases in training data can lead to prejudiced decision-making processes in advertising strategies, potentially undermining their effectiveness and fairness (Campolo et al., 2017; Dalenberg, 2018; Manyika et al., 2015). Furthermore, ethical considerations and data privacy issues pose significant challenges. The extensive use of consumer data for personalized advertising raises concerns about user consent and data security (Helsloot et al., 2018).

2.3. Consumer Behavior and AI-Powered Advertisements

Understanding consumer behavior has long been a complex challenge for marketers. Traditionally, experts in marketing and advertising have utilized various theories to decipher consumer behavior, recognizing that individual preferences greatly influence purchasing decisions (Jakhar, 2021; Kacen & Lee, 2002; X. Zhang & Dong, 2020). As brands strive to satisfy customers and enhance their market share, they invest significantly in defining customer needs and highlighting the potential of their products or services (Hamzah & Shamsudin, 2020; Gkikas & Theodoridis, 2021; Gonzalez, 2019).

In this context, AI has emerged as a transformative tool, especially in personalizing advertising to increase relevance and credibility (De Keyzer et al., 2015; Olsen & Pracejus, 2020). Proper personalization, when executed correctly, can build trust and loyalty—key psychological factors that critically influence how consumers interact with digital advertising (Bleier & Eisenbeiss, 2015; Kang et al., 2016; Tran et al., 2020). Such personalized ads align closely with individual preferences and needs, potentially increasing engagement and satisfaction (Zaki et al., 2021; Tan & Liew, 2022).

Moreover, AI's capability to predict and influence consumer choices by presenting options that resonate with past behaviors and anticipated needs signifies a profound shift in how marketers approach advertising and customer service (Gruber et al., 2020; Melumad et al., 2020). The immediate assistance and rapid solutions facilitated by AI not only enhance customer journeys but also deepen businesses' understanding of their consumer bases (Das et al., 2023). This is particularly vital as marketing's core activities evolve to focus more on aligning customer needs with firm offerings and persuading purchases effectively (Ameen et al., 2021; Kumar et al., 2024).

The diversification of advertising channels has significantly boosted the impact of AI in this field. Moving from traditional print and broadcast media to digital platforms and social media, advertising methods have expanded widely. This expansion has led to omnichannel advertising strategies, where consumers can interact with brands across multiple platforms smoothly (Nguyen et al., 2022; Payne et al., 2017). AI helps by making sure the messaging is consistent and personalized, whether it’s through social media ads, email campaigns, or in-store experiences (Y. Cai & Choi, 2023).

These changes in advertising channels have greatly increased consumer engagement. By providing a consistent and personalized experience, brands can reach consumers wherever they are, offering content that matches their individual preferences and behaviors (Honora et al., 2024; Kim & Kim, 2022). As a result, consumers are more likely to engage with and respond positively to ads, leading to higher satisfaction and loyalty (Calvo et al., 2023).

While AI has brought transformative benefits to advertising, its reliance also introduces significant challenges. One major concern is the opacity and unpredictability of AI decisions, which can undermine consumer trust (Danks, 2019; Troshani et al., 2021). Consumers often struggle to understand how AI systems arrive at certain conclusions, leading to a lack of confidence in these technologies (Nadella et al., 2023; X. Cheng et al., 2022). To address this, it is crucial to balance AI applications with human oversight. This approach allows marketers to combine the strengths of AI and human judgment, ensuring that simpler decisions are automated while more complex issues receive human attention, ultimately delivering superior customer service and maintaining trust (Sever, 2023).

Moreover, the high level of personalization enabled by AI raises concerns about consumer autonomy and the distortion of reality (Bjørlo et al., 2021). When ads are too finely tailored, they can limit consumers' exposure to a diverse range of products and ideas, subtly steering their choices and reducing their sense of freedom (S. Du & Xie, 2021). Additionally, such personalized advertising can create an echo chamber effect, where consumers are only exposed to information and products that reinforce their existing beliefs and preferences. This can narrow their worldview and potentially reinforce biases, negatively impacting their attitudes (Cinelli et al., 2021; Zhu et al., 2021).

2.4. Data Privacy and Ethics

Studies in Marketing and AI show that using AI in advertising brings up important data privacy and ethical issues (Helsloot et al., 2018; Hochbruck, 2023; S. Du & Xie, 2021). AI systems gather a lot of consumer data to understand behavior, improve targeted marketing, and automate interactions. This raises concerns about user consent, data security, and transparency (Kumar, D., 2024; Mittelstadt, 2019).

Legally, AI in marketing faces challenges with data privacy, intellectual property, and consumer protection. Laws like the European Union’s General Data Protection Regulation (GDPR, 2023) limit how personal data is collected, processed, and used (Mühlhoff & Willem, 2023; Van Ooijen and Vrabec, 2018). These laws aim to protect consumer information and ensure businesses act transparently and ethically. However, AI technology often advances faster than the laws, creating gaps in enforcement and compliance.

AI has changed advertising by allowing high levels of personalization and efficiency. But these benefits come with ethical concerns. AI can spread biases from its training data, leading to unfair practices that can harm certain groups (Buolamwini & Gebru, 2018). Also, automating tasks and engaging with customers in real time often happens in "black box" systems, making it hard to understand and question the decisions they make (Carabantes, 2019; Von Eschenbach, 2021).

Despite many uses of AI, there is little discussion on the deeper ethical and technical issues of AI-driven advertising (Coffin, 2022; Hermann, 2020). Current regulations like the GDPR and consumer protection laws in the USA, such as the Federal Trade Commission Act, aim to prevent deceptive marketing practices (Helveston, 2015). However, there is still a lack of focused research on the specific ethical and legal issues in marketing, like how data analytics is used for profit (Gulyamov & Raimberdiyev, 2023).

AI can predict and influence consumer choices through techniques such as microtargeting, where ads are tailored to individuals based on detailed personal data (Arsenault, 2020). This precision can limit consumer exposure to a variety of products and ideas, subtly steering their choices and reducing their freedom. Additionally, the use of dark patterns—design tricks that manipulate users into making specific choices—raises ethical concerns about consumer autonomy (Avolicino et al., 2022; B. Gao et al., 2023; Biplab et al., 2023).

Deepfakes, another controversial application of AI, involve creating realistic but fake images or videos. These can be used to deceive consumers, further complicating the landscape of digital advertising. Such practices not only risk misleading consumers but also undermine trust in digital content, creating a potential backlash against AI-driven advertising (Campbell et al., 2021; Hancock & Bailenson, 2021).

To address these challenges, advertisers and technologists need to follow strict data protection rules, promote transparent algorithms, and adopt ethical AI practices that protect consumer rights and fairness. More legal frameworks and regulations are needed as AI systems become more advanced. This will help deal with ethical issues and ensure that AI in advertising remains fair and accountable (Saeedi et al., 2022).

Chapter 3:
AI Technologies in Advertising

3.1. Introduction to AI Technologies

Artificial Intelligence has emerged as a transformative force across various industries, dramatically altering business practices and enhancing economic productivity (Noble & Mende, 2023). Once perceived as the subject of futuristic films and robotics, AI now plays a pivotal role in daily business operations and consumer interactions. For instance, AI-powered chatbots have become integral to the online shopping experience, personalizing interactions based on users' past behaviors, providing automated customer support, and even assisting with travel arrangements by offering tailored recommendations and booking services (Kumar, 2019).

AI's capabilities extend far beyond simple automation; it involves sophisticated algorithms and machine learning techniques that revolutionize how advertisers connect with audiences. Defined by Haleem et al. (2022) as technology that simulates human interaction, and by Haenlein and Kaplan (2019) as systems that analyze external data to perform tasks through flexible adaptation, AI supports functions that traditionally required human cognitive skills (Mustak et al., 2021). In advertising, this translates into unprecedented precision, personalization, and efficiency. Advertisers are now able to tailor their strategies to meet individual consumer preferences, fostering more engaging and productive interactions (Huang & Rust, 2022a; Yu et al., 2019).

Figure 3: AI applications in Marketing Domain (Haleem et al., 2022)

The self-learning nature of AI significantly enhances its effectiveness; it learns from each interaction to improve subsequent actions, automating both routine and complex tasks to uncover behavioral patterns and generate actionable insights (Verma et al., 2021). Moreover, generative AI tools have begun aiding advertisers in creating content, significantly reducing the creative load and facilitating innovative campaign ideas (Rodrigue, 2023). AI also plays a crucial role post-purchase by monitoring consumer behaviors and habits, providing valuable data that helps refine future marketing strategies (Cretella, 2022).

Ultimately, the rapid advancement in AI technologies has fundamentally transformed the advertising landscape. It bridges the gap between technology and consumer engagement, driving innovation, enhancing customer experiences, and delivering superior results in advertising (Kumar et al., 2019; Kumar, 2021; Huang & Rust, 2021). As AI continues to evolve, its integration into advertising practices is not just inevitable but essential for staying competitive in a dynamically changing market.

3.2. Core AI Techniques, Tools and Applications

Many advertisers are increasingly leveraging AI to transform the vast flow of data into valuable consumer insights, generate and distribute ads, and gather feedback on their effectiveness. The integration of various AI technologies and techniques is crucial to achieve optimal results (Kietzmann et al., 2018; Qin & Jiang, 2019). In this section, we will explore and explain the key AI technologies and techniques that play significant roles in advertising.

3.2.1. Machine Learning (ML)

"*Machine learning (ML) is a branch of artificial intelligence (AI) and computer science that focuses on using data and algorithms to emulate the way humans learn, progressively improving its accuracy*" (What Is Machine Learning (ML)? | IBM). Standing as a cornerstone of modern AI technologies, ML revolutionizes industries by enabling sophisticated data-driven decision-making and predictive analytics. In advertising, ML utilizes algorithms and statistical models to analyze vast amounts of consumer data, identifying patterns and making predictions without human input.

In the realm of advertising, ML's primary function is to predict and understand consumer behaviors. By analyzing historical data, ML models can uncover trends, preferences, and consumer behaviors that might not be immediately obvious. This predictive capability allows advertisers to better anticipate consumer needs and tailor messages that resonate more effectively with target audiences. ML techniques enhance targeting accuracy by predicting the most relevant advertisements for users based on contextual or existing user data, thereby improving the overall user experience and addressing challenges faced by advertisers.

Furthermore, numerous studies have focused on identifying and cataloging the key algorithms that enhance the effectiveness of targeted advertising. Principal machine learning techniques used in optimizing advertising personalization and strategies have been systematically classified as user-centric and content-centric by researchers such as Choi and Lim (2020). For example, Abraham et

al. (2020) discusses specific machine learning algorithms that optimize the delivery of targeted advertisements.

3.2.2. Machine Learning Techniques for Advertising

Linear and Logistic Regression

Linear regression and logistic regression are two fundamental statistical and machine learning techniques used to model relationships between variables and make predictions.

Linear Regression Analysis is a method used to predict a continuous dependent variable based on one or more independent variables. It establishes a linear relationship between these variables by fitting a straight line (or hyperplane in multiple dimensions) through the data points. This line, known as the line of best fit, minimizes the difference between the predicted and actual values of the dependent variable. The goal is to use this line to predict the value of the dependent variable for any given value of the independent variables (Effendi & Abbas, 2016).

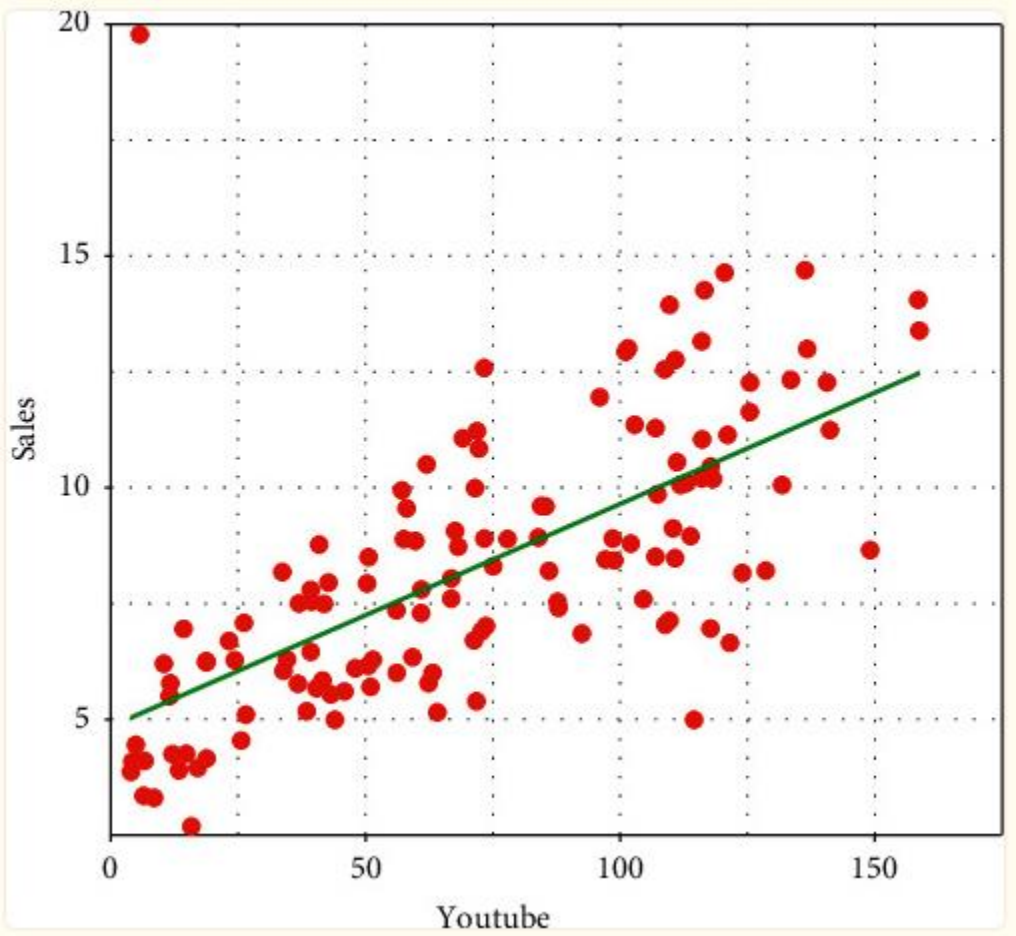

Figure 4: Linear Regression YouTube Budget – Sales (Zhou et al, 2021)

In a study by Zhou et al., 2021 (Figure 4), simple linear regression was used to investigate the relationship between a company's YouTube advertising budget and its sales. The researchers

examined data representing the YouTube advertising budget of a company and the corresponding sales data. They found a positive correlation, indicating that increases in the YouTube advertising budget were associated with increases in sales. This analysis demonstrated how changes in the ad budget might influence sales, providing valuable insights for making informed decisions about future advertising strategies to maximize sales.

Logistic Regression Analysis is used for binary classification problems where the outcome is categorical (typically yes/no, true/false). Unlike linear regression, logistic regression predicts the probability of an event occurring by fitting a logistic curve to the data. This curve is always between 0 and 1, representing probabilities. Logistic regression is particularly useful when you want to know the likelihood of a categorical outcome based on one or more predictors (Šoltés et al., 2020).

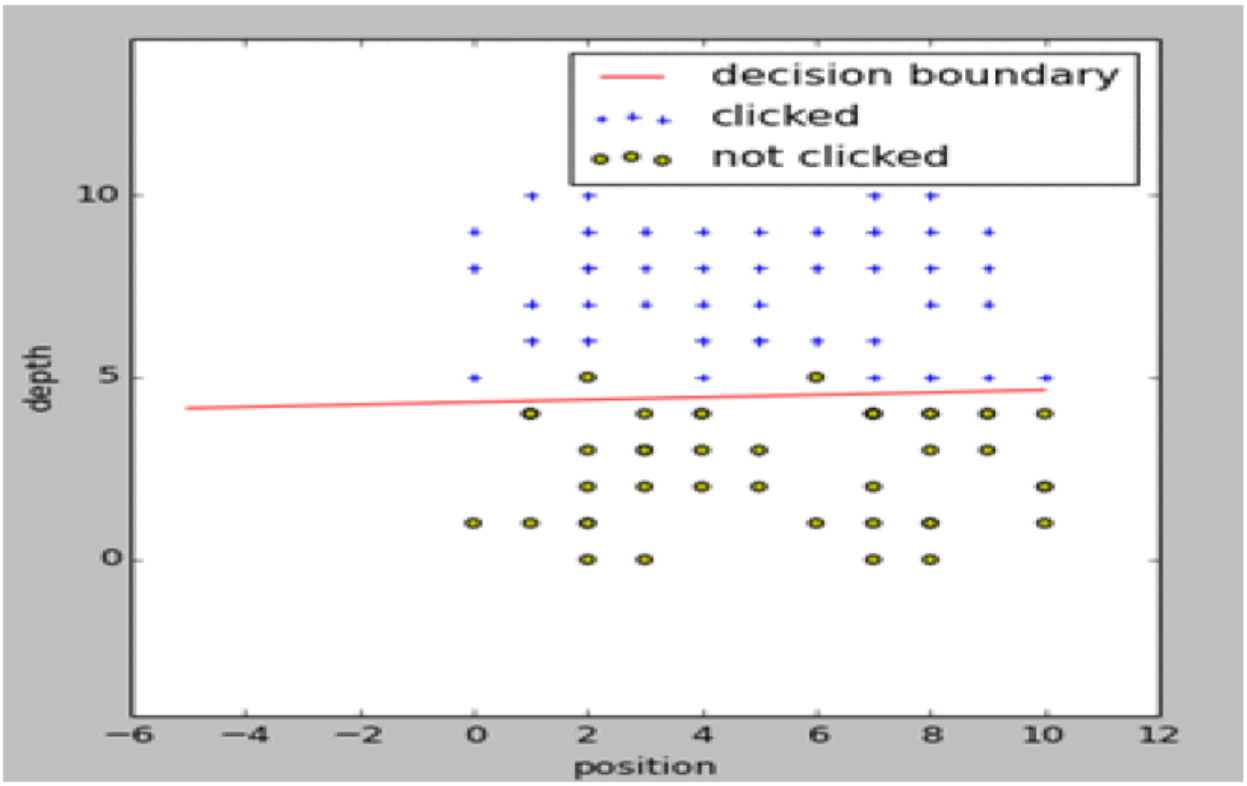

Figure 5: Logistic Regression scatter plot (R. Kumar et al., 2015)

In the context of advertising, logistic regression can be effectively used to predict whether a user will click on an ad or not. A notable study by R. Kumar et al., 2015, demonstrated this application in the domain of search engine advertising. The researchers focused on determining the click-through rate (CTR) for ads, which is crucial for enhancing user satisfaction and maximizing revenue for search engines.

In their research, Kumar et al. employed logistic regression as a robust framework to predict the CTR of ads, particularly for new advertisements where historical click data was not available. The study analyzed a week's worth of advertisement data, approximately 25 GB, using ad position and

impression as predictor variables. Through this approach, they were able to predict the likelihood of ads being clicked with about 90% accuracy.

Decision Trees and Random Forests

In the advertising sector, decision trees are utilized to enhance and refine marketing strategies by analyzing and predicting diverse outcomes from data.

Decision Trees defined by IBM as a non-parametric supervised learning algorithm, decision trees are suitable for both classification and regression tasks. They possess a hierarchical structure that includes a root node, branches, internal nodes, and leaf nodes. This layout allows decision trees to segment data effectively and make precise predictions based on input feature values.

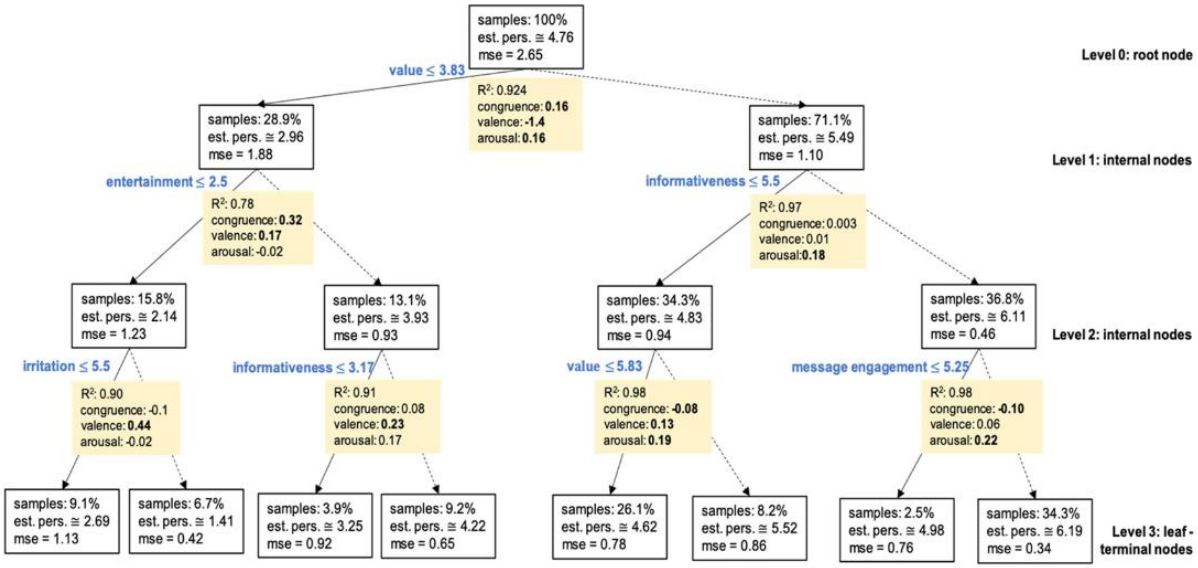

Figure 6: Decision tree for predicting persuasiveness by Wen et al, 2021

A pertinent example of decision tree application in advertising is the study by Wen et al. (2021), which investigated the persuasiveness of advertising. The study used decision trees to examine the emotional congruence and incongruence of ad placement on YouTube for music videos. By identifying key attributes that enhance ad persuasiveness, the research highlighted the utility of decision trees in exploring the contextual effects of emotions on advertising effectiveness. This approach not only brought psychological constructs into computational analysis to predict ad persuasiveness but also expanded the theoretical understanding of contextual congruence and incongruence in the emotional domain. Methodologically, the study demonstrated the efficacy of decision trees in exploratory theory testing, providing strategic insights for advertising design and evaluation on video-sharing platforms.

Random Forests are built on the foundation of decision trees. Random forests aggregate the predictions of multiple decision trees to enhance accuracy and reliability. By creating a "forest" of decision trees and averaging their predictions, random forests reduce the risk of overfitting and improve the stability of the model. This ensemble approach is particularly effective in advertising

due to its ability to handle complex datasets with multiple variables and to provide robust predictions across diverse scenarios.

Random forests play a vital role in the advertising sector by enhancing marketing strategies across various dimensions. They enable marketers to segment and target customers based on characteristics such as purchase history, loyalty, and demographics, facilitating tailored campaigns and offers. Additionally, these models are instrumental in predicting and mitigating customer churn by analyzing data like satisfaction, engagement, and usage, allowing for the development of effective retention strategies. Random forests also underpin recommendation systems, offering personalized suggestions to customers based on their past interactions and preferences, thereby increasing satisfaction, loyalty, and conversion rates.

Gradient Boosting Machines (GBMs)

Gradient Boosting Machines (GBM) are a type of advanced method used to make predictions by improving simple models, often decision trees, step by step. The process begins with training a basic decision tree on the data, treating each observation equally. After evaluating how well this tree performs, GBM adjusts its focus to better handle the observations that were previously misclassified by altering the data used for the next tree.

This process repeats, with each new tree focusing on correcting the mistakes of the ones before it. The final result is a combined model made up of all these trees, where each one contributes based on how well it corrected errors.

GBM is unique because it uses the difference between predicted and actual results, known as the loss function, to guide how the model improves. This approach lets GBM be adjusted to meet the specific needs of different situations, like predicting sales prices or figuring out which loans might fail. This makes GBM a flexible and effective tool for making predictions in various areas.

Gradient Boosting Machines, especially the Extreme Gradient Boosting (XGBoost) version, are very effective in advertising. For instance, a study by Çakmak et al., 2019, showed that XGBoost could predict the number of ad clicks based on impression counts and CTR for hotel ads. By analyzing data from an online travel agencies (OTA's) dashboard and adding specific features related to the industry, the study found that XGBoost performed better than other methods, achieving the highest R-Squared values in predicting key metrics for improving OTA's bidding strategies. This approach helped lower costs and increase revenue by using a predictive model to determine bid values.

Similarly, Sisodia D. and Sisodia D.S., 2020, used Gradient Tree Boosting (GTB) to find fraudulent publishers in the pay-per-click model of online advertising. They dealt with the challenges of large datasets that had missing information and many different values in categorical attributes. GTB successfully spotted fraudulent publishers, performing better in precision, recall, and f-measure than other methods. This study showed how strong and flexible GBM is in various areas of advertising, from predicting clicks to detecting fraud, proving its importance in making better decisions and improving how digital advertising works.

Neural Networks and Deep Learning

Neural networks are a foundational concept in the field of artificial intelligence, particularly inspired by the structure and function of the human brain. They consist of layers of interconnected nodes, known as neurons, which process and transmit information. Each neuron receives input, performs a computation, and then passes its output to subsequent neurons. The connections between these neurons have weights that adjust as learning proceeds, allowing the network to learn from data by optimizing these weights to minimize errors in predictions (Aggarwal, 2018).

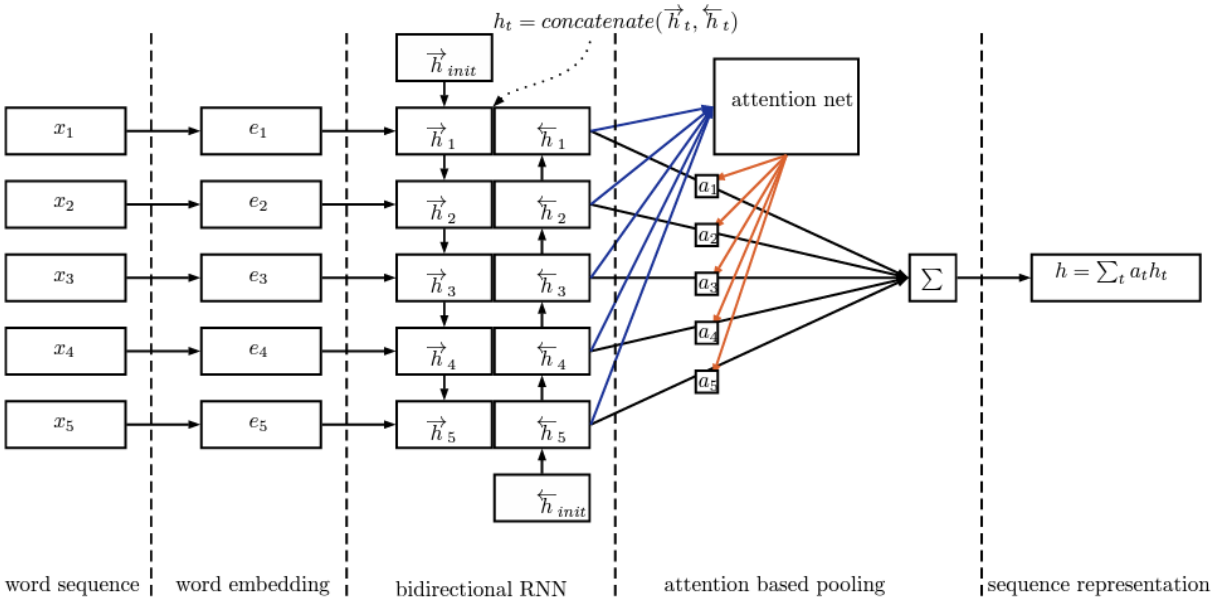

Figure 7: Neural Network architecture by Zhai et al., 2016

Deep learning is a subset of machine learning that uses neural networks with many layers, hence the term "deep." These networks can learn to recognize patterns of patterns, which makes them particularly powerful for complex tasks like image and speech recognition, natural language processing, and autonomous vehicle navigation. In deep learning, the network learns features automatically from data without needing explicit programming for feature extraction, which is a significant advancement over traditional machine learning methods. This capability allows deep learning models to handle large and complex datasets effectively, leading to significant improvements in accuracy and performance across a range of applications.

Neural networks and deep learning have long been fundamental to the advertising industry, continually evolving with advances in technology. These methods, while not new, have become increasingly sophisticated and effective due to the development of more powerful computational tools and larger datasets.

Neural networks, for example, are employed to analyze and forecast the impact of advertising and promotions. By predicting the performance of various advertising strategies, these models enable businesses to optimize their ad spend and strategic planning effectively.

Deep learning further extends the capabilities of neural networks, particularly in user interest and response prediction for online display advertising. By analyzing extensive user data, such as browsing history, clicks, and engagement, deep learning models can assess the likelihood of user responses to specific ads. This precision enhances the relevance and effectiveness of the ads, making them more tailored to individual interests and behaviors.

In e-commerce, deep learning is crucial for product advertising recommendations. It leverages user preferences, purchase history, and interactions to suggest products that users are more likely to buy, improving the shopping experience and boosting conversion rates and sales.

The use of recurrent neural networks in models like DeepIntent (Zhai et al., 2016) exemplifies deep learning's role in capturing user attention in online advertising. These models predict which parts of an ad are most likely to engage users, aiding advertisers in creating more captivating and efficient ads.

Overall, the integration of neural networks and deep learning in advertising combines established practices with innovative technology, leading to more accurate, personalized, and effective advertising solutions.

Recommender systems

Recommender Systems are algorithms designed to suggest relevant items to users based on various types of inputs and data. These systems are fundamental in many online platforms, such as e-commerce, streaming services, and social media, where they help personalize the user experience by suggesting products, movies, songs, or other content that users are likely to enjoy or find useful.

Figure 8: Content-based Filtering schema (NVIDIA)

There are several types of recommender systems, each using different approaches:

Content-Based Filtering: This method recommends items based on the features of the products and the preferences shown by the user. For instance, if a user frequently watches action movies, the system might suggest other movies with similar characteristics, like genre, director, or actors. The recommendations are based on matching the attributes of items with a user's established preferences.

Figure 9: Collaborative Filtering (NVIDIA)

Collaborative Filtering: This approach relies on collecting and analyzing data on user behavior, activities, or preferences and predicting what users will like based on their similarity to other users. There are two main types:

- User-based collaborative filtering: This method finds users who have similar preferences and tastes to a given user and recommends items they have liked.
- Item-based collaborative filtering: This focuses on the similarity between items. If a user likes a particular item, the system recommends other items that similar users have liked or that are similar in nature.

Hybrid Recommender Systems: These systems combine multiple recommendation techniques to improve recommendation quality. For instance, a hybrid system might use both content-based and collaborative filtering methods to leverage the strengths of both approaches and mitigate their weaknesses.

Clustering

Clustering in advertising is a sophisticated method that groups customers or ads based on shared characteristics, behaviors, or preferences to stand out in the market. This technique allows

advertisers to divide their audience more accurately, avoiding broad, general groupings that don't meet individual needs and preferences. By using machine technology and algorithms (Figure 10), clustering finds connections within market data to create clear, well-defined market segments (Killeen, 2024).

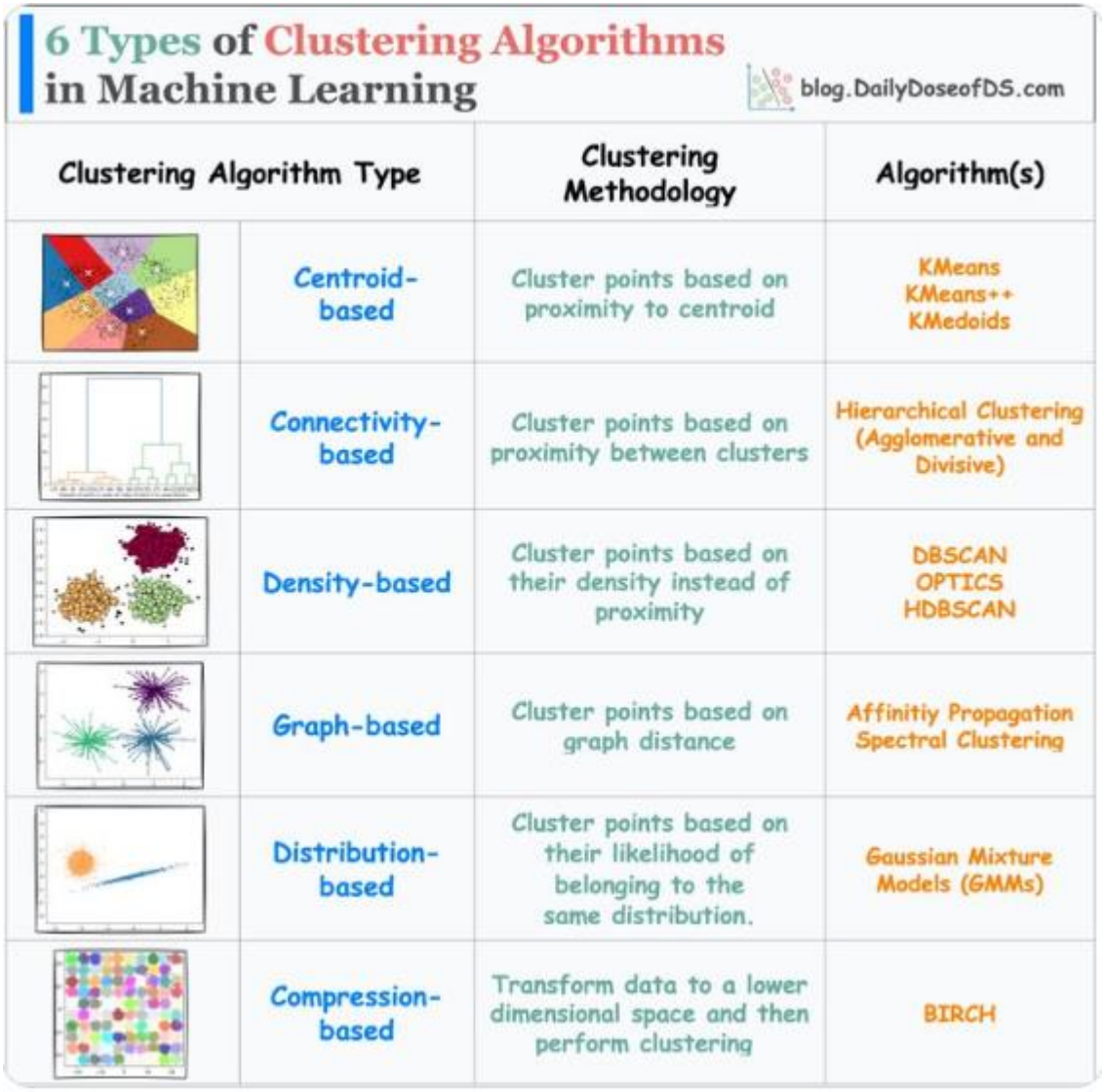

Figure 10: Clustering Algorithms (Killeen, 2024)

This approach is more effective and insightful than traditional market segmentation, which mainly sorts the audience by demographic and psychographic traits. While segmentation places the audience in groups like "women over age 50," clustering goes a step further by identifying and creating new groups based on shared traits across these segments. This detailed method ensures that marketing strategies are very specific, making each consumer feel that their particular wants and needs are recognized and addressed.

By using clustering, businesses can fine-tune their advertising efforts, making sure the right messages get to the right people at the right time. This focused strategy not only improves customer

engagement but also boosts the overall success and efficiency of marketing campaigns. With this method, advertisers can create effective messages that strongly connect with each specific cluster, building stronger relationships and achieving more success in the competitive world of marketing.

Some ways clustering is used in advertising:

- **Customer Segmentation:** Clustering algorithms help divide customers into clear groups based on things like age, gender, location, lifestyle, values, personality, purchase history, and browsing habits.
- **Ad Performance Analysis:** Clustering lets advertisers study how different ad campaigns are doing by grouping ads with similar performance numbers, such as click-through rates, conversion rates, or how much people engage with them.
- **Content Optimization:** By grouping similar content or ads based on how users interact with them, advertisers can figure out what content works best with certain audience groups. This knowledge helps make ad content more relevant and effective, leading to more user engagement and higher conversion rates.
- **Market Research:** Clustering aids in market research by grouping potential customers or markets that have similar traits. This makes it possible for advertisers to test different strategies or products with specific groups before launching them more widely, lowering the risk and increasing the chances of success.

Reinforcement Learning:

Reinforcement learning (RL) is a ML technique that trains software agents to make decisions that lead to the most favorable outcomes. It resembles the trial-and-error learning process that humans employ to reach their objectives. In this approach, actions that contribute to the goal are reinforced, while those that detract from it are disregarded.

RL algorithms operate within a framework of rewards and punishments as they analyze data. They learn from the outcome of each action and autonomously determine the most effective pathways to achieve the desired results. These algorithms are also capable of delayed gratification, understanding that the optimal strategy might involve short-term losses. Thus, the most effective route they identify may include certain penalties or temporary setbacks. RL is an effective method for enabling artificial intelligence systems to achieve optimal results in unfamiliar environments, as noted by Amazon.

- **Ad Placement Optimization:** Reinforcement learning is effectively utilized in optimizing ad placements through dynamic bidding processes. In programmatic advertising, RL agents continuously adjust their strategies based on prior results to determine the most successful bids for ad placements that maximize engagement or conversion rates. Moreover, these agents learn the most impactful positions for ads on websites or within video streams by analyzing user engagement data, allowing them to optimize ad placements for better results over time (Joshi, 2022).

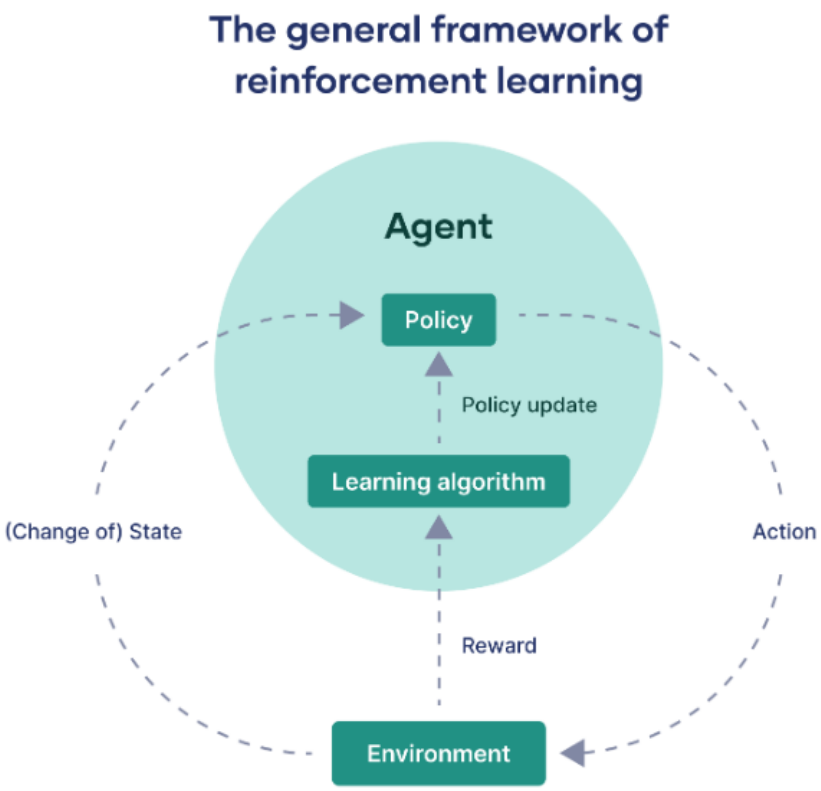

Figure 11: RL gerenal framework by Scribbr

- **Personalized Ad Recommendations:** Reinforcement learning plays a crucial role in delivering personalized ads by adapting to user preferences through continuous learning. As the RL algorithm observes user interactions with various types of ads, it fine-tunes future ad selections to align more closely with the user's preferences. This approach enhances the likelihood of user engagement by ensuring that the ads presented are more relevant and appealing to the individual (Hengst et al., 2020).
- **Budget Allocation:** Reinforcement learning assists in optimizing how an advertising budget is allocated across various channels, times of the day, or demographic groups. The RL agent learns to allocate more budget to strategies that yield higher returns, thus distributing funds in a manner that maximizes the overall effectiveness of the campaign (Cai et al., 2023).

User-Centric ML Techniques

User-centric ML techniques in advertising focus on understanding and predicting user behaviors, preferences, and interactions. These techniques use machine learning to analyze user data, such as click logs and interaction histories, to predict consumer actions like click-through rates and purchasing tendencies (Jiang, 2016). For example:

- **Keyword Extraction:** This involves using sequential pattern mining algorithms to identify meaningful language patterns from online content, which aids in real-time keyword extraction that can enhance targeted advertising (Li et al., 2007).
- **CTR Prediction Models:** Different architectures and models, like deep belief networks combined with logistic regression or attention mechanism-based neural networks, are employed to predict how likely a user is to click on an ad. These models process user information and click logs to predict CTR, utilizing advanced machine learning techniques like deep learning and factorization machines to enhance prediction accuracy and ad targeting (Tagami et al., 2013; Wang et al., 2018)**.**
- **User Profiling:** Techniques are developed to build detailed profiles based on user data, such as ad clicks and impressions. These profiles help in personalizing advertisements to match user interests more closely, enhancing engagement and effectiveness (Addis et al., 2009).

Content-Centric ML Techniques

Content-centric ML techniques focus on the content of the advertisements and how they relate to the context in which they are shown. These methods emphasize matching ad content to user context, enhancing relevancy and effectiveness:

- **Ad-Page Scoring Functions**: Integrates logistic regression models that use data from both the advertisement and the webpage to determine an ad's relevance to the page content. This method considers both semantic information and click feedback to optimize ad placement (Chakrabarti et al., 2008).
- **Contextual Advertising Frameworks**: Systems like blog-centric contextual advertising frameworks use text mining to select ads based on the content of a blog and personal interests shown by the user. These frameworks incorporate modules for intention recognition, sentiment detection, term expansion, and target-ad matching to enhance the relevance of ads displayed.
- **Sub-Document Classification**: For contextual advertising where only page-level labels are available, techniques like Multiple Instance Learning (MIL)-Boost are used to classify sub-sections of a document for better ad targeting, avoiding sensitive or unsuitable content (Zhang et al., 2008).
- **Response Prediction for Display Advertising**: Utilizes logistic regression with advanced feature selection algorithms to predict user responses in display advertising, aiming for simplicity, scalability, and efficiency in ad targeting (Perlich et al., 2013).

It is important to mention that both user-centric and content-centric approaches leverage machine learning to enhance the precision and effectiveness of advertising by focusing on either the user's characteristics or the content's context. These techniques enable advertisers to craft more personalized and contextually appropriate messages, thereby improving the overall efficiency of their advertising strategies (Choi and Lim 2020).

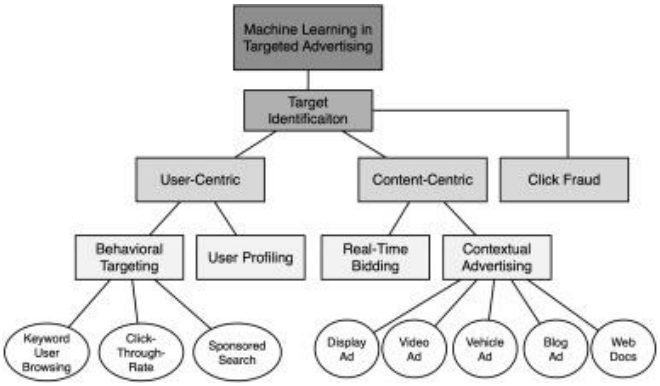

Figure 12: Classification of ML techniques by Choi and Lim, 2020

3.2.3. AI-powered Predictive Marketing Analytics

Predictive analytics involves leveraging data to anticipate future trends and occurrences. This approach utilizes historical data to project potential scenarios, thereby informing strategic decision-making. Predictive analysis may be performed manually or through machine-learning algorithms, with both methods relying on historical data to hypothesize about future events. The application of forecasting can facilitate more informed decision-making and the development of strategies based on data insights. Below are several instances of predictive analytics in practice, serving as a motivation for its adoption within your organization. ("What Is Predictive Analytics? 5 Examples", HBS Online, 2021)

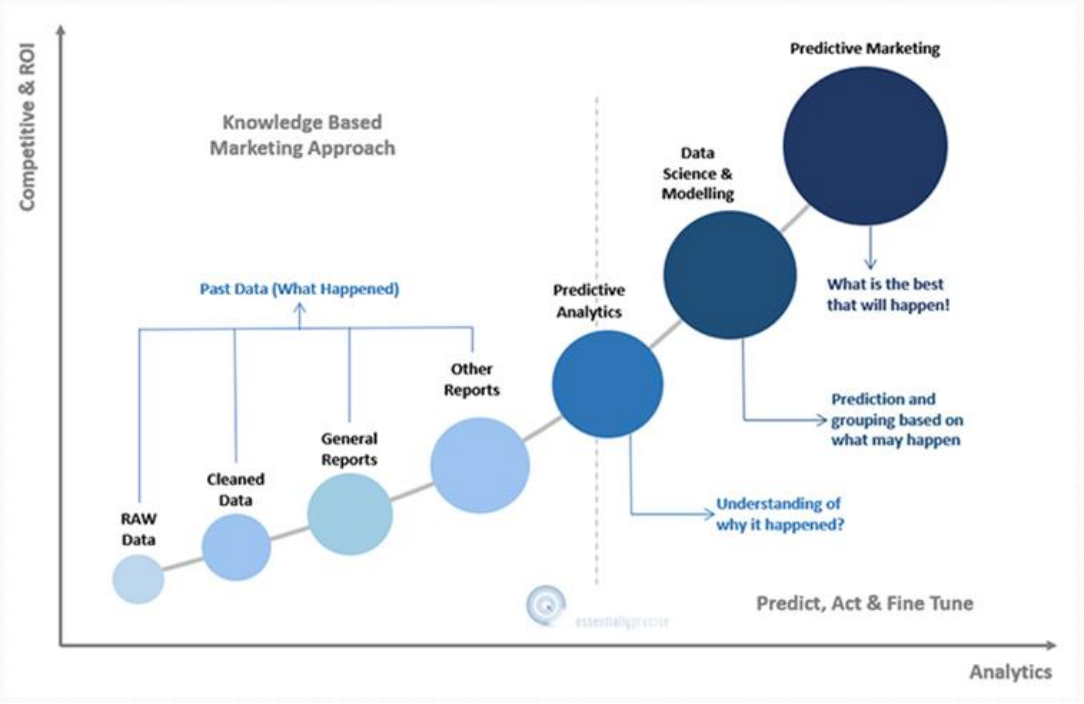

Figure 13: The role of predictive analytics

Predictive marketing analytics, empowered by AI, enables marketers to refine their strategies and target customers more effectively. By analyzing historical data and identifying patterns, AI tools can forecast consumer behavior, enhance campaign outcomes, and optimize advertising budgets for improved return on investment. Utilizing techniques such as data mining, machine learning, and statistical algorithms, predictive analytics helps in crafting personalized ad experiences by understanding and meeting the nuanced preferences and expectations of individual consumers. This approach not only ensures that customers are matched with products they are likely to purchase, avoiding irrelevant or out-of-stock items, but also allows for the tailoring of content and offers to enhance the overall customer experience. Furthermore, AI's ability to rapidly process vast amounts of data reduces the time and effort spent on extracting actionable insights, thereby enabling marketing teams to focus on strategic initiatives. As a result, companies can achieve a deeper, more detailed understanding of their target audience, leading to more personalized and efficient marketing efforts that have been proven successful by leading global brands (Haleem et al., 2022).

Examples of AI-powered Predictive Marketing Analytics

Uplift modeling: Today, accurately forecasting the outcomes of marketing campaigns is a critical skill in marketing that depends heavily on data analysis. Supported by machine learning models, which are particularly effective in processing large volumes of data, marketers can significantly reduce the time required to model the impact of campaigns. For instance, IDT, a company in the telecommunications and financial services sector, used predictive analytics and AI to customize messages for individual customers based on their history, language, and responses to previous campaigns. This approach allowed IDT to determine campaign uplift within just 2-3 days, a task that previously took weeks. By employing predictive customer models, lifecycle segmentation, and churn forecasting, IDT's marketing team managed to increase the number of customers acquiring new services and enhance the lifetime value of active customers (Marinina, 2023).

Ad personalization: In marketing, personalization is closely linked to click-through rates and overall ad performance. Creating highly effective advertisements for each audience and campaign is a resource-intensive task. However, predictive analytics enables the use of real-time consumer data to deliver personalized ad campaigns on a large scale. For instance, Mastercard utilized IBM Watson Advertising Accelerator to enhance awareness of their partnership with 'Stand Up to Cancer' and their initiative to donate funds for cancer research. Mastercard's marketing team leveraged IBM's AI-based platform to identify the most effective creative elements for each target audience based on factors such as location, device type, and time of day. Beyond a significant increase in CTR, Mastercard's team gained valuable insights into creative generation. For example, they discovered that unique and compelling calls to action (CTAs) like 'Start Something Priceless' had the strongest resonance with customers, while more generic CTAs such as 'Learn More' were less effective.

3.2.4. Natural Language Processing (NLP)

Natural Language Processing or in short NLP is a pivotal AI technology that enables machines to understand and interpret human language. In advertising, NLP is utilized to create more engaging

and interactive communication between brands and consumers, enhancing both the reach and relevance of advertising messages.

NLP's applications in advertising are diverse, ranging from content creation to consumer feedback analysis. By processing and analyzing text data from various sources such as social media, customer reviews, and online interactions, NLP helps advertisers gain deeper insights into consumer sentiments and preferences (Ma et al., 2018).

Examples of NLP usage in Advertising

Chatbots and Customer Service: Swedbank, the Swedish bank, employs a virtual assistant equipped with NLP to handle customer inquiries on the homepage of its website. This allows customer service staff to dedicate more time to sales activities that generate revenue, without compromising the quality of service (Kietzmann et al., 2018).

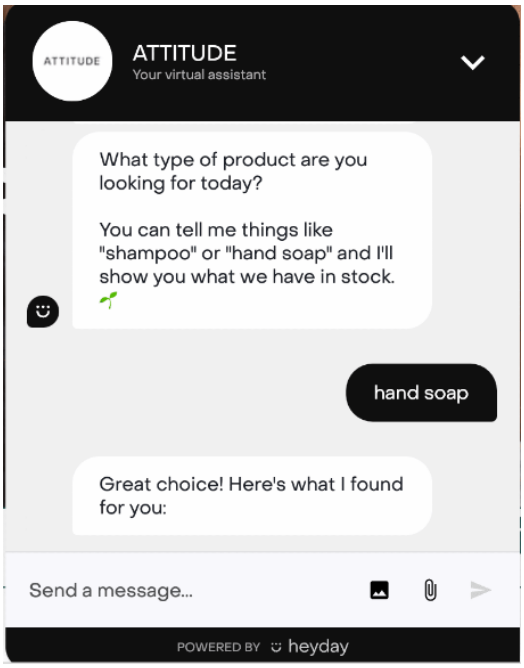

Figure 14: Chatbot by ATTITUDE

Sentiment Analysis: In 2016, Samsung utilized NLP-based sentiment analysis to address the Galaxy Note 7 crisis. By analyzing customer feedback and social media comments, they quickly identified a predominantly negative sentiment regarding the device's safety. This insight led to a decisive recall and eventual discontinuation of the product. Samsung used the data to enhance future product quality and communication, demonstrating a proactive approach to customer safety and feedback (Pepper, 2023).

3.2.5. Natural Language Generation (NLG)

Natural Language Generation (NLG) is an advanced application of artificial intelligence that focuses on transforming structured data into natural language. In the advertising domain, NLG offers a powerful tool for automating content creation, enabling brands to produce relevant, engaging, and customized messaging at scale. This technology is particularly valuable in advertising for its ability to generate written content automatically, which can adapt dynamically to various contexts and audience needs. NLG not only streamlines content production but also ensures consistency and personalization in brand communications (Reisenbichler et al., 2022).

While NLG is primarily concerned with outputting text, it is often used in conjunction with Natural Language Processing. These two technologies are strongly connected; NLP analyzes and understands human language, turning spoken or written input into structured data that NLG can then use. This process is essential because, for NLG to generate accurate and relevant responses, the machine first needs to "understand" the input it receives. Essentially, NLP reads (or hears) the input, and NLG writes (or speaks) the output, working together seamlessly to enhance communication between humans and machines. This synergy allows for more effective and efficient generation of advertising content, tailored specifically to the needs and behaviors of target audiences.

By leveraging both NLG and NLP, advertisers can automate complex, creative processes, significantly reducing the time and effort required to produce high-quality content while maintaining a high degree of personalization and relevance that resonates with consumers.

Examples of NLG usage in Advertising

Automated Ad Copywriting: NLG systems can generate creative ad copies based on input criteria such as campaign goals, target audience demographics, and key product features. For example, a company might use NLG to create different versions of ad text aimed at different segments of its market, each optimized for specific consumer preferences and behaviors.

Personalized Email Campaigns: By integrating NLG with customer data platforms, businesses can automatically generate personalized email content that addresses customers by name, mentions their past purchases, or recommends products based on their buying history. This approach not only enhances customer engagement but also increases the likelihood of conversion.

3.2.6. Image recognition (IR)

Image Recognition (IR) is a technology that allows computers to process and analyze visual data from images and videos, similar to how humans perceive visuals. By utilizing advanced algorithms and machine learning, this technology identifies and classifies various elements within visuals such as objects, places, people, and actions. The core functionality of image recognition involves analyzing the visual content and comparing it to a database of learned information to recognize and categorize different components accurately (Glover, 2023).

In the context of advertising, image recognition plays a crucial role in enhancing the effectiveness of marketing campaigns. It enables advertisers to automate the analysis of visual content across various media, helping to identify key elements that resonate with viewers. This capability allows brands to tailor their advertisements based on the visual preferences and interests of their target audience, ensuring that the content is relevant and engaging. Additionally, image recognition can help in optimizing ad placement by analyzing the visual context on web pages or in videos to insert ads that align with the surrounding content, thereby increasing the likelihood of viewer engagement and conversion.

Examples of Image Recognition usage in Advertising

Interactive and Augmented Reality Ads: Image recognition is foundational in developing interactive ads and augmented reality (AR) experiences. For instance, many beauty brands, like Sephora, use AR filters that allow consumers to virtually try on makeup by recognizing facial features in real-time. This provides a highly personalized and engaging shopping experience.

Figure 15: AR advertisement example

Product Recognition in Social Media: Brands use image recognition to identify their products in pictures posted on social media platforms. This allows them to understand how their products are being used in everyday life and can help target advertisements based on user-generated content. For example, a sportswear brand might recognize images of people using their gear and respond with targeted ads for related products.

Brand Logo Detection: Image recognition technologies can detect brand logos across digital and broadcast media, providing insights into brand visibility and engagement. This application is crucial for monitoring brand presence in various media and understanding competitor strategies as well.

3.2.7. Speech recognition (SR)

Speech recognition is a technology that allows computers and devices to interpret and transcribe spoken language into text. This capability is founded on advancements in computer science, linguistics, and engineering. Sophisticated speech recognition systems are capable of understanding natural speech patterns, different accents, and multiple languages, making them versatile tools for various applications. The technology is increasingly embedded in consumer devices and applications to facilitate hands-free operation and enhance accessibility, providing users with more convenient and efficient ways to interact with technology.

In the realm of advertising, speech recognition is revolutionizing how brands engage with consumers. By integrating this technology into platforms such as smart speakers and voice-activated devices, advertisements can become interactive experiences. For example, a voice-activated ad might allow users to inquire about products and receive personalized responses or participate in promotional activities using just their voice. This not only makes ads more engaging but also allows companies to collect valuable data on consumer preferences and behaviors, enabling more targeted and effective marketing strategies (Lutkevich & Kiwak, 2021).

Examples of Speech Recognition usage in Advertising

Voice-Activated Ads: An illustrative example of how brands are utilizing voice-activated advertising is seen in Burger King's innovative campaign. They designed a voice-enabled ad specifically to interact with Google Home devices. When the ad played, it prompted the devices to read out the ingredients of a Whopper burger. This creative use of voice activation technology not only engaged users in a unique way but also generated significant buzz around the product. Similarly, in the realm of smart speakers, users might ask for recipes and receive responses containing advertisements from grocery stores, suggesting ingredients available for purchase. This approach enhances the interactivity of ads and aligns closely with user interests and immediate needs, leveraging voice recognition to drive engagement (Global, 2023).

Customer Support and Interaction: Speech recognition technology is increasingly being leveraged by telecommunications companies in Greece to enhance their technical support services. By integrating voice-based assistance into their customer support lines, these companies are able to offer more dynamic and interactive help options. Customers can use voice commands to navigate through various service options, troubleshoot common issues, or get answers to frequently asked questions. This technology streamlines the support process by allowing for natural language communication, making it easier and more efficient for users to receive the help they need directly through conversational interfaces.

Real-Time Language Translation: In the context of global meetings and events, the use of speech recognition technology paired with translation services is exemplified by platforms like Wordly.

This AI-powered tool enhances accessibility by providing instant translation and captioning for attendees, enabling them to participate in multilingual presentations and discussions in their own language. By breaking down language barriers, Wordly helps facilitate more inclusive and effective communication across diverse linguistic backgrounds, thereby broadening audience engagement and improving comprehension during international events (Santana, 2024).

3.2.8. Generative Adversarial Networks (GANs)

Generative Adversarial Networks (GANs) are a sophisticated AI technology involving two neural networks that operate in tandem, locked in a sort of competitive game. The "generator" network creates data (like images, music, or text) that mimics real data, while the "discriminator" network tries to distinguish between the generator's fake data and actual data from the real world. Over time, through this adversarial process, the generator learns to produce increasingly realistic and convincing data**.**

In advertising, GANs have significant potential and are beginning to be used to enhance creative processes and content personalization. They can generate unique and appealing visual and audio content, simulate different advertising scenarios in order to personalize marketing materials to better match the preferences of specific audiences (Gill, 2023).

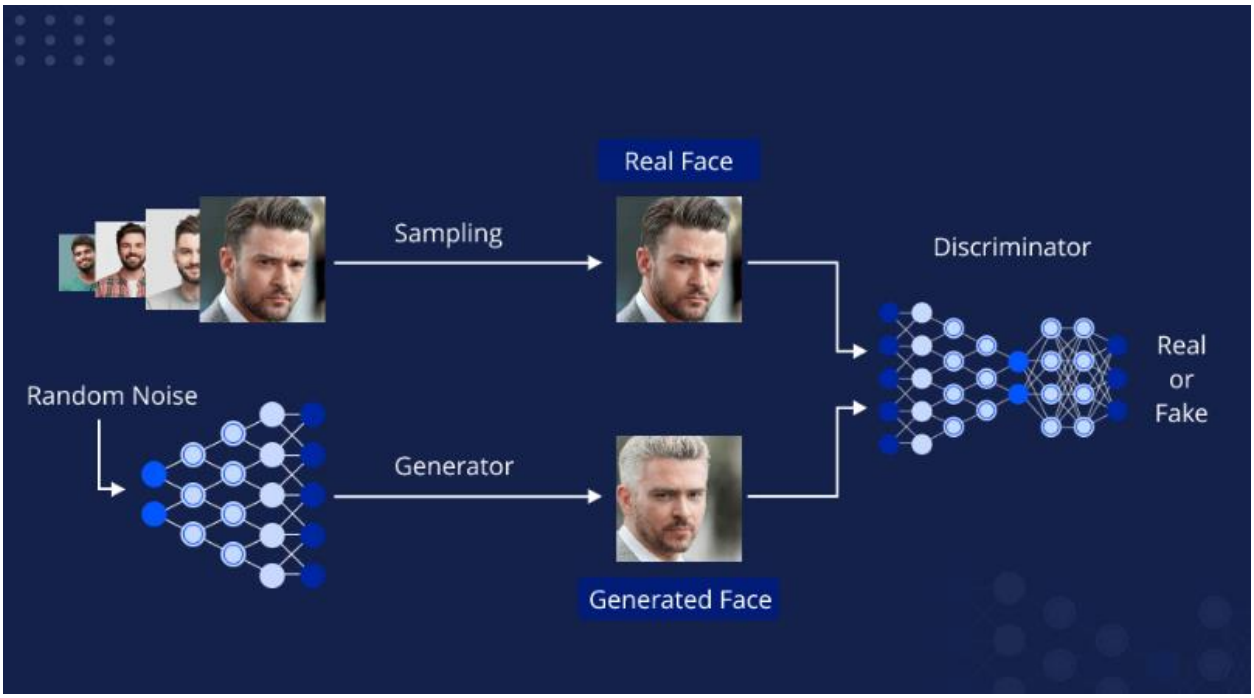

Figure 16: Face generation with GAN (Takyar, 2023)

Examples of GANs usage in Advertising

Content Creation: The Fabricant, a digital-only fashion house, is pioneering the use of GANs in the realm of fashion design. This innovative company utilizes GANs to generate new and unique digital clothing designs. By feeding the network with data from existing successful designs, The

Fabricant allows the GAN to learn and subsequently create fresh digital garments that do not physically exist but can be used in virtual environments or digital fashion applications. This approach allows The Fabricant to explore limitless creative possibilities without the constraints of physical production, leading to groundbreaking and visually striking fashion pieces that push the boundaries of traditional fashion design**.**

Personalization of Marketing Campaigns: Amazon, a leader in e-commerce and AI technology, utilizes GANs to enhance its marketing strategies through personalization. By analyzing individual customer data, such as past purchases and browsing behaviors, Amazon could deploy GANs to generate customized product images that align with the specific preferences and interests of each user. For example, if a customer frequently views outdoor gear, Amazon's GANs could generate and display images of camping equipment or hiking apparel in styles or colors that the customer has shown a preference for. This personalized approach not only makes the ads more relevant and visually appealing but also increases the likelihood of customer engagement and purchase, thereby optimizing the effectiveness of Amazon's advertising efforts**.**

3.3. AI in Shaping Modern Marketing Strategies

3.3.1. Ad Creation and Management

Create and Manage Ads for you: AI-powered systems are now capable of partially or fully creating advertisements tailored to advertisers and marketers' specific objectives. This feature is increasingly common on social media advertising platforms, which employ intelligent automation to recommend ads based on the content that is been promoted.

Today's AI tools are adept at producing various types of marketing content, including the concise, impactful copy often used in digital ads. These systems utilize natural language processing and natural language generation technologies to craft ad copy that can outperform or match human-created content, doing so more quickly and on a larger scale**.**

It's becoming more common for brands to experience significant success by pairing human copywriters with AI. This collaboration allows both to enhance and inspire each other's work, resulting in advertising content that surpasses what either humans or machines could create independently**.**

Generate Ad variation automatically: With AI, brands can automatically generate multiple variations of a single ad. Simply by inputting an original ad into an AI tool, and it will produce several different versions. These variations might differ in size and format to suit various platforms, or they could feature distinct designs and creative elements reflecting the diverse campaign concepts developed**.**

3.3.2. Ad Performance Optimization and Testing

Optimization of Advertising Budget and Performance: Performance optimization is a pivotal application of AI in the advertising sector. Machine learning algorithms, as integrated into various

commercially available platforms, analyze ad performance on specific platforms and provide actionable insights on enhancement strategies**.**

Advertisers, brands, and companies can leverage these AI systems not only for recommendations based on established best practices—thereby saving substantial time—but also for uncovering performance issues previously unnoticed. In advanced scenarios, AI can autonomously manage ad performance and budget optimization, making informed decisions to meet advertising KPIs and suggest fully optimized budget allocations**.**

When evaluating AI-driven advertising campaigns, understanding a range of metrics and KPIs is essential. These include click-through rates, conversion rates, cost per click (CPC), and return on investment (ROI). Familiarity with these metrics is crucial, but in the context of AI-powered campaigns, it's imperative to monitor them closely during initial phases to ensure the AI's adjustments are beneficial.

Defining clear and concrete KPIs is crucial as they guide the optimization of each campaign milestone. Regular monitoring and necessary adjustments in campaign strategies based on these metrics are vital for achieving overall success. Employing experts who understand both the digital advertising landscape and AI tools is indispensable for navigating this complex environment.

Some platforms are designed to automatically distribute advertising budget across all channels and target audiences, enabling human marketers to concentrate on strategic tasks rather than manual estimations of what might or might not work effectively. This is crucial because ad targeting is often as significant as, if not more critical than, the ad copy and creative itself.

Platforms like Facebook, LinkedIn, Amazon, and Google provide a rich dataset for targeting audiences through desktop and mobile advertising. AI tools enhance this process by analyzing historical audience data and ad performance, aligning them with current KPIs and incoming real-time performance data to pinpoint new, potentially lucrative audiences**.**

Ad creative and Messaging Test at Scale: A/B testing, a fundamental technique in advertising, involves comparing two versions of an ad to see which one performs better. This method is used to make data-driven decisions about which elements of an advertisement—be it the copy, layout, images, or calls to action—are most effective at engaging and converting audiences. Traditionally, these tests might have been manually intensive and limited in scope, but advancements in AI have transformed this landscape.

Today, AI tools allow advertisers to automate and scale up A/B testing to unprecedented levels. Instead of testing just a few variations, AI can handle hundreds or thousands of different ad creatives and messaging iterations simultaneously. This ability is particularly valuable because AI excels at processing and analyzing large volumes of data—tasks that can be cumbersome and error-prone when performed manually.

The use of AI in A/B testing enables rapid experimentation across multiple campaign variables. By quickly identifying the most effective elements, advertisers can refine their campaigns to better resonate with their target audience. The insights garnered from AI-driven A/B testing go beyond

simple preference, delving into which combinations of ad elements work best across different segments of the market.

The continuous improvement cycle facilitated by AI involves not just identifying the top-performing ad elements but also spotting and addressing any shortcomings in the algorithms themselves. Adjustments might include tweaking the ad's messaging, targeting different audience segments, modifying the ad format, or completely changing the creative approach.

This optimization process is ongoing. AI aids in the rapid iteration and testing of ads, but human insight is indispensable for interpreting data, making strategic decisions, and implementing nuanced changes that AI might overlook. The collaboration between AI's analytical capabilities and human strategic expertise ensures that advertising campaigns are not only optimized for performance but also aligned with broader marketing objectives. This synergistic approach maximizes campaign effectiveness and leverages the strengths of both AI and human creativity.

Ad Effectiveness Prediction: AI's predictive capabilities represent a transformative advancement in advertising, allowing marketers to foresee the effectiveness of their ads before they are even launched. This predictive power stems from AI systems trained on extensive datasets comprised of proprietary ad data from myriad successful campaigns.

In traditional advertising, marketers often relied on educated guesses and past experiences to determine which ad elements—such as images, copy, and calls to action—would resonate most with their target audience. This approach, while informed, lacked precision and adaptability. AI changes this dynamic by harnessing the insights gleaned from millions of data points across various campaigns. By analyzing patterns and outcomes from these vast datasets, AI can identify what has historically succeeded and apply these insights to new campaigns.

This process involves extracting and interpreting signals from previous campaigns that indicate certain features or strategies that are likely to succeed. AI then uses this information to make informed predictions about new ads, offering a level of foresight that was previously unattainable. For instance, if data shows that a specific type of messaging consistently performs well with a particular demographic, AI can predict that similar messaging could be effective for a comparable target group in a new campaign.

By leveraging AI's ability to predict ad effectiveness, advertisers can make more informed decisions about where to allocate their budgets and how to design their ads. This not only minimizes wasted expenditure but also maximizes the potential reach and impact of each campaign. The predictive aspect of AI in advertising thus marks a significant shift from reactive to proactive campaign planning, empowering marketers to craft campaigns that are not only creative but also data-driven and strategically sound.

3.3.3. Personalization and Targeting

Personalize Ads Based on What Motivates Consumers: AI's advancement in understanding and predicting consumer behavior has revolutionized how advertisements are personalized, making them significantly more effective at engaging individuals based on their unique motivations.

Today's AI solutions are adept at deciphering the language and content that resonate with different types of people and automatically adjusting ad content to reflect these insights.

For example, AI can discern that User X is more responsive to language emphasizing discounts and value, while User Y might be more influenced by messaging that evokes excitement and joy. This capability allows marketers to tailor a generic advertising message in distinct ways to appeal uniquely to each user. Such personalization extends beyond mere language adjustments, incorporating real-time data to adapt and customize advertising content based on individual user behaviors and environmental contexts. For instance, if a user spends considerable time on pages related to outdoor equipment, an online advertising platform might use AI to dynamically change banner ads to highlight camping gear.

AI tools dive deep into the customer interaction data, creating detailed customer journey maps from awareness to purchase. This extensive data helps marketers understand the effectiveness of different touchpoints and optimize strategies across the marketing funnel. For example, an e-commerce brand could employ AI to analyze a customer's navigation path through their website, enabling refinement of the user interface and personalized product recommendations tailored to the user's interests and behaviors.

Moreover, AI's capability to process various forms of data—from text and voice inputs to facial expressions—allows it to gauge customer emotions and sentiments effectively. This technology can tailor marketing messages and product offers to better match the mood and emotional state of consumers. For instance, sentiment analysis applied to social media posts and reviews can provide invaluable feedback on consumer reactions to a new product launch, enabling brands to make quick strategic adjustments.

During live events or when public sentiment shifts, AI's real-time sentiment analysis becomes a powerful tool for advertisers. By monitoring fan reactions on social media during major sports events, for example, AI can help brands adjust their advertising to either celebrate or commiserate with fans, enhancing emotional connections and maintaining brand sensitivity.

Furthermore, AI's predictive analytics enable advertisers to foresee and act on consumer needs before they are even explicitly expressed. By analyzing data trends, AI can predict when a user might run out of a consumable product and proactively serve ads or reminders to reorder, ensuring seamless consumer experiences and fostering brand loyalty.

Through these methods, AI not only personalizes advertising but also transforms it into a more dynamic, responsive, and effective tool for connecting with consumers at a deeper, more personal level.

Innovative Advertising Formats: The advertising sector is experiencing a transformative shift thanks to the integration of AI technologies, which are enabling the creation and deployment of innovative advertising formats across various new mediums and platforms. As brands strive to captivate and engage audiences in more immersive and interactive ways, AI is at the forefront of this evolution, enhancing both the creation and delivery of advertisements.

Augmented Reality and Virtual Reality (VR) are prime examples of how AI is enhancing user engagement through immersive technologies. Take IKEA's AR application, which uses AI to analyze room dimensions and lighting conditions, allowing users to visualize how different pieces of furniture would look in their own homes. This not only simplifies the shopping experience but also personalizes it, encouraging higher conversion rates. Similarly, Audi's use of VR in their showrooms, which incorporates AI to render vehicles in real-time according to customer specifications, offers a deeply personalized and engaging buying experience that traditional media could never achieve.

Drones, too, are being augmented by AI to revolutionize advertising. AI algorithms process real-time data to perform complex maneuvers and coordinate light shows, as seen in Pepsi's drone displays. These shows captivate large audiences with breathtaking aerial choreography that highlights the brand in a novel and memorable way.

Digital billboards and interactive displays also leverage AI to dynamically alter content based on a myriad of real-time factors such as traffic patterns, weather, and pedestrian demographics. This adaptive content is not only more relevant to the viewer but also more likely to drive engagement. In urban environments, these displays use sensors and AI to detect nearby mobile devices, allowing them to push hyper-targeted content that increases ad effectiveness.

On social media, AI-powered platforms like Instagram, Tik Tok and Snapchat are redefining engagement through the use of interactive ads that incorporate AR filters and smart targeting algorithms. These platforms analyze user interactions to deliver personalized ads that resonate more effectively with individual preferences and behaviors. For example, beauty brands use AR filters powered by AI to allow users to try on makeup shades virtually, making these ads not only fun but also incredibly functional.

Through these advanced applications, AI is not just a tool for automation—it's a powerful ally in crafting engaging, personalized, and innovative advertising experiences that meet consumers where they are, both physically and digitally. As AI continues to evolve, the potential for creating even more sophisticated and impactful advertising strategies is boundless, promising a future where ads are not only seen but truly experienced.

3.3.4. Competitive Analysis and Market Insights

In the competitive landscape of advertising, staying ahead requires not only crafting winning campaigns but also keeping a close eye on the competition. AI technologies have become essential tools for advertisers looking to gain strategic advantages. These advanced tools enable marketers to analyze competitors' advertising strategies comprehensively.

AI-driven platforms provide a wealth of information about competitors' ads. They can track which ads are being run on various platforms, the spending behind those campaigns, and the specific offers being promoted. This level of detail is achieved through AI's ability to aggregate and analyze vast amounts of data across multiple channels, providing insights that were previously difficult or impossible to obtain manually.

This capability allows advertisers to develop a full picture of their competitors' strategies. By understanding what the competition is doing, advertisers can better position their campaigns to differentiate their offers or to directly counter the strategies of their rivals. For instance, if a competitor is focusing heavily on a particular demographic or promoting specific discounts, an advertiser can tailor their marketing efforts to capture or divert attention from those audiences with more compelling offers or targeted messages.

Moreover, these insights are not just reactive; they enable proactive strategy adjustments. Armed with knowledge about competitors' ad timings, budget allocations, and content focus, brands can anticipate market shifts and adjust their strategies accordingly. This might mean altering campaign launches to avoid direct clashes, increasing budgets in under-leveraged platforms where competition is less intense, or refining messaging to highlight unique selling propositions more clearly.

In essence, AI tools do not just "spy" on the competition—they provide a strategic lens through which advertisers can view the entire battlefield, enabling them to make smarter, data-driven decisions that sharpen their competitive edge.

3.3.5. Programmatic Advertising

Programmatic advertising represents a significant evolution in the digital marketing landscape, where AI plays a pivotal role in automating the buying, selling, and placement of ads in real-time across the internet. This technology allows for more efficient and precise ad targeting, ensuring that the right ads reach the right audience at the optimal moment (Osmundson, 2024).

At its core, programmatic advertising uses algorithms and AI to facilitate the instant auction and purchase of digital ad space. This process occurs in milliseconds as a webpage load, determining which ads a specific consumer sees based on their past behavior, demographic data, and more. All digital advertising exchanges and platforms, including programmatic exchanges and third-party networks, leverage AI to manage these transactions. Major social platforms like Facebook, Instagram, and Snapchat also utilize AI to optimize ad delivery based on continuous learning from data.

However, the intricacies of how these AI algorithm’s function are rarely disclosed by the platforms. The algorithms operate behind the scenes, constantly adjusting how advertising budgets are spent, which ads are shown to consumers, and the effectiveness of each campaign. This opacity means advertisers must have a basic understanding of AI technology and its terminology to ask pertinent questions about how their advertising spend is being affected by AI (Ezzat, 2024).

A concrete example of AI at work in programmatic advertising is how Facebook manages ad frequency and relevance scores. These metrics are crucial; they dictate not only the cost of ads but also their visibility to the target audience. While traditional advertising strategies often advocate for high frequency to ensure memorability and engagement, this approach does not necessarily translate well to platforms like Facebook. Here, excessive frequency can lead to user fatigue, resulting in negative feedback that lowers an ad’s relevance score. A lower relevance score

diminishes an ad's likelihood of being displayed, compared to competing ads, potentially increasing the cost and reducing the effectiveness of the campaign.

Understanding this dynamic is crucial. The algorithm's interpretation of user interaction—like how often an ad is deemed irritating or irrelevant by users—can significantly impact the performance and cost-efficiency of ads. Thus, in modern programmatic advertising, success hinges not just on knowing the audience but also on understanding the underlying AI that influences how, when, and to whom ads are shown. This dual focus helps advertisers optimize their strategies to achieve better performance at lower costs, making AI comprehension an indispensable part of digital advertising knowledge.

3.4. AI-Powered Advertising on the Decision-Making Process

Advertising serves a fundamental role in the marketplace: it strategically positions brands and highlights their unique advantages to sway consumer decisions. By showcasing distinct benefits and aligning with consumer preferences and budgets, advertising not only informs but persuades, playing a pivotal role in influencing purchasing decisions. In the era of digital transformation, artificial intelligence has significantly enhanced this dynamic. AI empowers advertisers to deliver more personalized, timely, and effective messages. This integration of AI into advertising strategies not only sharpens the accuracy of targeting specific demographics but also optimizes the timing and content of ads to maximize impact. Through AI, brands can not only communicate their value propositions more effectively but also gain deeper insights into consumer behavior, driving more refined marketing strategies and fostering stronger brand loyalty (Buch and Thakkar, 2021; Ezzat, 2024; Kietzmann et al.,2018).

Bellow we examine how the Consumer Decision Making Process, the methodology that advertisers and marketers employ to identify a customer’s journey from initiation to completion, is evolved with the introduction of AI technologies (Marketing Theories: The Consumer Decision Making Process, 2022).

Understanding of Need: Traditionally, identifying the exact moment a consumer need arises has been challenging. AI, however, allows for a more nuanced understanding of evolving consumer needs in real-time. For instance, Microsoft's Azure platform is used by the media company Astro to analyze billions of data points instantly, identifying consumer needs and dynamically personalizing content to meet those needs. This real-time adaptation ensures that consumer desires are not just met but anticipated, allowing brands to position themselves effectively at the very inception of consumer interest.

Data Search: During the data search phase, where consumers look for options that fulfill their newly identified needs, AI enhances the visibility of brands at critical moments. By utilizing AI-powered search tools, brands can ensure they appear prominently when consumers are making decisions. Google, for example, uses AI to refine search results and ad placements based on a deep understanding of user queries and behaviors, ensuring that the most relevant and personalized advertisements are displayed, thus enhancing the likelihood of engagement.

Analysis of Alternatives: As consumers evaluate their options, AI supports deeper engagement by providing tailored content and recommendations. AI-driven predictive analytics, like those used by online retailers such as ASOS, adjust product offerings in real-time to match consumer preferences, increasing the likelihood of a purchase. Additionally, emotion AI can gauge consumer sentiment and modify marketing strategies accordingly, ensuring that ads and interactions always resonate with the current mood and preferences of the consumer base.

Figure 17: Consumer Decision Making Process (Marketing Theories: The Consumer Decision Making Process, 2022)

Purchase Decision: AI facilitates smoother and more intuitive purchase experiences. An example is Staples' smart ordering system, which uses AI to allow customers to make purchases via voice commands, texts, or emails, simplifying the buying process. Dynamic pricing models, powered by AI, adjust product prices in real-time based on various factors like demand and competitor pricing, as demonstrated by Amazon during high-traffic events like Black Friday. This responsiveness not only meets consumer expectations for value but also enhances the competitiveness of the brand.

After-Purchase Evaluation: Post-purchase, AI continues to play a crucial role. AI-enabled chatbots, like those used by Autodesk, provide immediate customer support, addressing any issues or questions in real time using natural language processing. This immediate support improves customer satisfaction and fosters loyalty. Furthermore, AI systems analyze customer value and predict future behaviors, allowing companies to tailor follow-up communications and engagement strategies effectively, ensuring that the customer relationship is nurtured and that brand loyalty is reinforced.

As we've explored the profound impact of AI across various stages of the consumer decision-making process, it's clear that this technology is reshaping the way brands interact with their audiences. However, the exploration of consumer behavior is extensive and multifaceted. In the next chapter, we will delve deeper into the nuances of consumer behavior, examining how these insights can further enhance marketing strategies and build deeper connections between brands and their consumers. This continued analysis will provide a more comprehensive understanding of the dynamic relationship between consumer actions and marketing responses in the digital age.

3.5. Challenges in AI-Powered Advertising

Adopting AI in advertising brings significant opportunities for precision, efficiency, and engagement. However, it also presents a set of challenges that adopters must navigate carefully to harness AI's full potential effectively. These challenges revolve around data management, ethical considerations, and operational transparency (Kumar, D., 2024; Mittelstadt, 2019).

Data Requirements and Quality

AI systems are inherently data-driven, relying heavily on the quantity and quality of data fed into them. For advertisers, this means that the effectiveness of AI-powered campaigns is directly linked to the richness and accuracy of their data sets. Challenges arise when there is insufficient data, or the data is not representative or up-to-date, which can skew AI predictions and outcomes. Advertisers must establish robust data acquisition and management strategies that ensure continuous access to high-quality, relevant data. This involves not only collecting and storing large volumes of data but also constantly refining data quality through cleaning and processing practices to maintain its relevance and accuracy.

Data Privacy and Security Risks

As AI integrates deeper into advertising strategies, concerns about data privacy, security risks, and compliance with regulatory frameworks like GDPR (EU) or CCPA (US California) become increasingly critical. Advertisers must navigate these concerns meticulously, ensuring that their AI implementations do not breach ethical or legal boundaries. This requires adopting stringent data security measures, transparent data usage policies, and ongoing compliance audits. Educating all stakeholders about the importance of data privacy and embedding privacy considerations into the AI lifecycle from the outset are essential steps in mitigating risks. This subject, along with detailed discussions on how to effectively manage these challenges, will be further analyzed in Chapter 5 of the thesis.

Algorithm Bias and Improvement

AI algorithms can inadvertently propagate biases if the data on which they are trained is biased or if the algorithmic design has inherent flaws. For example, if an AI advertising system is predominantly trained on data from a specific demographic—say, middle-aged consumers—it may not perform effectively for younger or older audiences, potentially leading to skewed advertising targeting. This can result in decisions that might alienate or unfairly treat certain groups of consumers by not displaying relevant ads, or worse, by reinforcing stereotypes. To address this

challenge, adopters need to continuously monitor and update their algorithms to ensure fairness and neutrality. This process includes employing techniques for unbiased data collection, ensuring diversity in training datasets, and implementing algorithm audits to detect and correct biases. Regularly revising the input data and algorithmic strategies in this way helps maintain an equitable advertising approach that accurately and fairly targets all segments of the population (Manyika et al., 2015; Campolo et al., 2017).

Transparency and Explainability

AI systems can often seem like "black boxes," where the decision-making processes are not transparent, making it difficult for users to understand how decisions are made. This lack of transparency can be problematic, especially when decisions need to be explained to customers or regulators. To build trust and manage accountability, it is crucial for advertisers to strive towards making AI processes as transparent and explainable as possible. This might involve developing AI models that are inherently more interpretable or using tools and frameworks that help elucidate how AI models make specific decisions (Buolamwini & Gebru, 2018).

Chapter 4:
Consumer Behavior in the Context of AI Advertisements

4.1. What is Consumer Behavior?

Understanding consumer behavior is pivotal in comprehending how individuals, groups, and organizations engage with the marketplace, particularly in the era of digital transformation and the growing influence of artificial intelligence. Consumer behavior investigates the processes involved when people select, purchase, use, and dispose of products and services, encompassing a wide range of activities and intrinsic factors that influence their decisions.

At its core, consumer behavior integrates insights from various disciplines such as psychology, sociology, social anthropology, and economics to analyze the diverse actions and underlying motivations of consumers. These analyses include studying the emotional, attitudinal, and preferential aspects of consumer choices, which are crucial for businesses aiming to understand and predict buying patterns. As Gkikas and Theodoridis (2021) suggest, AI's contribution to consumer behavior lies in enhancing our understanding of these complex processes by providing tools that can interpret and anticipate consumer actions more accurately and personally.

Furthermore, consumer behavior also explores the concept of free will in the context of consumer choices, emphasizing the role of self-control, carefully planned action, and logical decision-making in purchasing behaviors. This aspect of consumer behavior reflects a broader societal framework where cultural, social, and individual diversity plays a significant role in shaping purchasing decisions. The advent of digital technology, particularly AI, challenges and expands these notions, as traditional in-person transactions shift to dynamic online interactions.

The transition from traditional storefronts to online platforms has revolutionized the way consumers' access and acquire goods. This digital evolution has not only changed the marketplace as the market becomes increasingly heterogeneous, the task of understanding consumer purchasing behavior grows more complex and challenging. Entering the mind of consumers to grasp this behavior is one of the greatest challenges facing companies and researchers today. Their work highlights the complexity of navigating consumer behavior from a marketing perspective, underscoring the need for continued research and adaptation in strategies to achieve success in these diverse markets (Jorge et al., 2019).

In sum, consumer behavior is a dynamic and evolving field that requires a deep understanding of interdisciplinary theories and the application of these theories in a rapidly changing digital world. By examining how consumers make choices within this modern context, businesses can better tailor their products and services to meet the increasingly personalized demands of their customers.

4.2. Advertising and Consumer Behavior

Advertising is essentially about influencing people at the right moment when they're open to it. This happens at various "touch points" which are essentially moments when customers are deciding what to buy. These touch points make up what's known as the "funnel," a term that describes the customer's journey from considering many options to making a final purchase. The goal of marketing is to simplify this funnel, guiding customers toward a smaller set of choices.

However, today's well-informed customers and the rise of digital platforms and global markets make it tough to pinpoint these touch points (Gkikas & Theodoridis, 2021).

The process that customers go through before making a purchase has become much more complicated, leading companies to adopt new overall marketing strategies. Nowadays, companies are realigning themselves to adapt to these challenging conditions. They're finding new, intelligent ways to track consumer habits, improve brand effectiveness, and handle large amounts of personal data effectively. By using artificial intelligence, companies can better understand their customers, manage the marketing funnel, enhance advertising campaigns, and increase customer satisfaction with personalized solutions and product recommendations.

4.2.1. Exposure to advertisements

It is notably challenging to derive scientifically reliable estimates of the average daily exposure to advertising. Empirical research suggests that an individual encounters over 700 advertisements each day, which translates to a substantial annual exposure rate. This figure is expected to climb further due to the increasing consumption of digital media, coupled with consumers' growing propensity to rapidly switch between media content and engage with multiple media platforms simultaneously. This escalating exposure raises critical questions about how such high levels of advertising influence information processing. For global businesses, a significant challenge lies in understanding the effects of online stimuli on consumer behavior. This understanding is essential for comprehending the profound and lasting changes in consumer behaviors. As a result, this situation becomes increasingly complex for brands and organizations, particularly for advertisers who must strategically leverage available resources to captivate consumers' attention (Bell et al., 2022; Singh et al., 2024).

4.2.2. Consumer Autonomy

The era of AI brings together three key players: consumers, decision-makers, and algorithms. Consumers now have access to products and services that meet their needs at unprecedentedly low costs. Decision-makers, on the other hand, see benefits in AI because segmenting consumers leads to fewer overall searches but more personalized recommendations, which they believe can boost transactions and simplify decision-making processes. AI algorithms play a critical role by collecting, storing, analyzing, and finding patterns in vast amounts of user data each day, helping decision-makers to make more informed choices (Gkikas and Theodoridis, 2021).

The concept of "Autonomous Customer 2015: On Hold for Intelligent Customer Service" highlights that consumers value their freedom of choice as a core part of their identity and independence. The role of AI in enhancing consumer autonomy should therefore focus on serving people, ensuring that automated decisions are balanced, operate within defined rules and boundaries, and most importantly, support self-determined choices.

Several factors influence consumer autonomy, including an inherent, though not fully understood, desire for choice—even when the selection process requires minimal effort. Not only do

consumers enjoy the process of making purchases, which gives them a sense of pleasure, but they also place high value on the ability to make autonomous choices (André et al., 2017).

In conclusion, AI-driven personalized content and audience segmentation seem to be beneficial for consumers, helping them to enjoy high-quality services tailored to their needs. These services include convenience, lower costs, readily available products, better recommendations, and integrity.

4.2.3. Echo Chambers

AI-driven advertisements have become a staple in digital marketing, leveraging algorithms to deliver highly targeted content to users. This technology excels in creating efficiencies and ensuring relevance by aligning closely with consumers' existing preferences. However, even though consumer autonomy is enhanced, this practice often leads to the formation of "echo chambers," where users are continually exposed to similar ideas and opinions that reinforce their existing beliefs (Gao et al., 2023).

Echo chambers occur when consumers' views are amplified and echoed back to them, creating a feedback loop that limits exposure to diverse perspectives. In the realm of advertising, this means that consumers are frequently presented with products and services that resonate with their established interests. While this can enhance the user experience by providing content that seems particularly relevant and engaging, it also risks narrowing the spectrum of consumer choices and stifling diversity and innovation in the marketplace.

Figure 18: The Echo Chamber (Gao et al., 2023)

Echo chambers reinforce cognitive biases, particularly confirmation bias, where individuals favor information that reinforces their preconceived notions. This predisposition can lead to a skewed perception of reality, making consumers susceptible to misleading information, false news, and rumors, which can have detrimental social impacts.

The concept of echo chambers extends beyond mere consumer behavior, significantly impacting societal norms and political discourse. For instance, during the 2016 and 2020 U.S. presidential elections, targeted advertising contributed to the formation of isolated information bubbles. These bubbles can intensify political polarization by limiting exposure to opposing viewpoints and can also facilitate the spread of misinformation (Duff, 2024).

One of the most crucial steps in addressing the challenges posed by echo chambers is to enhance consumer awareness. Many users remain unaware of how their online behavior influences the content and advertisements they encounter. This lack of awareness is generally harmless but educating consumers about data privacy, the mechanics of targeted advertising, and how to manage their digital footprints can empower them to make more informed decisions.

By increasing transparency and fostering a better understanding of how algorithms shape online experiences, we can mitigate the effects of echo chambers. This shift not only demands changes from digital marketers but also calls for users to engage critically with the content they consume. This dual approach will help in balancing the benefits of targeted advertising with the need for exposure to a broader range of ideas and products, ultimately supporting a more informed and diverse society.

4.3. AI: Awareness and Acceptance

Trust and the practical applications of AI are significant factors that shape public opinion and engagement with the technology. The widespread introduction of solutions like ChatGPT, DALL-E 3, and Gemini AI has significantly expanded the scope for creativity in advertising. These technologies not only allow the public to interact freely with AI, playing a crucial role in shaping opinions, but also help them understand its capabilities, albeit limited but significant.

Generative artificial intelligence is poised to play an increasingly important role in the industry, and many consumers are aware of this. However, the vast range of applications of AI can make it challenging for consumers to form a definitive opinion about the technology. Additionally, these opinions may fluctuate over time and vary depending on the context in which AI is used. This variability underscores the complexity of public perceptions towards AI and its multifaceted impact on daily life (Gerlich, 2023).

4.4. Consumers Perceptions and Concerns

In this section of the thesis, we aim to explore and analyze the diverse perceptions and concerns that have emerged in the contemporary market, which are inherently linked to the proliferation of AI-driven advertising. To accomplish this objective, we conducted a comprehensive review of the

literature, focusing on case studies and research that investigate consumer perceptions and concerns related to this topic.

4.4.1. Personalization

Personalized advertising (PA) also known as personalized ads, is a rapidly growing trend within the realm of online advertising. Leveraging sophisticated data collection methods, marketers are now able to design advertisements that appear custom-made for each individual. Prominent platforms like YouTube, Facebook, Instagram, and Gmail and many web pages are increasingly adopting this approach, featuring personalized banner and text ads.

Thanks to advancements in data gathering and artificial intelligence, PA enables the identification and analysis of individual consumer behaviors. This approach ensures that the advertisements presented are not only more relevant but also more engaging, as they are constructed based on detailed consumer data and preferences that are either explicitly provided or inferred from their past online (and not only) activities.

According to a 2018 Salesforce report, contemporary consumers increasingly demand a seamless and personalized experience. In today's digital age, individuals encounter a higher volume of advertisements through social media platforms and various websites. Consequently, there is a growing expectation for these advertisements to resonate with their specific interests and needs—a trend supported by substantial evidence.

Research by Mueller and Castro in 2021 indicates that consumers are five times more likely to engage with personalized advertisements compared to generic ones. Additionally, seven out of ten internet users in Europe express satisfaction with personalized ads, highlighting their preference for advertising that reflects their personal tastes and requirements.

According to a survey conducted by Ipsos across 54 countries about Facebook, which interviewed over 58,000 people aged 18 and older in 2021, we obtained some intriguing findings.

Figure 3: European internet users are happy with personalized ads[42]

Figure 19: Europeans happy with personalized ads

a) A large majority agree they understand why they are being shown the ad. (*84% of people in the US, 78% of people in the EU, 84% of people in Brazil, 83% of people in Kenya, 74% of people in Morocco, 74% of people in South Korea, 91% of people in Thailand*)

b) Most agree personalized ads show information and products of interest. (*75% of people in the US, 73% of people in the EU, 85% of people in Brazil, 84% of people in Kenya, 80% of people in Morocco, 74% of people in South Korea, 91% of people in Thailand*)

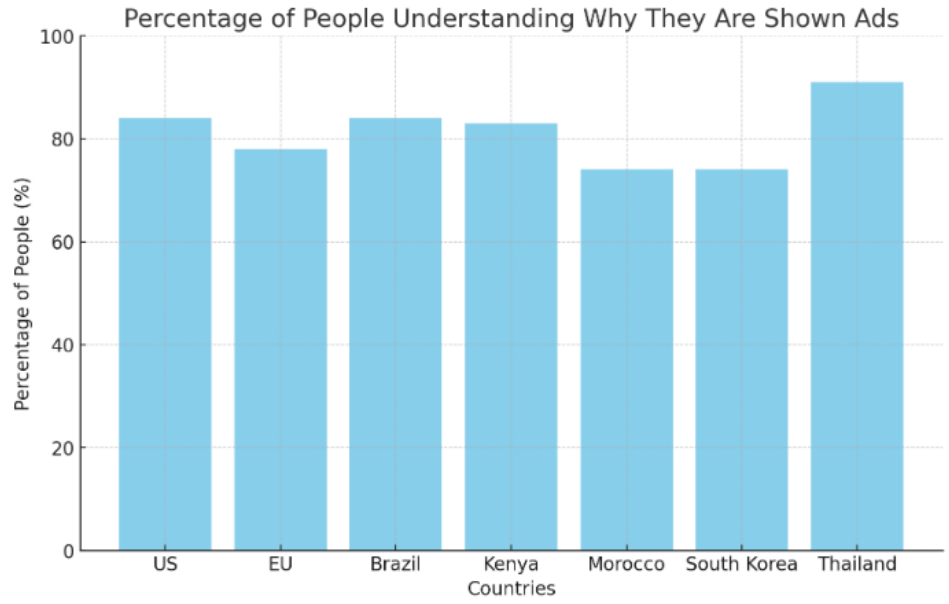

Figure 20: Percentage of people that understand why they are being shown the ad

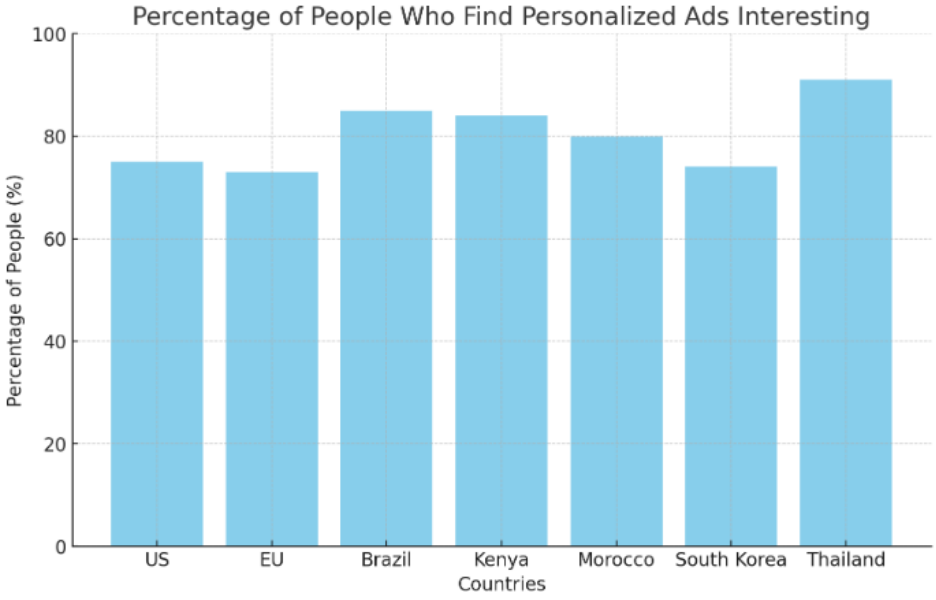

Figure 21: Percentage of people that agree personalized ads show information and products of interest

c) Some agree personalized ads help save money (e.g., finding discounts and lower prices), with considerable variation by country. (*22% of people in the US, 33% of people in the EU, 57% of people in Brazil, 64% of people in Kenya, 50% of people in Morocco, 38% of people in South Korea, 59% of people in Thailand*)

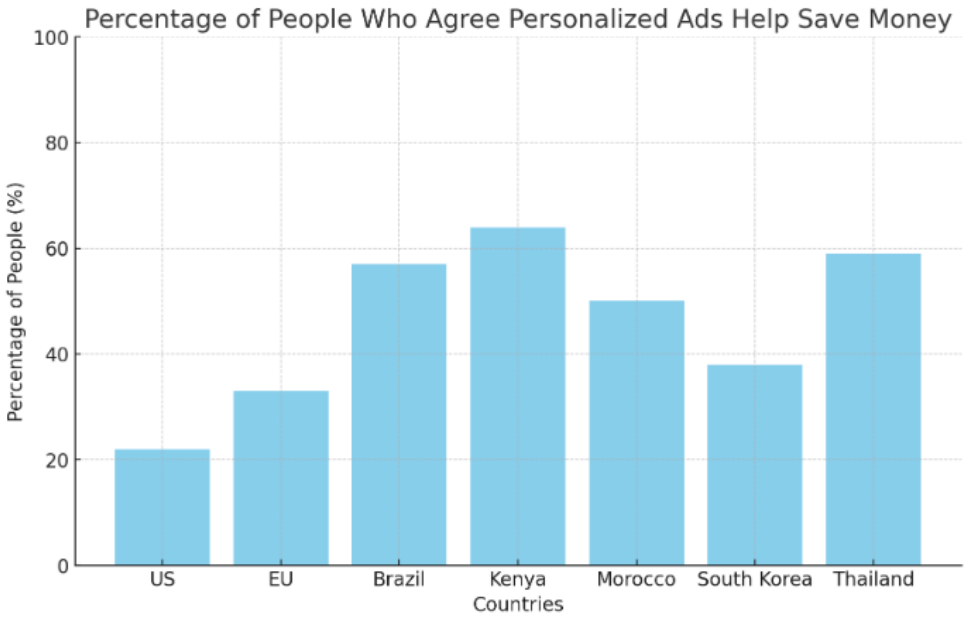

Figure 22: Percentage of people that agree personalized ads help save money

4.4.2. Perceived Personalization

Perceived personalization refers to how individuals perceive the customization of content or ads as being specifically tailored to them, which can differ from actual personalization that is based on specific data like demographics or behavior. Understanding the factors that lead to a higher perception of personalization is crucial to drawing accurate conclusions about its effects. In this context, a study conducted in 2022 by De Keyzer et al. explored how different elements of actual personalization—such as age, gender, location, life events, interests, and friend referrals—influence the perception of personalization in Facebook ads. This research utilized conjoint analysis to examine six product categories (a bank, a smartphone, tableware, furniture, a restaurant, a fashion retailer) with 595 consumers in the United States.

The findings from the study suggest that all the examined personalization elements positively impact the perception of personalization. However, some elements, notably interests, location, and age, are more effective in creating a strong perception of personalization. These elements emerged as the most significant in enhancing perceived personalization, consistent across different product perceptions such as product category involvement, product qualities, and buying motivations, as well as across varied socio-demographic profiles including gender, age, and education.

Table 9
Conjoint analysis for perceived personalization: pooled across demographic characteristics.

Attribute	Level	Men		Women		Age: under 27		Age: over 27		Education: low		Education: high	
		Part-worth	Importance	Part-worth	Importance	Part-worth	Importance	Part-worth	Importance	Part-worth	Importance	Part-worth	Importance
Location	Not mentioned	−0.170	19.176	−0.166	17.938	−0.215	19.776	−0.116	17.467	−0.170	19.177	−0.161	17.503
	Mentioned	0.170		0.166		0.215		0.116		0.170		0.161	
Age	Not mentioned	0.164	17.699	−0.172	17.471	−0.121	17.370	−0.198	17.910	−0.142	17.477	−0.149	18.525
	Mentioned	0.164		0.172		0.121		0.198		0.142		0.149	
Gender	Not mentioned	−0.057	14.766	−0.099	16.173	−0.065	15.299	−0.076	15.675	−0.051	15.738	−0.050	14.907
	Mentioned	0.057		0.099		0.065		0.076		0.051		0.050	
Life-event	Not mentioned	−0.015	13.606	−0.018	13.753	−0.042	13.518	0.004	13.324	−0.012	13.618	−0.014	13.131
	Mentioned	0.015		0.018		0.042		−0.004		0.012		0.014	
Interests	Not mentioned	−0.210	20.969	−0.221	20.934	−0.243	21.384	−0.175	20.473	−0.220	20.355	−0.144	21.108
	Mentioned	0.210		0.221		0.243		0.175		0.220		0.144	
Friend referrals	Not mentioned	−0.081	13.784	−0.071	13.730	−0.061	12.653	−0.092	15.151	−0.069	13.636	−0.092	14.826
	Mentioned	0.081		0.071		0.061		0.092		0.069		0.092	
Constant		4.199		4.296		4.195		4.292		4.091		4.363	

Notes: $R_{men} = 0.998$, $p < .001$; $R_{women} = 0.998$, $p < .001$; $R_{under\ 27} = 0.995$, $p < .001$; $R_{over\ 27} = 0.999$, $p < .001$; $R_{low\ education} = 0.996$, $p < .001$; $R_{high\ education} = 0.997$, $p < .001$.

Figure 23: Importance of elements that affect personalization

The study conducted by De Keyzer et al. in 2022 provides valuable insights into how different personalization elements affect the perception of personalization in Facebook ads. However, it is important to acknowledge certain limitations and identify opportunities for future research. One of the primary limitations is the focus on only six personalization elements—age, gender, location, life events, interests, and friend referrals. While these elements are commonly used in advertising on social networking sites and have been identified as particularly useful or annoying, the study did not explore other potentially influential elements. Future research could expand on this by examining additional factors such as the respondent's name, work status, income, and online behavior, which could provide further insights into their relative importance in perceived personalization.

Additionally, the reactions of consumers to personalized advertisements may vary across different social media platforms, even though these platforms may utilize similar personalization techniques. This variation suggests an opportunity for future studies to investigate how the context of different social media environments impacts the effectiveness of personalized advertising.

It is also crucial to note that while the study offers a good initial indication of how perceived personalization operates, its findings cannot be generalized across all settings or populations. The specific results are tied to the selected personalization elements and the platform studied (Facebook). Future research could broaden the scope to include diverse platforms and a wider range of personalization elements to better understand the nuances of perceived personalization across various digital environments. This approach would enhance the applicability and relevance of the research findings to a broader array of advertising strategies and technologies.

4.4.3. Relevance vs Creepiness

Personalized advertising is increasingly recognized for its effectiveness in the synchronous AI-driven marketing, as it seems to provide more targeted and relevant content than non-personalized approaches. However, a study conducted by De Keyzer, Van Noort, et al. (2022) explored the dual effects of PA, revealing that while it can enhance relevance, it may also evoke feelings of creepiness or invasion of privacy among consumers.

The study utilized a factorial survey featuring a 3x4 between-subjects design to investigate the effects of low, moderate, and high levels of personalization across four different source types—health, governmental, commercial, and news. It specifically targeted, similarly to the previous case

Facebook users, accounting for their varying usage patterns, such as hours spent per day and days active per week on the platform. The sample comprised 619 participants from the Netherlands, who had an average age of 45,73. These individuals provided valuable insights into how different levels of personalization interact with user habits and the type of content source.

	Perceived creepiness of the advertisement		Perceived relevance of the advertisement	
	Mean	SD	Mean	SD
Low level of personalization	1.97	1.38	3.21	1.62
Moderate level of personalization	2.49	1.68	2.76	1.55
High level of personalization	2.69	1.69	3.02	1.70

Figure 24: Perceived personalization and creepiness

Creepiness in marketing is described not as the presence of an actual threat but the uncertainty of a threat. The study's hypothesis (H1) proposed that higher personalization levels would increase perceived creepiness, leading to less favorable attitudes towards the source. The results confirmed that moving from a low to a moderate level of personalization notably increases creepiness, but further increases to a high level do not exacerbate this feeling. Thus, the threshold for perceived creepiness occurs between low and moderate personalization levels.

Conversely, the research anticipated that higher personalization would enhance the relevance of ads (H2). Unexpectedly, findings showed that a moderate level of personalization decreased perceived relevance, and increasing it further to a high level did not significantly alter this perception. It suggests that there might be a diminishing return on perceived relevance with higher personalization levels.

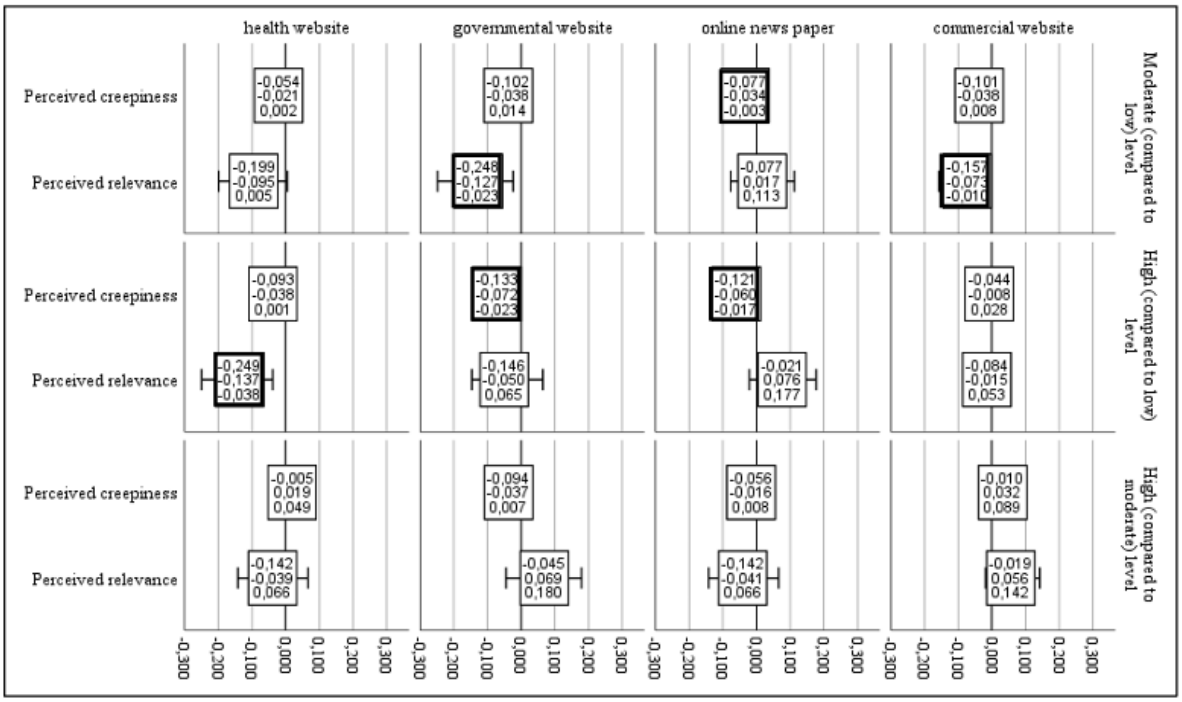

Figure 25:Perceived relevance and creepiness correlation

The study also investigated whether different source contexts affected consumer attitudes through perceived creepiness and relevance. It found that personalization's negative impacts through perceived creepiness were particularly evident in governmental and news contexts, where using personal information was deemed inappropriate. However, in health and commercial settings, such as on health websites and online stores, creepiness was not a significant factor

These results suggest several future research directions. Further studies could explore additional personalization elements and examine the specific conditions under which personalization may either benefit or hinder marketing efforts. Moreover, understanding the varying effects of personalization across different social media platforms could offer deeper insights into crafting more effective advertising strategies that minimize creepiness while maximizing relevance.

In summary, while the findings from De Keyzer et al.'s study provide a compelling look at the dynamics of personalized advertising, they highlight the complex balance between effectiveness and consumer comfort, indicating that the strategy's success may heavily depend on the level of personalization and the context in which it is used.

4.5. Consumer Satisfaction & Loyalty

Satisfaction is a key measure used in business to determine how well products or services meet customer expectations. According to the expectancy-confirmation model, if a product or service performs better than expected, customers are likely to be satisfied. In communication research, user satisfaction is an essential measure of user experience, often seen as a general sense of pleasure from regular media use, encompassing long-term average outcome expectations (Cheng & Jiang, 2020).

Research has shown that how satisfied users are with their media use depends on the benefits they get from it. Studies have shown that things like socializing and getting support from others greatly influence how happy users are with social networking services. These studies also show a clear connection between how appealing the media is and how it meets users' basic needs, with practical, enjoyable, and social aspects all leading to greater user satisfaction.

In addition to influencing continued use intentions, scholars believe that loyalty is a significant outcome of user satisfaction. Loyalty is often seen as customers' long-term commitment to repeatedly choose their preferred brands, even when other competitors try to attract them with their marketing efforts. Past research has shown the importance of user satisfaction in building loyalty among long-term users. For example, how satisfied customers feel about a service can also increase their trust in recommendation agents, which then affects their likelihood to buy a brand's products or services. Additionally, the fun and pleasure customers experience when using new technologies such social media or chatbots can lead to a positive brand image, higher purchase intention, and improved brand awareness (Brill et al., 2022; Maiwald, 2019).

Satisfaction and loyalty are achieved through AI's ability to forecast user preferences and behaviors, leading to the creation of highly personalized ads that align with individual interests and needs. This tailored approach ensures that customers receive content that is most relevant and appealing to them, thereby enhancing their satisfaction. Moreover, as AI adapts based on user

interactions, the accuracy of these targeted ads improves, nurturing a stronger bond and loyalty to the brand. This dynamic role of AI in advertising not only enhances the success of campaigns but also cultivates a robust, loyal customer base by consistently fulfilling and surpassing customer expectations.

4.6. Persuasiveness

Persuasion, defined as the act of influencing others to adopt certain beliefs or take specific actions, is an essential part of human interaction and significantly impacts sectors like business and politics. Recent advancements in artificial intelligence have led to the development of systems capable of affecting human behavior, encouraging individuals to buy products, watch videos, click on search results, and more. Sometimes, systems not explicitly designed for persuasion can still influence users. Notably, AI systems that mimic human appearance and behavior can forge lasting relationships with users, greatly enhancing their persuasive power. These developments underscore the changing dynamics of AI in advertising, where the ability to subtly sway consumer decisions is increasingly refined (Burtell & Woodside, 2023).

Personalization in AI advertising is essential for boosting consumer persuasion by tailoring advertising messages to individual consumer personalities. AI effectively enhances persuasion by analyzing consumer traits and matching them with appropriate advertising content. For consumers with neurotic traits, it's crucial to mitigate perceived risks and highlight cues for social acceptance and achieving goals. Conversely, extroverted consumers are more receptive to ads that resonate with their social and achievement-oriented inclinations. By customizing messages based on these personality insights, AI ensures consumers receive the most relevant and appealing content, enhancing engagement and marketing success. This targeted approach not only enriches the user experience but also leads to more effective marketing campaigns (Shumanov et al., 2021; Matz et al., 2024).

An intriguing case study by Matz et al., 2024, offers some of the earliest empirical evidence that AI technologies such as Large Language Models (LLMs) can fully automate the process of designing and implementing personalized persuasion. This study demonstrates that OpenAI's ChatGPT can generate personalized persuasive messages that effectively influence people's attitudes and intended behaviors. This breakthrough illustrates the potential of AI in transforming how businesses engage with consumers by tailoring messages to individual preferences and enhancing the effectiveness of marketing strategies.

Studies 1a and 1b explored if personality-tailored messages generated by the pre-trained Transformer model ChatGPT-3 could enhance the perceived persuasiveness of those messages. Additionally, Study 1b examined whether awareness that the messages were AI-generated and designed to target specific personality traits affected this perception. The studies focused on the Big Five personality traits, which are well-validated and known to predict various preferences and life outcomes. These traits include Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism.

The research employed linear regression analyses to determine if people preferred personalized messages automatically generated by GPT-3. The findings supported the hypothesis, revealing that participants' traits of Openness, Conscientiousness, and Extraversion significantly influenced their preferences for ads tailored to these traits, while Agreeableness showed no significant effect.

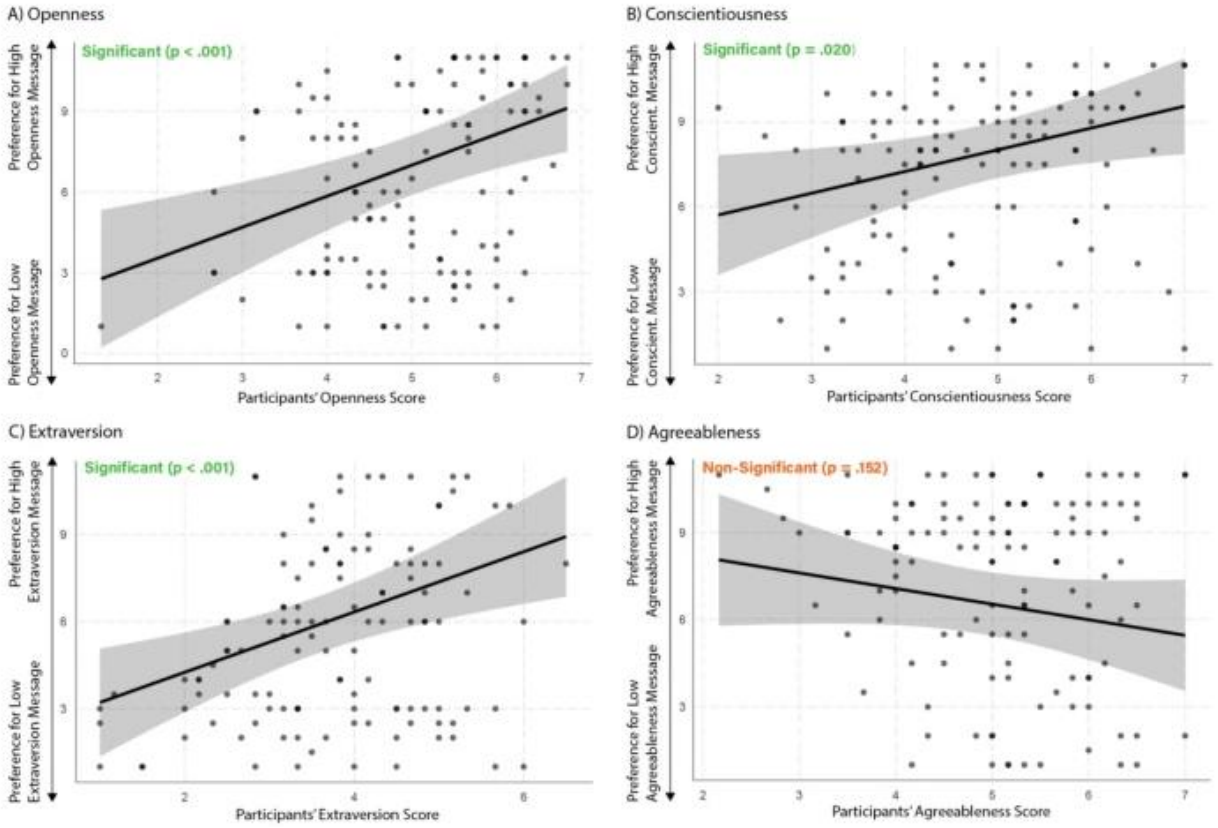

Figure 26: Effects of Big Five personality traits on effectiveness ratings for the respective ads.

In Study 1b, using the full sample, the results were replicated, confirming that Openness, Conscientiousness, and Extraversion, but not Agreeableness, influenced preferences for AI-generated, trait-tailored ads. Additionally, the study found that the impact of personality matching was not affected by participants knowing about the AI's involvement and the ads' targeted nature.

Study 2 expanded on these findings by testing the generalizability of the effects with a broader set of stimuli and psychological characteristics. This included using ChatGPT to generate ads for products like Nike sneakers, tailored to the Big Five traits, messages encouraging exercise tailored to regulatory focus, and political appeals for climate action tailored to moral foundations. The study confirmed that Openness and Extraversion significantly influenced ad preferences, with no significant effects found for Conscientiousness or Agreeableness.

For health behavior messages and climate change appeals, the study observed matching effects with certain moral foundations and political ideology, showing that these could predict preferences

for corresponding ads. However, the results varied for willingness-to-pay measures, where the effects were generally weaker but consistent with broader behavioral patterns.

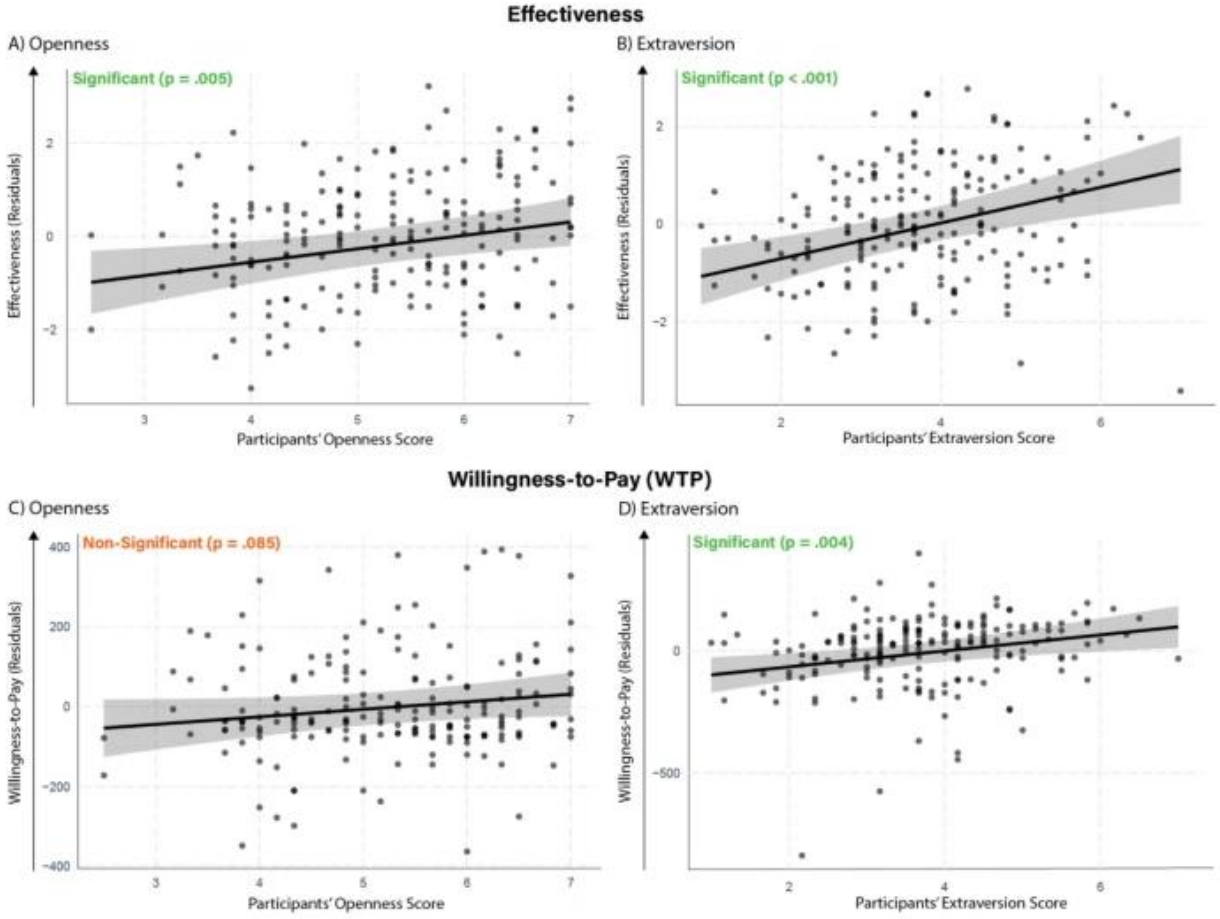

Figure 27: Effects of Big Five personality traits on effectiveness ratings and WTP for the respective ads.

In subsequent studies (3a, 3b, and 3c), the potential for AI-generated matching effects was tested under more conservative conditions to validate the real-world applicability of the findings. These studies replicated the earlier results, showing that Openness and Extraversion influenced the effectiveness of AI-generated messages and, to a lesser extent, the willingness to pay for advertised products or causes. The studies also found that political ideology influenced persuasiveness scores and donation amounts for political messages. These findings underscore the potential of AI to enhance personalized persuasion by aligning messages with individual psychological profiles.

In conclusion, the findings of this study likely represent a cautious estimate of generative AI's potential to enable personalized persuasion on a large scale. The research used limited information about the target's psychological profile, focusing on basic traits and simple prompts. This approach reflects real-world situations where detailed information about individuals is often scarce. Despite this, the study shows the significant impact of generative AI on persuasion. The effectiveness of AI-driven personalized persuasion could greatly improve with more detailed insights into the target's personality. Additionally, the rapid advancements in AI technologies and the use of other

persuasive tools, such as visual stimuli, suggest that generative AI's effectiveness in personalized persuasion will continue to increase.

4.7. Awareness and Demand for Privacy

The concept of consumer privacy within the advertising sphere is often described as 'information privacy' or 'data privacy'. This is defined as the right of individuals, groups, or institutions to decide when, how, and to what extent their information is shared with others. At the heart of this definition is the principle that individuals should have control over their personal information (Boerman & Smit, 2022).

Advancements in digital communication and technology have empowered advertisers to gather, store, analyze, utilize, sell, and disseminate consumer data to create personalized advertising campaigns. However, this capability poses a significant challenge: safeguarding consumer privacy. While consumers recognize the advantages of personalized ads, such as more relevant content and economic benefits, many are also significantly concerned about their privacy due to the ongoing collection and usage of their personal data.

In response, today's consumers are increasingly demanding that privacy protections keep pace with the sophisticated AI technologies that rely on their personal data. As AI technology progresses, the need for data grows, requiring a careful balance between the use of data and the preservation of privacy.

This challenge involves more than just compliance with regulations like the GDPR or CCPA; it's about shaping an ethical stance on AI and privacy that can build and maintain consumer trust.

It is also valuable to explore how aware consumers are of AI features and what their expectations are regarding the benefits and risks of increasing AI implementation in the field of advertising. (Ecdb, 2024)

4.7.1. Privacy and Data Security Concerns Predominate

The demand for privacy and data security is not a new phenomenon, but it has gained significant momentum in recent years. In early 2024, a survey was conducted among U.S. online shoppers to gauge their expectations, concerns, and awareness regarding artificial intelligence and its use in the realm of digital commerce. The results offer a comprehensive insight into the consumer psyche surrounding the burgeoning use of machine learning algorithms and their implications for personal data security.

The survey revealed that a significant majority of online shoppers—70%—are primarily concerned with privacy and data security issues. This high level of concern underscores a widespread apprehension about the capacity of AI to connect disparate data points and process extensive information sets, potentially compromising the confidentiality and integrity of personal data.

The analysis of responses based on gender highlighted that female shoppers are slightly more likely than their male counterparts to express unease about privacy and data security, with 72% of

female respondents citing it as a concern compared to 67% of males. This indicates a gender disparity in perception and priority given to personal data security in the context of AI-driven online shopping environments.

The survey also explored how concerns about privacy and data security vary across different age groups. While apprehensions about AI and data privacy are significant across the board, they show a gradual increase with age.

The survey also investigated how concerns about privacy and data security differ across various age groups. While apprehensions regarding AI and data privacy are consistently significant among all demographics, the data revealed a subtle but noticeable trend: as age increases, so does the level of concern about data and privacy. Although the overall differences are slight, this gradual increase suggests that older consumers may become more aware and cautious about their personal information and how it is handled in digital environments.

4.7.2. Disclosure Intentions, Trust and Trade-offs

In psychological research, the concept of self-disclosure originally pertains to the deliberate revelation of personal information by an individual to others or within a community. With the advent of digital platforms, individuals are increasingly confronted with frequent decisions about disclosing data. Online data disclosure occurs in various contexts, each with distinct purposes, recipient types (individuals or corporations), and data sensitivity levels. For instance, in e-commerce, sharing data typically facilitates functions like user authentication through registration forms, online transactions by providing financial details, or customization of products and services through customer profiles. Conversely, in online social networks, personal information is often shared to connect with other users or enhance one’s self-esteem.

What unifies these diverse online activities is the significant privacy implications of data disclosure, which diminishes the "selective control of access to the self." Sharing personal details with others, especially strangers, allows them to acquire intimate knowledge about a person, potentially exposing them to exploitative behaviors. The sensitivity of disclosing data, already a concern in offline, interpersonal contexts, is magnified online where anonymity and the absence of traditional social cues complicate decisions about sharing personal information. Furthermore, once data is disclosed online, it is often unclear who ultimately gains access to it (Quach et al., 2022).

According to the Privacy Calculus Theory, the decision to disclose personal data is the outcome of a rational comparison between potential risks and perceived benefits. This decision-making process considers both the risks associated with the type of data shared and the benefits offered in return (Culnan & Armstrong, 1999).

However, as highlighted by Norberg et al. (2007) in their discussion of the Privacy Paradox, there is a discrepancy between people's stated intentions and their actual data disclosure behaviors. This paradox makes it challenging to understand decision-making in data privacy. While intentions to disclose are primarily driven by risk assessment, actual disclosure is more influenced by trust in the recipient organization.

Trust in the recipient plays a critical role in decisions about data disclosure. A lack of trust can lead to withholding data, often driven by the binary nature of privacy policies that force users into an all-or-nothing decision. Providing more nuanced control options could enhance user trust in the organizations seeking personal data.

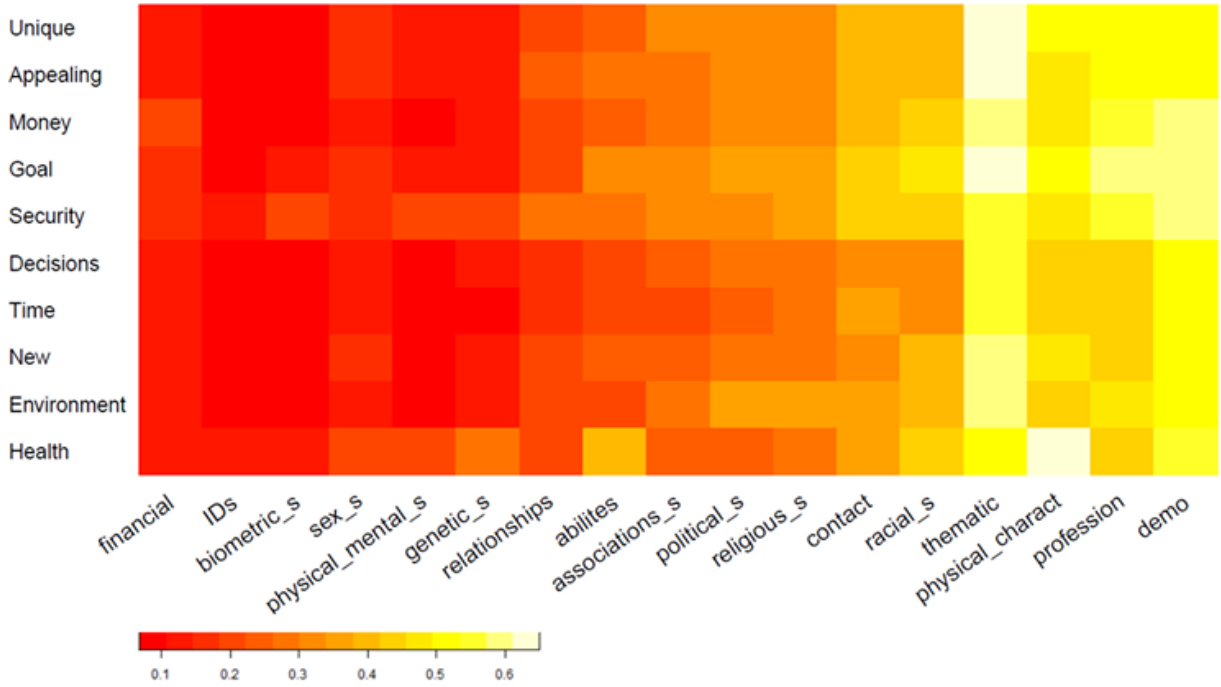

Figure 28: Heat map of data categories intended to be disclosed (Wadle et al., 2019)

Despite general privacy concerns, individuals may still choose to disclose personal data if the specific benefits presented outweigh the potential risks, as demonstrated in multiple studies (Wadle et al., 2019). This indicates that the decision to share personal information is not solely based on privacy concerns but involves a calculated assessment of both the risks and rewards involved.

The study from Wadle et al. (2019), conducted with among 1.121 people in Germany focusing on the trade-off between the intention of data disclosure and the benefits of personalization revealed that individuals are more likely to share personal data when they perceive significant benefits from personalization. This observation supports the Privacy Calculus Theory, where the decision to disclose data hinges not just on privacy concerns but also on the perceived utility of personalized services. The findings indicate that personalization can be a compelling reason for users to override their privacy reservations, emphasizing the crucial role of perceived benefits in influencing data disclosure decisions.

Data Sensitivity and Disclosure Frequency: The study finds a clear correlation between the sensitivity of data and its frequency of disclosure. Sensitive data, such as financial information or genetic data, is disclosed less frequently across all benefit scenarios. This suggests a strong privacy concern among participants when it comes to information that could potentially lead to significant personal or financial harm if misused. The reluctance to disclose sensitive data aligns with general

privacy norms and legal standards, such as those outlined in the GDPR, which provide stricter guidelines for handling sensitive information.

Influence of Benefit Scenarios: The intention to disclose data also varies significantly depending on the benefit scenarios presented. Data disclosure is more likely when the benefits are directly relevant to the type of data being requested. For example, health-related data is disclosed more frequently in scenarios where the benefits are related to health improvements or personalized healthcare solutions. This indicates that individuals are more willing to share personal information when they perceive a direct and tangible benefit that enhances their personal well-being or security (Table *Heat map displaying the relative frequencies data categories were intended to be disclosed with for all combinations of benefit scenarios and data categories*).

Homogeneity and Heterogeneity in Data Categories: The study highlights that some data categories, like demographic information, tend to be disclosed more uniformly across different scenarios, suggesting lower levels of sensitivity and concern. In contrast, other categories display more heterogeneous patterns, indicating that the decision to disclose can be highly contextual and dependent on the specific benefits promised. For instance, data concerning someone's abilities might see increased disclosure rates in contexts where such data can enhance personalized services or outcomes.

Special Categories of Data: The results show that special categories of data (as defined by GDPR) are generally disclosed less frequently than non-special categories. This reflects a cautious approach towards data that is legally recognized as sensitive. However, deviations from this pattern in specific scenarios suggest that the context of the benefit can override general caution, leading to higher disclosure rates when participants see a clear linkage between the data and the benefit.

Interaction Effects: The interaction between benefit scenarios and data categories is particularly insightful. It reveals that not all data types are equally likely to be disclosed in all scenarios. This interaction effect highlights the complexity of decision-making processes in data privacy, where individuals must continually assess the relevance and risks associated with data sharing in light of varying benefits.

Overall Disclosure Trends: Across all findings, there is a clear gradient in data disclosure intentions, influenced by both the type of data and the perceived quality of the benefit. This gradient indicates that while some data types are almost always considered too sensitive to share freely, others may be shared more liberally if the perceived benefits align closely with personal or societal gains.

4.7.3. The example of Cookies

Building on the concerns about privacy discussed earlier, it is essential to understand the role of cookies in data collection, as they are a common means of disclosing information. Many websites store small text files on users' browsers known as cookies. These cookies store a variety of information, most commonly a unique identifier or cookie ID, which helps the website recognize the user's browser during future visits. This allows the website to remember and auto-fill the user's preferences. Cookies can include data that meets the legal definition of personal information under

regulations like the GDPR, the EU Cookie Law, and the CCPA (Llm, 2024). Furthermore, the way people respond to cookie consent prompts can provide valuable insights into their privacy intentions and how they interact with systems that collect their data. Understanding these interactions helps in assessing user comfort levels and their trust in data collection practices.

Cookies have several uses, such as keeping users logged in, saving preferences, and tracking browsing behavior for targeted advertising. The data collected by cookies is often used in AI models to enhance personalized advertising, making ads more relevant and effective based on user behavior.

Figure 29: Cookie disclaimer as seen on Facebook.com

Despite the benefits cookies offer, user reactions to them are varied and often reflect broader privacy concerns. The goal of cookie disclaimers is to clearly inform users about how cookies are used. However, research shows that users often ignore or quickly dismiss these disclaimers (Kulyk et al., 2018) leaving the website. The trade-off to the user between the trustworthiness of the website and potentially privacy-infringing practices of cookie use as indicated in the disclaimer is yet to be studied (Bornschein et al., 2020).

Many users report not understanding the disclaimers, feeling suspicious due to a lack of transparency, or being unaware of the privacy implications of cookie use. Consequently, disclaimers often fail to effectively inform users. Even with opt-in options, users may quickly click "agree" just to get rid of the prompt, without considering the privacy consequences.

Some users see cookies as a "necessary evil" of online browsing. They often react negatively to cookies, viewing disclaimers as annoying or worrying about their privacy. Even when disclaimers include positive information about cookies, users may remain skeptical about how their data is used.

However, the trustworthiness of a website can affect user decisions. Users are more likely to accept cookies on sites they trust or frequently visit, and on sites that provide important content or services. This suggests that trusted websites can offer more detailed cookie information, such as third-party cookie use, without driving users away.

The researches on this subject conclude that the key challenge is finding a balance between user privacy and the benefits cookies provide. Improving transparency, offering better control options, and educating users about cookies can help. By making cookie policies clearer and providing more choices, it is possible to address privacy concerns while maintaining the advantages of cookies.

4.8. Engagement and Interaction

In the era of modern advertising, engagement refers to the interaction between consumers and advertisements. This interaction can take various forms, including clicks, likes, shares, comments, and time spent viewing the ad. Engagement is a crucial metric because it indicates how effectively an advertisement captures and retains consumer interest.

Various forms of engagement offer different insights into consumer behavior:

- **Clicks:** Clicking on an ad shows a direct interest in the content, suggesting that the advertisement has successfully captured the user's attention and motivated them to seek more information.
- **Likes and Shares:** These social interactions indicate a positive reception of the ad, with shares extending the ad's reach to the user's network, thereby amplifying its impact.
- **Comments:** User comments provide valuable feedback, reflecting the ad's ability to provoke thought, discussion, or emotional responses.
- **Time Spent Viewing the Ad:** The longer a user engages with an ad, whether through video or interactive content, the more compelling the ad is considered to be. This metric helps gauge the depth of user interest and the effectiveness of the ad's message.

High engagement levels suggest that an ad resonates well with its audience. When consumers interact positively with an ad, it often leads to increased brand awareness as users become more familiar with the brand's message and products. This familiarity can enhance trust and loyalty, making consumers more likely to choose the brand in the future.

Moreover, high engagement can directly influence sales. When ads capture consumer interest and encourage interaction, they can drive traffic to websites or physical stores, leading to higher conversion rates. Engaged consumers are also more likely to share their positive experiences with others, further promoting the brand through word-of-mouth and social proof (Araujo et al., 2020).

Measuring consumer engagement in advertising is essential for evaluating the effectiveness of ad campaigns and optimizing them for better performance. Several KPIs are commonly used to assess how well advertisements engage their target audience:

- **Click-Through Rate:** is the percentage of users who click on an ad after viewing it. It is calculated by dividing the number of clicks by the number of impressions (views) and multiplying by 100. A higher CTR indicates that the ad is compelling and relevant to the audience, as it successfully captures their attention and prompts them to take action. CTR is a critical metric for gauging the immediate appeal of an ad and its effectiveness in driving traffic to a website or landing page.
- **Conversion Rate:** measures the percentage of users who complete a desired action after clicking on an ad. This action can be making a purchase, signing up for a newsletter, or filling out a contact form. It is calculated by dividing the number of conversions by the number of clicks and multiplying by 100. A higher conversion rate indicates that the ad is not only attracting clicks but also driving meaningful actions that contribute to business

goals. This metric is crucial for understanding the ad's effectiveness in turning interest into tangible results.

- **Bounce Rate:** is the percentage of users who leave a website shortly after clicking on an ad, typically without interacting with the content. It is calculated by dividing the number of single-page sessions by the total sessions and multiplying by 100. A lower bounce rate suggests that the ad has successfully directed users to relevant and engaging content on the website. A high bounce rate, on the other hand, may indicate a disconnect between the ad's promise and the landing page's content, highlighting the need for better alignment and optimization.
- **Time Spent on Page:** measures the average duration users spend on a webpage after clicking on an ad. Longer times indicate higher engagement and interest in the content. This metric helps advertisers understand how well the landing page holds the users' attention and encourages them to explore further. It can also provide insights into the quality and relevance of the content provided, helping to identify areas for improvement.
- **Social Media Interactions:** include likes, shares, comments, and follows on social media platforms. These metrics indicate how well an ad is performing in terms of generating buzz and fostering social engagement. High levels of social interaction suggest that the ad resonates with the audience, prompting them to engage with it and share it within their networks. This can amplify the ad's reach and impact, leveraging the power of social proof and word-of-mouth marketing.

A study by Bag et al. (2021) highlights how the COVID-19 pandemic has shifted consumer behavior towards greater reliance on digital platforms for purchasing products and services. The research emphasizes the role of AI in engaging customers on social media, which has become a crucial tool for marketing due to its cost-effectiveness and wide reach. AI-driven strategies not only engage consumers but also influence them towards impulse buying, thereby increasing sales volumes in the e-commerce sector.

The study found that the use of AI in social media marketing significantly boosts conversion rates by engaging consumers more effectively. This increased engagement leads to higher customer satisfaction and loyalty, as satisfied customers are more likely to make repeat purchases. The ability of AI to process large amounts of data and segment consumers in real-time allows businesses to customize their marketing efforts, enhancing the overall consumer journey in the digital age.

Another study by Du et al. (2023) further investigates the impact of AI-generated content (AIGC) on consumer engagement through online experiments. The results indicate that AIGC positively influences both psychological and behavioral engagement of customers. Psychological engagement, which refers to the mental and emotional investment consumers make in response to ads, was found to mediate the relationship between AIGC and behavioral engagement, which includes actions such as clicks, shares, and purchases.

Interestingly, the study also found that emotion plays a negative regulatory role in the relationship between AIGC and consumer behavioral engagement. This suggests that while AI-generated content can effectively engage consumers, the emotional tone of the content must be carefully

managed to avoid negative impacts. Additionally, the labeling of advertisements as AI-generated was shown to significantly affect customer behavior engagement, highlighting the importance of transparency in AI advertising.

In conclusion, AI has become a critical tool in modern advertising, significantly enhancing consumer engagement by providing personalized, relevant, and timely content. As businesses continue to integrate AI into their marketing strategies, understanding and leveraging these insights will be essential for maximizing the effectiveness of their advertising efforts.

Chapter 5:
Ethical Considerations

5.1. AI and Data Privacy

In the first section of this chapter, we delve into the complex relationship between AI and data privacy, structured to provide a comprehensive understanding of the topic. We begin by analyzing the process of data collection, highlighting how AI technologies gather and utilize vast amounts of personal information. Following this, we discuss the various data privacy laws that have been enacted to protect consumers, such as the GDPR in the European Union and the CCPA in California. Next, we examine how these regulations affect the AI advertising sector, focusing on the compliance challenges and the impact on business practices. Finally, we explore the privacy concerns that arise from AI-driven data collection, including issues of transparency, data misuse, and the potential for unauthorized access. This structured approach ensures a thorough exploration of each aspect, demonstrating the interconnectedness of AI technologies, regulatory frameworks, and privacy concerns.

5.1.1. Overview of Data Collection in AI Advertising

Data collection is the process of gathering and measuring information from various sources to gain insights, inform decisions, and predict outcomes. In advertising, data collection involves accumulating data related to consumer behavior, preferences, and demographics from different digital platforms and interactions (Nlockwood, 2024).

The landscape of data collection has undergone significant transformations over the past few decades, evolving from traditional methods of data gathering to sophisticated, real-time data collection processes enabled by advancements in technology. Here are some key aspects of this evolution:

- **Real-Time Data Collection:** In the early days, data collection was a time-consuming process involving manual entries and batch processing, often leading to outdated information. Today, technological advancements have enabled real-time data collection, allowing businesses to capture and analyze data as it happens. Real-time data collection helps in providing timely insights and enables quick decision-making, which is essential for dynamic and responsive advertising strategies. For instance, real-time tracking of user behavior on websites can trigger immediate personalized ad placements that are relevant to the current user context.
- **Consistent Data:** Initially, data collection methods were fragmented, resulting in inconsistent and incomplete data. The advent of integrated data collection systems has allowed for more consistent data gathering across multiple touchpoints and platforms. Consistent data collection ensures that the information gathered is uniform and reliable, facilitating more accurate analysis and insights. This consistency is crucial for developing a comprehensive understanding of consumer behavior and for ensuring that marketing efforts are based on accurate data.
- **Clean Data:** In the past, data collection was often hampered by issues such as data redundancy, errors, and inconsistencies, leading to poor data quality. Modern data collection practices emphasize the importance of clean data, which is free from errors,

duplicates, and irrelevant information. Data cleaning processes, including validation and standardization, are now integral parts of data collection, ensuring that the data used for analysis is accurate and useful. Clean data is essential for training AI models effectively and for making informed marketing decisions.

AI advertising relies heavily on the collection and analysis of vast amounts of data to deliver personalized and targeted ads. This data, crucial for understanding and predicting consumer behavior, can be broadly categorized into structured and unstructured data (Kietzmann et al., 2018).

- **Structured Data:** This type of data is highly organized and easily searchable within databases. Structured data includes traditional, standardized datasets such as customer demographics, transaction records, and web-browsing history. AI systems are particularly adept at processing structured data quickly and efficiently. For example, AI can analyze demographic information and purchase histories to identify target audiences for specific ads, enabling precise ad targeting and segmentation.
- **Unstructured Data:** Unstructured data, which constitutes about 80% of daily user-generated content, includes text, images, videos, and audio files that are not organized in a predefined manner. This data is more complex to analyze due to its varied formats and lack of structure. AI technologies excel in processing and making sense of unstructured data by employing techniques like natural language processing and image recognition. For instance, AI can analyze customer reviews, social media posts, and multimedia content to extract insights about consumer sentiment, preferences, and emerging trends.

Within the broad categories of structured and unstructured data, several specific types of data are collected to enhance the effectiveness of AI advertising:

- **Behavioral Data:** Falling under the structured data category, behavioral data encompasses information about user interactions such as clicks, page views, and time spent on websites. This data is vital for understanding user engagement and interaction patterns. By analyzing behavioral data, AI can predict future behaviors and preferences, helping advertisers to tailor ads that are more likely to capture user interest and drive conversions.
- **Demographic Data:** Also classified as structured data, demographic information includes personal attributes like age, gender, income level, and education. This data is fundamental for segmenting audiences and customizing advertising content to match the characteristics of different demographic groups. Demographic targeting ensures that ads are relevant to the audience's needs and interests, thereby enhancing the likelihood of engagement.
- **Psychographic Data:** Psychographic Data: Psychographic data can include both structured elements (like survey responses) and unstructured components (like social media interactions). It provides insights into consumer lifestyles, interests, values, and attitudes. AI leverages psychographic data to create ads that resonate on a deeper, emotional level, aligning with the user's personal beliefs and preferences. This data is particularly useful for brands aiming to build emotional connections with their audiences.
- **Transactional Data:** Primarily structured, transactional data includes records of purchases and financial transactions. This data is crucial for understanding consumer buying habits

and patterns. By analyzing transactional data, AI can identify repeat purchase behaviors and predict future buying trends, enabling the creation of highly targeted and personalized advertising campaigns that encourage further purchases.

In the context of the digital consumer journey, users express their needs and preferences through a variety of channels and formats, including search queries, social media interactions, blogs, videos, and face-to-face conversations. This diverse data landscape necessitates robust AI systems capable of processing and integrating both structured and unstructured data to derive actionable insights.

5.1.2. Data Privacy Laws

The rapid growth in digital communication and data exchange has led to an unprecedented increase in the amount of personal information being shared and processed. While this surge in data flow has facilitated numerous advancements and conveniences, it has also introduced significant risks regarding the security and privacy of personal data. The rise in data breaches and cyberattacks underscores the necessity for stringent regulations to protect personal information and ensure ethical data handling practices. (Law, 2024; D. Kumar & Suthar, 2024)

Consumers routinely share substantial amounts of personal data with companies, which often includes sensitive information about their finances, health, and other personal details. Mishandling this data can lead to severe consequences such as identity theft, financial fraud, and other malicious activities. Frequently, consumers are not fully informed about how their data will be used, stored, or possibly shared with third parties, nor are they always aware of their rights concerning data privacy. This lack of transparency and awareness highlights the critical role of data privacy laws in safeguarding personal information and maintaining consumer trust in the digital realm (Martin & Murphy, 2016).

Recognizing the importance of addressing these challenges, legislators worldwide are increasingly enacting data privacy laws to set clear guidelines for the collection, use, and storage of sensitive consumer information. These laws are essential in combating the growing number of cyber threats and vulnerabilities, ensuring that individual privacy rights are protected and that businesses adhere to ethical data management practices. Notably, regions such as Europe and the United States are at the forefront of developing and enforcing robust data privacy regulations.

Data privacy laws can be broadly categorized into two types: vertical and horizontal, each serving crucial roles in protecting personal information across different contexts and sectors.

- **Vertical Privacy Laws:** These laws are sector-specific and focus on protecting particular types of sensitive data. They provide targeted regulations tailored to address the unique risks associated with specific categories of information. Examples of vertical privacy laws include the Health Insurance Portability and Accountability Act (HIPAA) in the U.S., which protects health information, and the Gramm-Leach-Bliley Act (GLBA), which secures financial data.
- **Horizontal Privacy Laws:** In contrast, horizontal privacy laws apply broadly across various industries and types of personal data. They establish general principles for data

handling and are applicable to any entity that processes personal information, regardless of the sector. Examples of horizontal privacy laws include the General Data Protection Regulation in the European Union and the Personal Information Protection Law in China. These laws set comprehensive standards for data protection and ensure consistent application of privacy principles across multiple contexts.

Several major data privacy laws around the world exemplify the principles of vertical and horizontal regulations. The European Union has established a single, unified framework for data protection across its member states through the GDPR, ensuring consistent data privacy standards throughout the region. In contrast, the United States has adopted a more fragmented approach, creating multiple laws tailored to protect different types of information and addressing various aspects of data privacy. Below are detailed analyses of some of the most significant data privacy laws globally. These laws exemplify the diverse approaches taken globally to protect personal information and ensure ethical data handling.

General Data Protection Regulation (GDPR) – European Union: The GDPR, implemented on May 25, 2018, is considered the most comprehensive data protection law to date. It introduces seven key principles: lawfulness, fairness, and transparency; purpose limitation; data minimization; accuracy; storage limitation; integrity and confidentiality; and accountability. The GDPR applies to all entities processing the personal data of EU citizens, regardless of where they are located, and grants individuals significant rights over their data, such as the right to access, correct, and delete their information. It imposes strict obligations on data controllers and processors to ensure the protection and privacy of personal data, thereby fostering trust and security in digital interactions across the EU.

Before the GDPR, the primary legislative framework for data protection in the European Union was the Data Protection Directive 95/46/EC. This directive provided foundational principles and rights related to data protection but allowed for considerable variation in how member states implemented these rules. Other significant frameworks and agreements, such as the E-Privacy Directive, the Safe Harbor Agreement, and various national laws, also played critical roles in shaping the data protection landscape. The GDPR replaced the Data Protection Directive with a more comprehensive and unified approach, addressing the challenges of a rapidly evolving digital world and providing stronger and more consistent data protection across the EU.

California Consumer Privacy Act (CCPA) and California Privacy Rights Act (CPRA) – United States: California was the first state in the United States to adopt comprehensive data privacy legislation with the enactment of the California Consumer Privacy Act (CCPA), which became effective on January 1, 2020. The CCPA grants California residents the right to access, delete, and opt-out of the sale of their personal information. Building on this foundation, the California Privacy Rights Act (CPRA), which took effect on January 1, 2023, further strengthens consumer rights by introducing additional protections for sensitive personal information and establishing the California Privacy Protection Agency to oversee and enforce data privacy laws. These pioneering laws set a benchmark for data privacy and have influenced other states to pursue similar regulatory measures, signaling a move towards more robust data protection standards across the United States.

Following California's lead, many states have taken steps to enact their own data privacy laws, reflecting a growing recognition of the importance of protecting personal information. However, states such as Nevada, Maine, Michigan, Minnesota, and Vermont have not yet established comprehensive data privacy laws. The absence of state-specific regulations in these states highlights the patchwork nature of data privacy protections in the U.S. and underscores the need for a more unified approach to data privacy at the federal level.

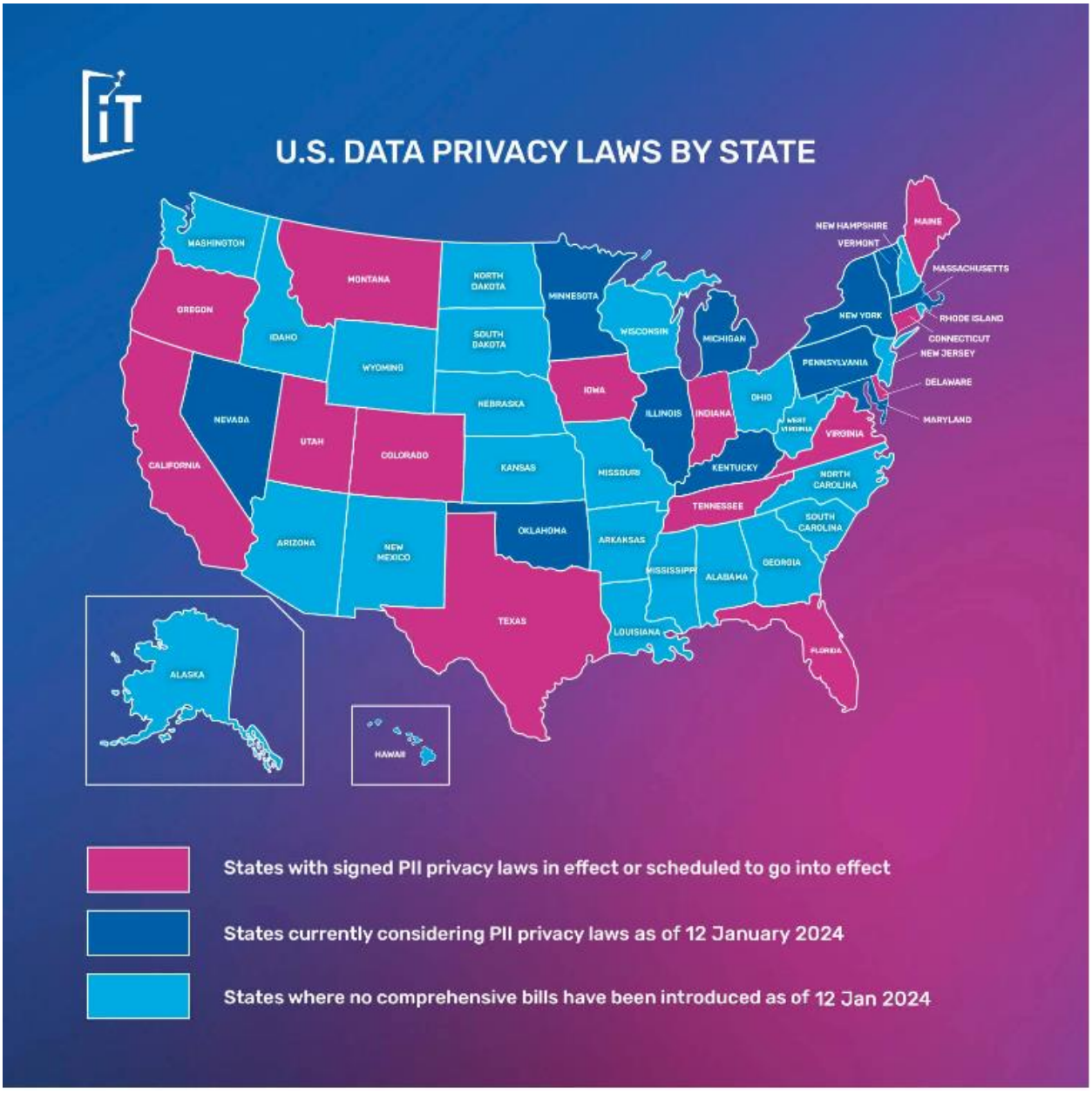

Figure 30: 2024 US data privacy laws by state (Walters, 2024)

Health Insurance Portability and Accountability Act (HIPAA) – United States: HIPAA, enacted in 1996, establishes national standards for the protection of health information. It requires healthcare providers, insurers, and other entities to safeguard the privacy and security of medical

records and personal health information. HIPAA mandates that individuals' health data be kept confidential and provides rights for patients to access and control their health information.

Gramm-Leach-Bliley Act (GLBA) – United States: The GLBA, passed in 1999, protects the privacy of consumer financial information. It requires financial institutions to explain their information-sharing practices to customers and to implement safeguards to protect sensitive data. The GLBA is crucial in ensuring that financial institutions maintain the confidentiality and security of customer information.

Children's Online Privacy Protection Act (COPPA) – United States: COPPA, effective since 2000, regulates the collection of personal information from children under 13. It mandates that online services obtain parental consent before collecting data from children, provide clear privacy notices, and allow parents to access and delete their children's information. COPPA aims to protect children's privacy and ensure responsible data handling practices by online operators.

Personal Information Protection Law (PIPL) – China: Enacted on November 1, 2021, PIPL is China's first comprehensive national data protection law. It governs the processing of personal information within China and has extraterritorial reach, applying to foreign entities that process data of Chinese residents. PIPL provides individuals with rights to control their personal information and imposes stringent compliance requirements on organizations to protect data privacy. It emphasizes transparency, data security, and the rights of individuals to access and manage their personal information.

5.1.3. Impact on AI Advertising

Data privacy laws significantly influence the operations of AI-driven advertising, particularly in data collection and processing, presenting several challenges and considerations for compliance (Arora, 2024).

One of the main impacts is the restriction on data collection. AI advertising relies on extensive data to create detailed consumer profiles and deliver personalized ads. However, data privacy laws limit the types and quantities of data that can be collected, often requiring explicit user consent. This constraint can reduce the amount of data available to AI systems, potentially diminishing the precision and effectiveness of targeted advertising. Businesses must revise their data collection practices to comply with these regulations, which may involve restructuring how and when they obtain user consent.

Ensuring data security is another significant impact of data privacy laws on AI advertising. These laws mandate that personal data must be protected against unauthorized access and breaches, requiring AI advertising platforms to adopt advanced security measures. This includes implementing encryption, secure data storage solutions, and conducting regular security audits to safeguard data integrity and confidentiality. Compliance with these requirements is essential to prevent data breaches, which could have severe legal and reputational consequences. Advertising companies must invest in robust security technologies to protect the vast amounts of data they handle.

The requirement for increased transparency and respect for user rights also affects AI advertising. Data privacy laws compel businesses to provide clear information about how personal data is used by AI systems and to obtain informed consent from users. This entails developing privacy notices and mechanisms for users to access, correct, or delete their data. Advertising companies must ensure that their data usage practices are transparent and that they respect user rights, which can involve significant changes to data management and processing workflows. Enhancing transparency and facilitating user rights help build trust with consumers, which is crucial for the long-term success of AI-driven advertising (Martin & Murphy, 2016).

Compliance with these laws also entails significant costs and operational changes for advertising businesses. The need for compliance audits, legal advice, and technological updates can increase operational expenses. Additionally, the process of ensuring compliance with complex data privacy regulations can slow the deployment of new AI features and capabilities. Advertising companies must allocate resources to maintain compliance, which can affect overall business efficiency and innovation. Navigating these challenges is essential for integrating AI technologies in a manner that adheres to data privacy regulations.

Lastly, data privacy restrictions impact the quality of data-driven insights in AI advertising. Restrictions on data collection and processing can limit the availability of diverse data sets, affecting the quality of insights generated by AI algorithms. This necessitates reliance on smaller, more specific data sets, which may not provide as comprehensive an understanding of consumer behavior. AI advertising platforms must find innovative ways to comply with data privacy laws while maintaining the effectiveness of their AI models, such as using anonymized data or developing new methods for data analysis that respect privacy constraints. Compliance with data privacy laws is crucial for balancing the benefits of AI-driven advertising with the need to protect individual privacy rights (D. Kumar & Suthar, 2024).

5.1.4. Privacy Concerns

The widespread collection and processing of personal data in the digital age led to significant concerns about privacy and data security. While data privacy laws aim to protect personal information and ensure ethical data management, numerous challenges persist. This section explores major privacy concerns associated with data collection and processing and examines notable cases that illustrate these issues, including one significant data breach incident.

A primary concern in the realm of data privacy is the lack of transparency and informed consent. Often, individuals are not fully aware of how their personal data is collected, processed, and used by companies due to complex and lengthy privacy policies. This lack of clarity can lead to uninformed consent where users unknowingly agree to data practices. A prominent example of this issue is the Facebook and Cambridge Analytica scandal in 2018. Cambridge Analytica collected data from millions of Facebook users through a personality quiz app without their explicit consent, which was then used to influence political campaigns. This incident highlights the risks associated with inadequate transparency in data practices and underscores the need for clearer communication regarding data usage (Kanakia et al., 2019). In the context of AI advertising, the concern is magnified as AI technologies, such as machine learning algorithms and large language

models, require vast amounts of data to function effectively. The lack of transparency in how this data is collected and used can lead to mistrust among consumers, particularly when they realize their personal information might be used to train AI models without their explicit knowledge or consent.

Data misuse and exploitation also pose significant risks. Personal data collected for one purpose can be misused for unauthorized activities, such as being sold to third parties or used for targeted advertising without user consent, leading to invasive profiling and manipulation. A striking example of this issue is the case of Clearview AI, a company that scraped billions of images from social media and other websites without users' consent to build a facial recognition database. This data was then sold to law enforcement agencies and private companies for various surveillance purposes. The unauthorized collection and commercial use of individuals' personal data by Clearview AI highlight significant privacy violations and raise concerns about the ethical implications of data misuse. This incident, which led to widespread criticism and legal actions against Clearview AI, exemplifies how companies can exploit personal data, undermining user privacy and eroding public trust (Clarke, 2023). For AI advertising, the exploitation of personal data without proper authorization can lead to sophisticated targeting that manipulates consumer behavior. This practice not only raises ethical questions but also fuels public concern about the potential for AI to perpetuate unfair or intrusive advertising tactics.

Another critical concern is the inadequate security measures implemented by many organizations to protect personal data, making it vulnerable to breaches and unauthorized access. The 2017 Equifax data breach, which exposed sensitive information such as Social Security numbers and financial data of over 147 million individuals, vividly illustrates the severe consequences of inadequate data security practices. This breach underscored the urgent need for robust data protection measures to safeguard sensitive information and maintain consumer trust (Fruhlinger, 2023).

Inadequate privacy protections for sensitive data, including health records and financial information, also present major concerns. The exposure of the health information of thousands of patients in 2019, when a major hospital group's unsecured database was found accessible online, emphasizes the importance of stringent security measures for protecting sensitive data. This incident demonstrated the potential personal harm resulting from inadequate safeguards and the need for heightened protection of sensitive information. In AI advertising, the handling of sensitive data is particularly concerning when it comes to the use of AI for ad targeting. AI systems that process sensitive data need to adhere to strict privacy standards to prevent misuse and ensure that sensitive information is not exploited for commercial purposes without proper safeguards and consent.

Finally, there is a pressing issue of inadequate accountability and inconsistent enforcement of data privacy laws. Some organizations are not held accountable for data privacy violations, leading to gaps in data protection. In 2020, Google faced minimal fines for data privacy breaches in multiple countries, demonstrating the challenges in enforcing data protection laws and ensuring compliance. This case illustrates the need for stronger regulatory frameworks to hold companies accountable and protect consumer privacy (The Associated Press, 2023). In the realm of AI

advertising, this lack of accountability is particularly problematic, as it can lead to unchecked data practices where personal data is used to train AI models without proper oversight. Consumers express significant discomfort with the idea of their personal data being used for training AI models, such as those used in advertising technologies. Findings reveal that a majority of respondents are uncomfortable sharing personal data to help train AI models (Drenik, 2023).

In conclusion, the multifaceted concerns surrounding data privacy—ranging from transparency and informed consent to data misuse and inadequate security—are evident in various real-world cases such as the Facebook and Cambridge Analytica scandal and the Equifax data breach. These incidents underscore the importance of robust privacy protections, effective enforcement of data privacy laws, and continuous efforts to address emerging challenges in data privacy and security. In the context of AI advertising, these concerns are particularly pertinent as AI technologies continue to evolve and require large datasets for training and optimization. Addressing these concerns is crucial for building a secure and trustworthy digital environment where consumers feel confident that their data is used ethically and responsibly.

5.2. Regulation of AI use

Having explored the profound impact of AI on advertising and the critical issues surrounding data privacy, it is essential to examine the broader regulatory landscape governing AI technologies. As AI increasingly influences consumer behavior through personalized advertising, there is a growing need for regulations that ensure ethical and transparent practices. This section provides a concise overview of the current AI regulations, focusing on how they address the use of AI in advertising. We will also identify gaps in these regulations and discuss the challenges in adapting to rapid technological advancements.

5.2.1. Current Regulatory Landscape

AI technologies, with their transformative potential, have prompted a range of regulatory responses from governments and international organizations. The regulatory landscape for AI is diverse and evolving, reflecting varying approaches and priorities across different regions. Here we will focus on the three major players of the AI industry: European Union, United States and China.

European Union (EU) and the AI Act: The European Union has been at the forefront of establishing comprehensive regulatory frameworks for new technologies, including AI. The EU's approach is characterized by a strong commitment to transparency, accountability, and the protection of fundamental rights. The proposed AI Act is a cornerstone of this effort, designed to create a harmonized regulatory environment for AI technologies across member states.

The AI Act introduces a risk-based framework that categorizes AI systems into four levels of risk: minimal, limited, high, and unacceptable. Each category comes with specific regulatory requirements aimed at ensuring safety and compliance. AI systems used in high-risk applications, such as healthcare, employment, and critical infrastructure, face stringent requirements. This is particularly relevant for AI in advertising, where systems that profile and target individuals based

on their personal data could be considered high risk due to the potential impact on consumer rights and autonomy (EU AI Act: First Regulation on Artificial Intelligence | Topics | European Parliament, 2023).

A key aspect of the AI Act is its emphasis on transparency. The Act mandates that AI systems, especially those that interact with individuals, must clearly disclose that an AI system is involved and explain the purposes of data processing. For AI-driven advertising, this means that consumers must be made aware when they are being targeted by AI and must be informed about how their data is being used to tailor ads. This requirement is crucial for building consumer trust and ensuring that individuals understand the implications of their interactions with AI.

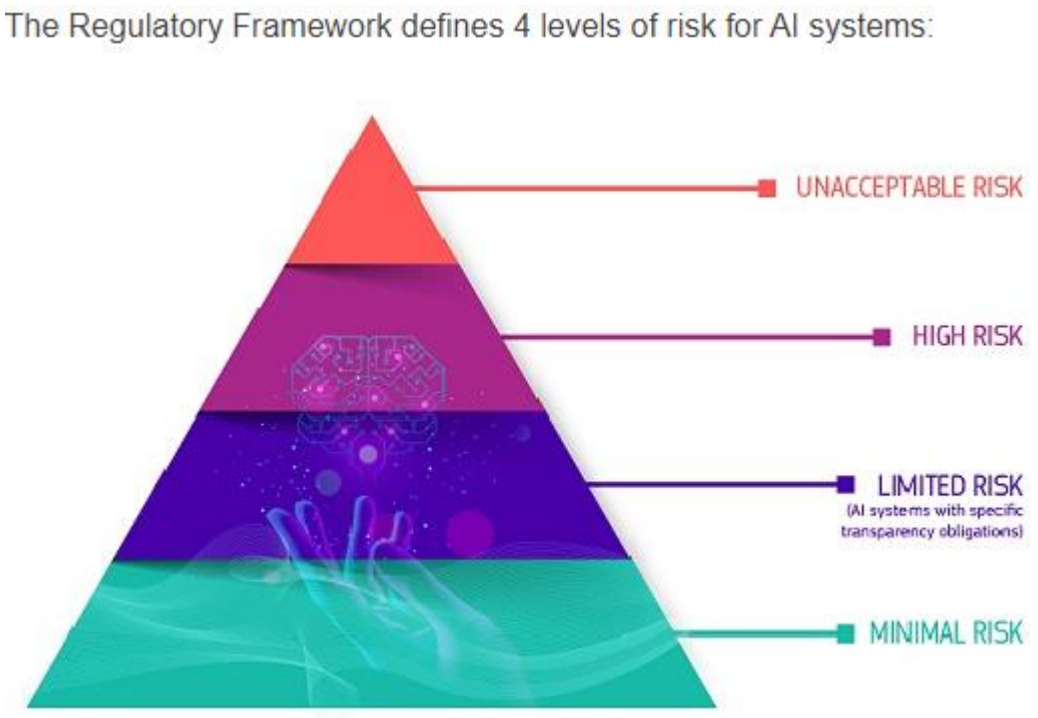

Figure 31: AI-Act Levels of Risk

Accountability is another critical element of the AI Act. The regulation requires organizations to ensure that their AI systems comply with established standards and are subject to continuous monitoring and evaluation. This includes implementing robust oversight mechanisms to address issues such as bias and discrimination. For the section we study, this means that companies must regularly audit their AI systems to ensure they adhere to ethical standards and do not engage in manipulative or exploitative practices.

Data quality and governance are also central to the AI Act. The regulation stipulates that data used to train AI systems must be of high quality and free from biases that could lead to discriminatory outcomes. This is particularly important for AI-driven advertising, where the use of biased data can result in unfair targeting practices that perpetuate inequalities. Ensuring the integrity and accuracy of data helps create fair and equitable AI systems that respect consumer rights.

Bias and fairness in AI systems are also major concerns. AI systems can inadvertently perpetuate and amplify biases present in their training data, leading to unfair and discriminatory outcomes. Addressing these biases requires continuous monitoring and intervention to ensure that AI systems operate in a fair and equitable manner. The AI Act emphasizes the need for regular bias audits and the implementation of fairness criteria, but the challenge lies in effectively identifying and mitigating biases in complex AI models.

Lastly, the issue of accountability and liability in AI systems remains unresolved. The complex and autonomous nature of AI technologies raises questions about who is responsible for the actions and decisions made by these systems. Clear guidelines on liability and accountability are necessary to ensure that developers, operators, and users are held responsible for the outcomes of AI systems, preventing harm and ensuring ethical use.

United States - A Fragmented Approach to AI Regulation: In the United States, the regulatory landscape for AI technologies is characterized by a fragmented approach, reflecting a complex interplay between federal guidelines and state-level initiatives. Unlike the comprehensive and unified frameworks seen in regions like the European Union, the US approach to AI regulation is diverse and decentralized, resulting in a patchwork of rules and standards that vary across different jurisdictions.

Figure 32: US president signing executive order outlining AI safeguards (Buchanan, 2023)

At the federal level, the regulation of AI technologies is guided by a combination of general guidelines and sector-specific regulations. The Federal Trade Commission (FTC), for instance, has

taken an active role in overseeing the ethical use of AI, especially in consumer-facing applications like advertising. The FTC's guidelines emphasize the need for transparency, fairness, and accountability in AI systems. Companies are urged to ensure that their AI technologies do not mislead consumers, maintain transparency about data use, and provide clear information on how AI-driven decisions are made. This is crucial for AI in advertising, where maintaining consumer trust is essential for the success of personalized and targeted marketing strategies (Using Artificial Intelligence and Algorithms, 2024).

The National Institute of Standards and Technology (NIST) is another key federal body involved in AI regulation. NIST is developing a voluntary AI risk management framework (AI RMF) that aims to provide a structured approach for identifying, assessing, and managing risks associated with AI technologies. This framework emphasizes best practices for ensuring the safety, reliability, and security of AI systems. For companies using AI in advertising, adhering to NIST's guidelines can help mitigate risks related to data security and algorithmic biases, thereby enhancing the credibility and effectiveness of their AI-driven marketing efforts (AI Risk Management Framework | NIST, 2024).

State-level regulations add another layer of complexity to the US AI regulatory landscape. States like California have been pioneers in establishing more stringent AI regulations. California's laws focus on enhancing transparency and accountability in AI systems, particularly those that handle personal data or influence consumer behavior (Cooke, 2024). Additionally, California has proposed regulations specifically targeting AI, such as requirements for businesses to disclose the use of automated decision-making technologies and to assess the potential impacts of these technologies on consumers. This reflects a growing recognition of the need to address the ethical and social implications of AI, particularly in areas like advertising where AI can significantly influence consumer decisions.

Beyond California, other states are also exploring AI-specific regulations, though the scope and focus vary. For example, New York has introduced legislation aimed at preventing biases in AI algorithms used for hiring and lending, while Illinois has enacted laws regulating the use of biometric data in AI applications. These state-level initiatives highlight the diverse approaches to AI regulation across the U.S., each addressing different aspects of AI use and its potential impacts on society.

At the federal legislative level, the proposed Algorithmic Accountability Act seeks to impose additional requirements on companies using AI (Mökander et al., 2022). This act would mandate that companies conduct impact assessments of automated decision systems to evaluate and mitigate potential biases and discriminatory outcomes. This is particularly relevant for AI in advertising, where algorithmic biases can lead to unfair targeting and exclusion of certain consumer groups. By requiring regular assessments and accountability measures, the act aims to promote fairness and transparency in AI technologies, ensuring that they are used in ways that are ethical and equitable.

Overall, the US approach to AI regulation reflects a balance between encouraging innovation and addressing the ethical and legal challenges posed by AI technologies. While federal guidelines

provide broad principles for responsible AI use, state-level regulations introduce specific requirements that reflect local priorities and concerns. This fragmented regulatory landscape necessitates that companies operating in the AI space, particularly in advertising, navigate a complex web of rules and standards to ensure compliance and maintain consumer trust.

China - Comprehensive and Strategic AI Governance: China's approach to AI governance is anchored in a series of high-level plans and policies aimed at ensuring the country's leadership in AI. The State Council's AI Development Plan, launched in 2017, provides a detailed roadmap for AI governance, setting milestones for 2020, 2025, and 2030. This plan outlines ambitious goals for AI research, ethical norms, and regulatory frameworks, reflecting China's commitment to establishing a comprehensive environment that balances innovation with ethical considerations (J. Cheng & Zeng, 2022).

By 2020, China aimed to develop initial ethical norms and policies for AI. The plan's target for 2025 is to establish a more structured framework for AI laws and regulations, alongside capabilities for assessing and controlling AI-related security risks. By 2030, the goal is to create a fully developed system of AI laws, ethical norms, and policy structures. This phased approach demonstrates China's dedication to fostering an environment that supports AI advancement while addressing ethical and social challenges.

China has introduced several significant regulatory measures to govern AI, focusing on privacy protection, data security, and ethical standards. These initiatives are part of a broader effort to build a regulatory environment that supports both the rapid development of AI technologies and the protection of individual rights.

China's Personal Information Protection Law (PIPL), discussed in a previous section, sets strict rules for the collection and use of personal data, ensuring that AI-driven advertising practices comply with data protection standards. Complementing the PIPL, other key regulatory frameworks include the Data Security Law (DSL), which was enacted in 2021 to bolster data security across various sectors. The DSL establishes a framework for classifying data based on its sensitivity and mandates robust security measures to protect critical data. For AI in advertising, this means implementing stringent data security practices to safeguard consumer data from breaches and misuse, maintaining the integrity of AI systems and protecting consumer privacy.

The Civil Code, issued in 2020, includes provisions for the protection of privacy and personal information, outlining the rights of individuals regarding their data and setting legal obligations for organizations that collect and process this data. This code reinforces the principles of data protection in the context of AI technologies, ensuring that consumer rights are upheld in AI applications, including those in advertising.

China has also developed comprehensive guidelines to integrate ethics into AI development and deployment. The "Guide to AI Ethics" proposed in 2020 and the "Ethical Norms for New Generation AI" released in 2021 provide frameworks for incorporating ethical considerations into AI systems. These guidelines emphasize the importance of fairness, accountability, and transparency, aiming to prevent biases and ensure that AI technologies are used in ways that benefit

society. For AI in advertising, these ethical norms encourage the development of AI systems that are not only effective but also fair and respectful of consumer rights.

In addition, China has published several white papers on AI governance, including the "White Paper on Trustworthy AI" in 2021, which underscores the need for fairness, accountability, and transparency in AI development. The "White Paper on Mobile Apps Personal Information Protection and Governance" provides specific steps for improving data governance mechanisms for mobile apps, which are widely used in AI-driven advertising. These documents set the standards and best practices for ethical AI use, guiding companies in their AI initiatives.

China has been proactive in developing technical standards for AI, aiming to establish a comprehensive standard system by 2023. The "White Paper on AI Standardization" published in 2018 and updated in 2021, along with the "Guide to the Building of a National Standard Framework for New Generation AI," outline key standards for AI technologies, covering various aspects from fundamental technologies to applications and ethics. For advertising, adhering to these standards ensures that AI systems are reliable, secure, and aligned with ethical guidelines.

Key Differences in AI regulations: EU, US and China

Although all major players have developed regulations for AI technologies, distinct differences characterize the approaches of the European Union, the United States, and China. These variations reflect their unique priorities, cultural values, and strategic objectives. Here, we explore the key differences in AI regulation among these regions, focusing on how each addresses scope and focus, regulatory control and enforcement, ethical and legal frameworks, and data privacy and protection (Dixon, 2022).

Scope and Focus: The European Union takes a comprehensive and risk-based approach to AI regulation, primarily through the proposed AI Act. This act focuses on categorizing AI applications by their potential risk to fundamental rights and public safety, with stringent regulations for high-risk applications. The EU's framework aims to create a unified regulatory environment across member states, ensuring that AI innovations are safe and ethical while allowing flexibility for lower-risk applications to foster innovation. The United States, on the other hand, has a more fragmented regulatory landscape. It blends federal guidelines with diverse state-level regulations, which allows for a flexible and adaptive approach to AI governance. This method supports innovation by letting states tailor regulations to local contexts without imposing a rigid national standard. China's approach is characterized by its centralization and strategic alignment with national goals. The government's top-down framework focuses on rapidly advancing AI technologies to support socio-economic objectives. Chinese regulations are highly directive, ensuring that AI development aligns with national interests and security priorities, reflecting a less flexible but more cohesive strategy.

Regulatory Control and Enforcement: In the European Union, regulatory control over AI is centralized and rigorous. The GDPR and the forthcoming AI Act are enforced across all member states, ensuring high standards of data protection and ethical AI use. The EU imposes significant penalties for non-compliance, reflecting its commitment to strict oversight and maintaining public trust in AI technologies. This centralized enforcement ensures consistency and reliability across

the EU. In contrast, the United States exhibits a decentralized approach to regulatory control. Federal agencies such as the FTC provide overarching guidelines, while individual states have the autonomy to implement specific regulations. This leads to a varied enforcement landscape, where compliance requirements can differ significantly across states. This decentralized model prioritizes flexibility and local adaptation, but can result in a patchwork of regulations. China's regulatory control is similarly centralized but distinctly more assertive. The government enforces comprehensive rules uniformly across the country, focusing on aligning AI development with state interests. Chinese regulations ensure strict compliance, with significant state oversight to maintain control over AI technologies and safeguard national security.

Ethical and Legal Frameworks: The European Union's ethical framework for AI is deeply integrated into its legal structures, emphasizing the protection of human rights and individual freedoms. The AI Act includes provisions that mandate transparency, accountability, and the management of risks associated with AI, reflecting the EU's commitment to ethical technology deployment. This approach prioritizes safeguarding individual rights and fostering responsible AI use across the union. The United States adopts a more flexible ethical framework, often driven by industry standards and voluntary guidelines. This model allows for diverse ethical considerations across states and sectors, encouraging innovation while providing a baseline for ethical practices. The flexibility inherent in the U.S. approach facilitates rapid adaptation to new technologies and ethical challenges. China's ethical framework is closely aligned with national objectives and societal norms. The government sets ethical guidelines that emphasize the collective good and national priorities, ensuring that AI technologies contribute to social harmony and economic progress. This approach places a greater emphasis on state-defined ethics and less on individual rights compared to Western models, reflecting China's socio-political context.

5.2.2. Gaps in Regulations

Despite significant advancements in AI regulation across major global players, there are notable gaps and challenges that need to be addressed to ensure comprehensive and effective governance of AI technologies. These gaps can undermine the effectiveness of regulations and pose risks to both consumers and businesses. This section highlights some of the key gaps in current AI regulations, focusing on areas such as harmonization, adaptability to emerging technologies, transparency and explainability, bias and fairness, and accountability and enforcement (Dixon, 2022; Rodrigues, 2020).

Harmonization across Jurisdictions: One of the most pressing gaps in current AI regulations is the lack of harmonization across different jurisdictions. While the European Union has made strides towards creating a unified regulatory framework with the AI Act, global consistency in AI regulations remains elusive. The fragmented approach seen in the United States, where federal guidelines are supplemented by diverse state-level regulations, complicates compliance for companies operating across multiple regions. Similarly, China's centralized regulatory model, while effective domestically, diverges significantly from the more decentralized and flexible approaches in the West. This lack of harmonization can create barriers to the global deployment

of AI technologies and pose challenges for multinational companies attempting to navigate varying regulatory landscapes.

Adaptability to Emerging Technologies: Current AI regulations often struggle to keep pace with the rapid evolution of AI technologies. The static nature of many regulatory frameworks can make it difficult to address new and unforeseen applications of AI. For instance, advanced machine learning techniques, such as deep learning and generative models, present unique challenges that are not fully covered by existing regulations. The EU's AI Act, while comprehensive, may require continuous updates to remain relevant as new AI technologies emerge. The flexibility of the U.S. regulatory approach allows for some adaptability, but the lack of a cohesive national framework can lead to gaps in oversight. China's approach, while strategic, may also face challenges in adapting to the fast-changing AI landscape due to its emphasis on centralized control.

Transparency and Explainability: A significant gap in current AI regulations is the lack of emphasis on transparency and explainability of AI systems. Many AI technologies, particularly those based on complex machine learning models, are inherently opaque, making it difficult to understand how decisions are made. The EU's AI Act includes provisions for transparency, but practical implementation and enforcement of these requirements remain challenging. In the U.S., transparency and explainability are often addressed through voluntary guidelines, which may not provide sufficient oversight for high-risk applications. China's regulations emphasize state control and data management but may lack specific requirements for ensuring the explainability of AI systems. This gap can undermine trust in AI technologies and limit their acceptance by the public and regulators.

Bias and Fairness: Addressing bias and ensuring fairness in AI systems is a critical concern that current regulations do not fully address. AI systems can inadvertently perpetuate and amplify biases present in their training data, leading to discriminatory outcomes. The EU's AI Act requires regular audits and risk management to mitigate these risks, but enforcing these measures across diverse AI applications is complex. The US approach, with its reliance on voluntary standards, may not provide adequate safeguards against biased AI systems, particularly in sectors like advertising where discriminatory practices can have significant impacts. China's centralized model focuses on ensuring that AI technologies align with national goals, but there is less emphasis on addressing bias and fairness in a way that reflects the diverse needs of its population. This gap highlights the need for more comprehensive regulatory measures to identify and mitigate biases in AI systems effectively.

Accountability and Enforcement: Establishing clear accountability and enforcement mechanisms for AI systems remains a significant challenge. Current regulations often do not provide sufficient clarity on who is responsible for the actions and outcomes of AI technologies. The EU's AI Act includes provisions for accountability, but enforcing these across multiple jurisdictions with varying legal frameworks can be difficult. In the US, the decentralized regulatory environment complicates the establishment of consistent accountability standards, leading to potential gaps in oversight and enforcement. China's strong government control ensures strict compliance with AI regulations, but this approach may not address issues of accountability in a

way that aligns with global standards. The lack of clear guidelines for liability and responsibility can lead to legal uncertainties and hinder the effective governance of AI technologies.

Ethical Considerations and Public Trust: Another gap in current AI regulations is the insufficient focus on broader ethical considerations and the need to build public trust. While the EU emphasizes ethical AI use through its regulations, practical implementation of these ethical guidelines remains a challenge. The US approach allows for ethical flexibility, but this can lead to inconsistencies in how ethical considerations are applied across different sectors. China's focus on aligning AI development with state-defined ethics may not fully address the ethical concerns of a global audience, particularly regarding issues like surveillance and privacy. Bridging this gap requires a concerted effort to integrate ethical considerations into AI governance and to engage with the public to build trust in AI technologies.

5.3. Manipulation of Consumer Choices and Controversial AI Applications

As AI technologies continue to evolve, their use in advertising and marketing has raised significant ethical and regulatory concerns. AI's ability to analyze vast amounts of data and create highly personalized content can lead to the manipulation of consumer choices, raising questions about transparency and consumer autonomy. This section explores some of the most controversial applications of AI in advertising, including the use of deepfakes, behavioral targeting, dark patterns, emotional AI, hyper-personalization, and AI-generated reviews, focusing on the ethical implications and potential risks associated with these technologies.

Behavioral Targeting and Microtargeting: Behavioral targeting is a common practice in digital advertising, where detailed data on individuals' online activities are collected to create highly personalized marketing campaigns. This data includes browsing history, social media interactions, and purchase behaviors, which are used to build comprehensive consumer profiles. While behavioral targeting can enhance the relevance of advertisements, it also poses ethical concerns about consumer manipulation. By targeting ads based on individuals' behaviors and preferences, advertisers can subtly influence their decisions, often without their knowledge or explicit consent.

Microtargeting, a more granular form of behavioral targeting, involves delivering tailored messages to very specific segments of the population. This technique is often used in political advertising to influence voter behavior by addressing their specific concerns and biases. The ethical issue here is that microtargeting can exploit individuals' vulnerabilities and reinforce existing biases, limiting their exposure to diverse viewpoints and potentially manipulating their opinions and behaviors in non-transparent ways (Matz et al., 2017).

Dark Patterns: Dark patterns are deceptive design practices in user interfaces that trick consumers into taking actions they might not otherwise choose. Examples include pre-selecting options that benefit the company, hiding or obscuring opt-out buttons, and using confusing language to gain consent for data sharing. These practices exploit cognitive biases and can lead to unintended consequences for consumers, such as signing up for unwanted subscriptions or agreeing to share more personal data than they intended. Dark patterns undermine consumer autonomy and trust,

raising ethical concerns about the manipulation of consumer choices through design (Sin et al., 2022).

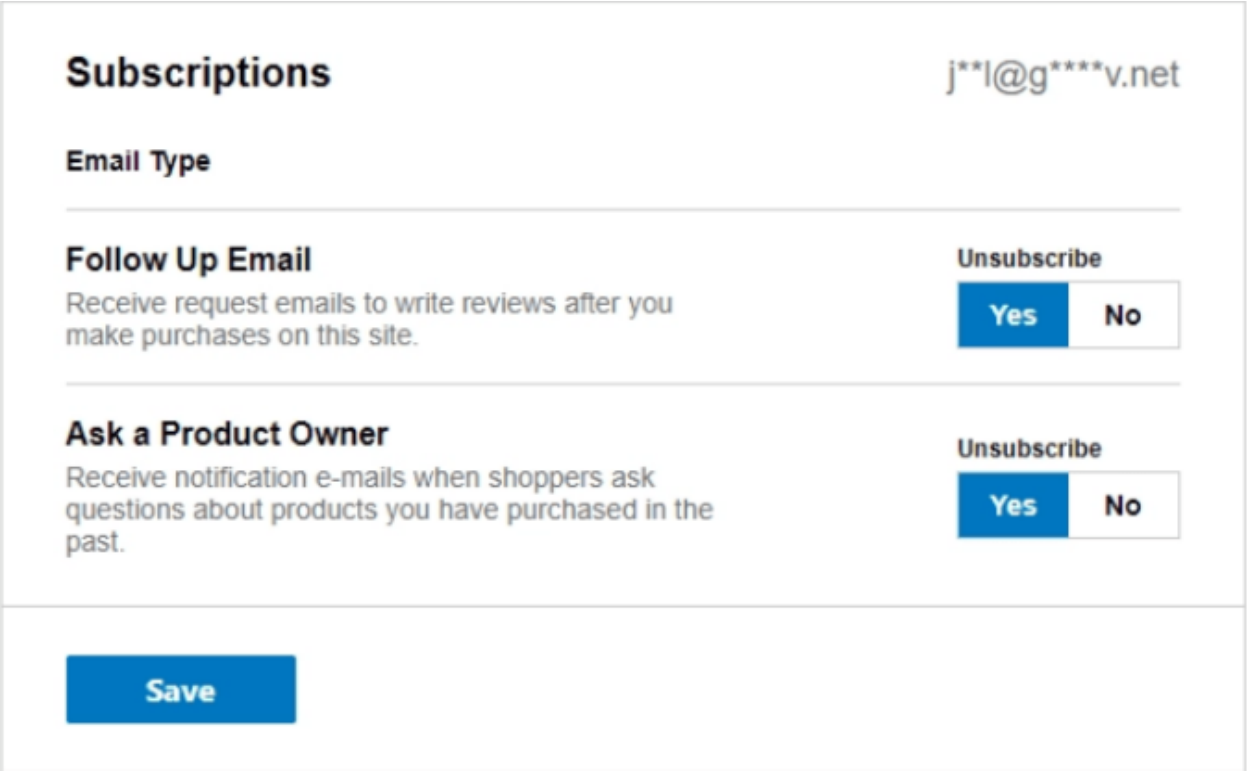

Figure 33: Dark pattern example by Cheq.ai

Emotional AI and Sentiment Analysis: Emotional AI refers to technologies that detect and respond to human emotions. In advertising, emotional AI can be used to create content that elicits strong emotional responses, aiming to influence consumer behavior by tapping into their emotional states. For instance, an advertisement that uses emotional AI might change its messaging based on the detected mood of the viewer, attempting to evoke feelings that drive them toward a purchase decision. Sentiment analysis tools analyze consumer text, speech, or social media interactions to gauge their emotional responses and tailor marketing messages accordingly. While these technologies can enhance engagement by making ads more relevant, they also raise concerns about emotional manipulation and the ethical implications of exploiting consumer emotions for commercial gain (Ma et al., 2018).

Hyper-Personalization: Hyper-personalization involves using AI to gather extensive data on individuals and create highly specific content or offers tailored to their personal preferences. This level of personalization goes beyond standard customization by considering a wide range of factors, such as past behaviors, real-time location, and even predicted future actions. While hyper-personalization can make advertisements highly relevant and engaging, it also raises ethical issues about privacy and over-intrusion. Consumers may feel their autonomy is compromised as they are continually targeted with content designed to influence their decisions. The risk is that consumers might be manipulated into making choices that align with the advertiser's interests rather than their own (Ali et al., 2023; Kietzmann et al., 2018).

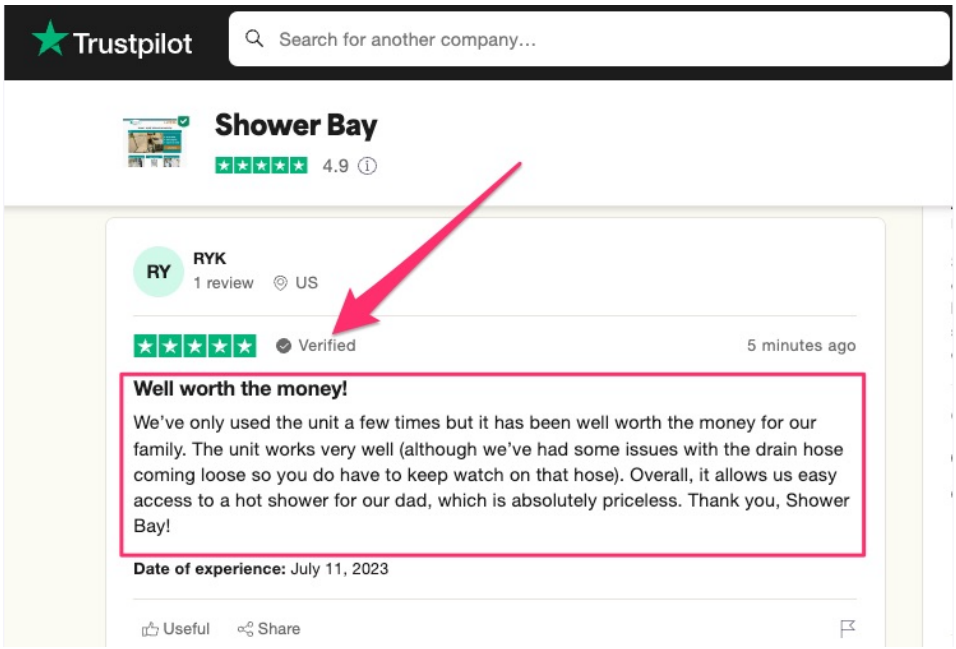

Figure 34: AI generated review in Trustpilot

AI-Generated Reviews and Testimonials: AI-generated reviews and testimonials are another controversial application of AI in advertising. These reviews are created using natural language processing algorithms to simulate human-written content, giving the appearance of genuine customer feedback. This practice can manipulate consumer perceptions by creating a false sense of credibility and trust in a product or service. AI-generated testimonials can mislead consumers, influencing their purchasing decisions based on fabricated endorsements. The prevalence of such deceptive content undermines trust in online reviews and complicates consumers' ability to make informed choices (Mukherjee, 2024).

The Challenge of Deepfakes: Deepfakes represent one of the most advanced and controversial applications of AI in the digital age. These AI-generated videos or images can convincingly portray individuals saying or doing things they never actually said or did. In the context of advertising, deepfakes can be used to create highly realistic but deceptive content that can manipulate consumer perceptions and choices (Gambín et al., 2024).

Deepfake technology can produce lifelike video and audio content by using deep learning algorithms to swap faces, alter voices, and create entirely synthetic personas. This technology can be used to create advertisements that feature celebrities or influencers endorsing products they have never actually endorsed. The realistic nature of deepfakes makes it difficult for consumers to distinguish between authentic and manipulated content, increasing the risk of deception and misinformation (Kietzmann et al., 2020).

An illustrative example of the sophistication of deepfake technology is the numerous social media accounts dedicated to creating deepfake videos of famous individuals. These accounts often focus on celebrities like Keanu Reeves, Tom Cruise, and Morgan Freeman, producing highly realistic videos primarily for entertainment purposes. However, deepfake technology is not limited to

entertainment; there are also accounts and content that target politicians such as Barack Obama and Donald Trump. These politically-oriented deepfakes can depict fake actions or statements, raising significant concerns about misinformation and the potential for manipulating public opinion (Foley & Guilcher, 2024).

One of the most troubling aspects of deepfakes is their potential to undermine trust in digital content. As consumers become more aware of the existence of deepfakes, they may become skeptical of all video and audio content, leading to a general erosion of trust in media. This can have far-reaching implications for brands and advertisers who rely on the authenticity of their content to build and maintain consumer trust.

The use of deepfakes in advertising also raises significant ethical and legal questions. Creating deepfake content without the consent of the individuals involved can be considered a violation of privacy and intellectual property rights. Moreover, using deepfakes to manipulate consumer perceptions and choices can be seen as a form of deceptive advertising, which is subject to legal and regulatory scrutiny in many jurisdictions.

To address the challenges posed by deepfakes, regulators and industry stakeholders must work together to develop guidelines and frameworks for the ethical use of AI in advertising. This includes establishing clear rules for the creation and dissemination of deepfake content and ensuring that consumers are adequately informed about the nature of the content they are viewing. Efforts to develop deepfake detection technologies are also crucial for identifying and mitigating the impact of deceptive content.

Figure 35: Morgan Freeman deepfake

5.4. Mitigating Ethical Issues in AI Advertising

As AI technologies continue to transform the landscape of advertising, addressing the ethical concerns and potential for consumer manipulation becomes increasingly important. Effective mitigation strategies are essential to ensure that AI is used responsibly, transparently, and in ways

that respect consumer rights and autonomy. This section explores how organizations and consumers can mitigate the ethical issues associated with AI in advertising, supported by recent research and guidelines.

5.4.1. Organizational Strategies and Best Practices

Organizations play a crucial role in addressing the ethical challenges posed by AI in advertising. By implementing robust ethical practices and ensuring compliance with regulatory frameworks, businesses can foster trust and enhance their reputation. Key strategies for organizations include adopting ethical AI principles, enhancing data governance, promoting ethical advertising practices, and building consumer trust (Dixon, 2022).

Organizations should adopt and adhere to ethical AI principles that guide the development and deployment of AI technologies. Principles such as transparency, fairness, accountability, and privacy protection are essential. Transparency involves clearly communicating how AI systems collect, process, and use data, providing consumers with understandable information about data usage and the implications of AI-driven decisions (Fjeld et al., 2020). Fairness requires ensuring that AI systems do not perpetuate or exacerbate biases, with regular audits to identify and mitigate potential biases. Accountability means establishing clear mechanisms for AI-related decisions, ensuring transparency about who is responsible for AI outcomes, and providing means for addressing grievances (Floridi, 2024). Privacy protection involves implementing robust data protection measures to safeguard consumer data, ensuring compliance with data protection laws and ethical standards.

Effective data governance is essential for mitigating ethical issues in AI advertising. Organizations should develop clear data policies that govern data collection, storage, and usage, ensuring compliance with legal and ethical standards. Ensuring data quality by collecting high-quality, accurate data reduces the risk of biased or incorrect AI outcomes. Adopting data minimization practices, collecting only the data necessary for specific purposes, helps avoid collecting excessive or unrelated data that could pose privacy risks or lead to misuse.

Promoting ethical advertising practices involves ensuring that advertisements are truthful, clear, and provide accurate information about products and services. Organizations should avoid using dark patterns, misleading claims, or manipulative tactics in advertising. Disclosing AI use in advertisements and explaining how AI influences ad content and delivery is crucial, allowing consumers to opt-out of AI-driven advertisements if they prefer. Regular monitoring and auditing of AI systems ensure compliance with ethical standards and evaluate the impact of AI-driven advertisements, making necessary adjustments to mitigate any negative effects on consumers (Floridi, 2024).

Building and maintaining consumer trust is crucial for the successful use of AI in advertising. Organizations should engage in open communication with consumers about how their data is used and how AI technologies impact their experience, encouraging feedback and being responsive to consumer concerns (Aldboush & Ferdous, 2023). Providing educational resources helps consumers understand AI technologies and their implications, empowering them to make informed

decisions. Upholding high standards of transparency and integrity in all business practices, being honest about the capabilities and limitations of AI technologies, and avoiding exaggerated claims about their benefits are essential.

5.4.2. Consumer Empowerment

Consumers also have a role to play in mitigating the ethical issues associated with AI in advertising. By being proactive and informed, consumers can protect their rights and make better decisions about their data and how it is used. Key strategies for consumers include exercising data rights, staying informed and vigilant, and advocating for stronger regulations.

Consumers should exercise their data rights to protect their privacy and ensure ethical data usage. This involves requesting access to personal data held by organizations to understand how it is used, controlling how personal data is used by opting out of data collection for advertising purposes, and managing privacy settings. Ensuring that personal data is accurate and up-to-date is crucial to prevent incorrect or biased AI outcomes (Jakhu, 2024).

Staying informed about how AI technologies work and their implications for privacy and autonomy is essential for consumers. Educating themselves about AI technologies and their use in advertising helps consumers make informed decisions. Being aware of their digital footprint and how it can be used for targeted advertising allows consumers to manage their data exposure and recognize manipulative practices. Developing an awareness of common manipulative practices, such as dark patterns and misleading claims, helps consumers identify and avoid being influenced by unethical advertising tactics (Hollebeek et al., 2024).

Consumers can also advocate for stronger regulations and policies that protect their rights and promote ethical AI use. Supporting policy initiatives and regulations that enhance data privacy and ethical AI use is important. Consumers can participate in public consultations, engage with advocacy groups, and support legislation that aligns with their values. Holding organizations accountable for unethical practices by raising concerns, reporting violations, and supporting businesses that demonstrate a commitment to ethical AI use is crucial.

Chapter 6:
Conclusions

6.1. Conclusions

Advertising has significantly evolved from its early days. Initially, ads were primarily print-based, appearing in early newspapers and broadsheets as simple text messages meant to inform rather than persuade. As the print industry progressed, advertisements grew in complexity and creativity, incorporating illustrations and more persuasive language to capture the audience's attention. This gradual transformation laid the groundwork for the sophisticated advertising strategies we see today. In recent years, this evolution has accelerated dramatically with the introduction of AI technologies. Companies and organizations continuously integrate new AI tools to gain a competitive edge, reach broader audiences, and enhance their impact. The advertising field has expanded significantly over the last decade, transforming into a sophisticated science. AI has been a major driver of this transformation, enabling advertisers to analyze vast amounts of data, identify patterns, and deliver highly relevant ads to specific audiences. This technological advancement has not only enhanced the precision and effectiveness of advertising campaigns but also introduced new methods and platforms for engaging with consumers.

AI Technologies in Advertising

The integration and advancement of artificial intelligence have fundamentally transformed the digital advertising landscape. This transformation is well-documented in related work and substantiated by our thesis. AI technologies bridge the gap between technology and consumer engagement, driving innovation, enhancing customer experiences, and delivering superior results in advertising. Our research aligns with existing literature in recognizing the substantial shifts AI has brought to industries such as advertising, media, e-commerce, and education. We found that advertisers increasingly leverage AI to convert vast amounts of data into valuable consumer insights, generate and distribute ads, and gather feedback on their effectiveness. This supports the related work's emphasis on the critical role of AI technologies like Natural Language Processing, Image Recognition, Deep Learning, AI-powered Predictive Marketing Analytics, Natural Language Generation, and Image and Speech Recognition in consumer insight discovery, targeting, ad creation, media planning, and impact evaluation.

However, our findings extend beyond the existing literature by categorizing AI techniques into content-centric and user-centric approaches. This categorization is crucial for understanding the landscape as it highlights the different ways AI can be applied to tailor content to individual preferences and enhance user engagement. We identified specific technologies such as Generative Adversarial Networks as pivotal in modern advertising. Even though the related work is recent, this finding underscores that new AI technologies are being introduced to the field at a rapid pace, continually reshaping advertising strategies. These technologies often work in packages rather than in isolation, achieving better results through their interdependent nature. As evidenced by many examples in Chapter 3, we saw numerous technologies working in alignment or in packages to optimize advertising outcomes.

AI's role in real-time data analysis and decision-making, which allows advertisers to optimize strategies dynamically based on consumer responses and market trends, is a key point where our research and related work converge. Our thesis emphasizes that AI technologies enhance various

aspects of advertising, including ad creation and management, performance optimization, personalization, competitive analysis, and programmatic advertising. These contributions, although sometimes not visible or understood by the general public, significantly influence consumer decision-making processes.

We also highlighted the challenges associated with AI in advertising, such as data requirements and quality, data privacy and security risks, algorithm bias, and transparency issues. While related work notes the significant time and cost involved in implementing AI and the technical barriers due to a lack of standardized protocols, our research further discusses the potential for large companies to monopolize AI technologies. This monopoly could lead to market imbalances and reduced consumer welfare, an aspect not extensively covered in the existing literature.In synthesizing our findings with the related work, we underscore the transformative power of AI in advertising and the ethical and practical challenges that accompany it. The rapid advancement of AI technologies continues to push the boundaries of digital advertising, making it crucial for advertisers to balance technological innovation with ethical considerations and data privacy.

Consumer Behavior and AI-Powered Advertisements

Our research confirms that AI has fundamentally transformed the advertising landscape by providing powerful tools for understanding and influencing consumer behavior. Advertising is fundamentally about reaching people at the right moment when they are receptive to marketing messages. These moments, known as "touch points," are critical stages in the consumer journey from awareness to purchase. Traditionally, marketers have relied on these touch points to guide consumers through the "funnel" from considering many options to making a final purchase decision. However, in today's digital age, with well-informed customers and the proliferation of global markets and digital platforms, identifying these touch points has become increasingly complex.

Our findings align with the existing literature, confirming that AI has become an essential tool in managing the complexities of modern advertising. AI enables companies to intelligently track consumer habits, improve brand effectiveness, and handle vast amounts of personal data. By leveraging AI, companies can better understand their customers, manage the marketing funnel, enhance advertising campaigns, and increase customer satisfaction with personalized solutions and product recommendations. Additionally, while the strategic use of AI to capture consumer attention amidst the daily exposure to numerous advertisements is regularly overlooked in research, our findings highlight its critical role in contemporary advertising practices.

AI-driven personalization has significantly impacted consumer behavior by fostering trust and loyalty, key psychological factors that shape how consumers interact with digital advertisements. Personalized ads that align with individual preferences and needs can boost engagement and satisfaction. However, this high level of personalization raises concerns about consumer autonomy. Finely tailored ads can limit exposure to a variety of products and ideas, subtly steering choices and reducing freedom. While most research highlights the positive aspects of personalization, only recent studies have brought attention to these potential downsides. Overly intrusive personalization can create echo chambers, reinforcing existing beliefs and preferences,

narrowing consumer perspectives, and potentially reinforcing biases. These dynamics underscore the need to balance the benefits of AI-driven personalization with preserving consumer autonomy and promoting a diverse marketplace.

Additionally, AI technologies are revolutionizing how advertisers predict and influence consumer choices. By providing immediate assistance and rapid solutions, AI enhances customer journeys and deepens businesses' understanding of their consumer bases. Despite these benefits, reliance on AI introduces challenges like the opacity and unpredictability of AI decisions, which can undermine consumer trust. Balancing AI applications with human oversight is crucial to maintaining this trust and ensuring ethical and transparent decision-making.

We also underscore the importance of consumer trust in AI technologies. As consumers become more familiar with AI through widespread applications like ChatGPT they are likely to develop a more nuanced understanding of its capabilities and limitations. This growing familiarity can lead to greater acceptance of AI, but it also underscores the need for transparency and ethical practices in AI-driven advertising to maintain consumer trust and engagement.

The challenge of balancing personalization with privacy remains a significant concern. Consumers value both personalized experiences and their privacy, and finding the right balance is critical. Our research indicates that while consumers are generally more willing to share information if they perceive a high reward, they are particularly sensitive about sharing personal data such as financial, biometric, genetic, physical, or mental information. Transparent policies and practices, such as clear cookie disclaimers and detailed privacy options, can help address these concerns and build consumer trust.

In the era of modern advertising, engagement, which encompasses clicks, likes, shares, comments, and time spent viewing ads, has evolved as a crucial metric for measuring the effectiveness of advertisements in capturing and retaining consumer interest. High engagement levels indicate that an ad resonates well with its audience, often leading to increased brand awareness, trust, and loyalty, as users become more familiar with the brand's message and products. AI plays a pivotal role in enhancing customer engagement, particularly in social media marketing, where it significantly boosts conversion rates by processing large amounts of data and segmenting consumers in real-time. This ability allows businesses to customize their marketing efforts, resulting in higher customer satisfaction and loyalty, as well as more repeat purchases. Additionally, AI-generated content has been shown to positively influence both psychological and behavioral engagement, deepening the mental and emotional investment consumers make in response to ads and translating this into tangible actions such as clicks, shares, and purchases.

Data Privacy and Ethics

During this research we confirmed the critical ethical considerations surrounding AI in advertising, as highlighted in existing literature. Studies in Marketing and AI consistently underscore that the integration of AI into advertising introduces substantial data privacy and ethical challenges. These challenges are primarily rooted in the extensive data collection required to understand consumer behavior, improve targeted marketing, and automate interactions. Key concerns include user consent, data security, and transparency.

We found that existing laws such as the GDPR, CCPA, CPRA, HIPPA, CLBA, COPPA, and PIPL significantly influence AI-driven advertising operations. These regulations impose stringent requirements on data collection and processing, demanding increased transparency and respect for user rights, which align with the findings in the literature. Our research also supports the notion that compliance with these laws involves considerable costs and operational adjustments for businesses. Implementing these regulations requires substantial investment in secure data storage, regular audits, and comprehensive training for staff. For smaller organizations, these high costs may lead to seeking workarounds to avoid full compliance, which can undermine the effectiveness of the regulations and compromise data privacy and security.

Both our findings and the related work emphasize the ethical risks posed by AI, such as the propagation of biases from training data and the opacity of "black box" systems. This lack of transparency complicates accountability and ethical decision-making, highlighting the necessity for human oversight to ensure trust and ethical standards in AI applications. Additionally, our study concurs with the literature on the ethical dilemmas presented by techniques like microtargeting and dark patterns, which can manipulate consumer choices and limit exposure to diverse ideas. Deepfakes, another significant issue, involve creating realistic but fake images or videos that can deceive consumers and erode trust in digital content. Furthermore, behavioral targeting, sentiment analysis manipulation, and hyper-personalization that crosses personal boundaries pose severe ethical concerns. The use of AI to generate fake information, such as reviews and testimonials, further contributes to a potentially dangerous environment for consumers. These practices can distort reality, undermine consumer autonomy, and create a marketplace rife with misinformation and exploitation.

While the literature notes the rapid advancement of AI technology outpacing current regulations, our research identifies specific gaps and inconsistencies across different jurisdictions. We found significant differences in scope, focus, regulatory control, and enforcement between the AI ACT in Europe, various US initiatives, and China’s AI Development Plan. These disparities necessitate harmonization across jurisdictions, adaptability to emerging technologies, and enhanced transparency and explainability in AI systems.

Moreover, our detailed analysis of controversial AI applications, such as deepfakes and hyper-personalization, underscores the urgent need for robust ethical guidelines and public trust. Both our research and existing studies call for stricter data protection rules, transparent algorithms, and ethical AI practices. However, our findings emphasize that regulations alone are insufficient. There is a pressing need for proactive mitigation strategies by organizations and heightened awareness among consumers to navigate the ethical complexities of AI in advertising effectively.

While most studies identify the ethical issues associated with AI in advertising, they often stop short of proposing concrete mitigation measures or frameworks. This lack of actionable solutions presents a clear danger of chaos in the marketing field, as unaddressed ethical concerns can lead to widespread mistrust and potential harm to consumers.

Organizations play a pivotal role in addressing these ethical challenges. By implementing robust ethical practices and ensuring compliance with regulatory frameworks, they can foster a more

trustworthy digital advertising environment. Organizations should adopt and adhere to ethical AI principles that guide the development and deployment of AI technologies. Developing clear data policies that govern data collection, storage, and usage is essential to ensure compliance with legal and ethical standards. Promoting ethical advertising practices involves ensuring that advertisements are truthful, clear, and provide accurate information about products and services. Building and maintaining consumer trust is crucial for the successful use of AI in advertising, and this trust can be achieved through transparency, accountability, and a commitment to ethical standards.

Consumers, on the other hand, should exercise their data rights to protect their privacy and ensure ethical data usage. Staying informed about how AI technologies work and their implications for privacy and autonomy is essential. By educating themselves about AI technologies and their use in advertising, consumers can make informed decisions about their digital interactions. Additionally, consumers can advocate for stronger regulations and policies that promote transparency and fairness in AI applications. This proactive approach will help build a more ethical and trustworthy digital advertising landscape, balancing innovation with consumer protection.

While AI technologies offer transformative potential in personalizing and optimizing advertising strategies, they also present significant ethical and privacy challenges. Addressing these challenges requires a multifaceted approach that includes stringent regulations, ethical guidelines, and active engagement from both organizations and consumers. By doing so, the industry can harness the benefits of AI while maintaining fairness, transparency, and public trust.

6.2. Future Work

Following the conclusions drawn in our study, there are several promising avenues for future research that can further expand our understanding and address the emerging challenges associated with AI in advertising. These potential areas of future work can be categorized into AI technologies and techniques, consumer behavior, and ethical considerations and mitigation measures.

AI Technologies and Techniques Used for Advertising: Given the rapid advancements in AI, continued exploration of emerging technologies is essential. Future research could investigate the potential impacts of specific AI technologies such as deep learning, reinforcement learning, and generative models on advertising practices. Since many diverse technologies are used in advertising, focusing on particular ones can provide a clearer understanding of their capabilities and limitations, which is crucial for anticipating future trends and challenges. Furthermore, conducting real-world case studies to evaluate the effectiveness of AI-powered advertising campaigns across various industries can provide invaluable practical insights and best practices for leveraging AI in marketing. This research is particularly necessary because many companies that study real cases currently keep their results proprietary, limiting the broader industry's ability to learn from these experiences.

Consumer Behavior: To build on our findings about consumer responses to AI advertisements, future studies could focus on longitudinal research to observe how consumer attitudes and behaviors towards AI-powered advertisements evolve over time. This would provide insights into

the lasting effects of AI interventions. Cross-cultural studies could also explore how different cultural contexts influence consumer reactions to AI advertisements, helping tailor strategies to diverse markets. Further, investigating the impact of AI-powered advertising on small and medium-sized enterprises (SMEs) compared to large corporations could reveal unique challenges and opportunities for SMEs.

Ethical Considerations and Mitigation Measures: Addressing the ethical challenges of AI in advertising is crucial. Future work could focus on developing comprehensive ethical frameworks and guidelines for AI use in advertising, collaborating with industry experts, ethicists, and policymakers. Research into consumer privacy and data security implications, including studying the effectiveness of current regulations and proposing enhancements, remains vital. Moreover, exploring methods to improve the transparency and explainability of AI algorithms used in advertising can ensure fair and unbiased decision-making processes. Developing tools and technologies that empower consumers to control their data and make informed decisions about their interactions with AI-powered advertisements, such as user-friendly privacy settings and consent management systems, can also be beneficial.

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