Setting the Research Agenda: Emotion Recognition Tools for AI-Generated Marketing and CRM

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***Abstract*— The study's aim is to consider setting research agenda for emotional AI to enhance marketing strategies, consequently to improve customer satisfaction. This study explores the integration of emotional artificial intelligence (AI) developed using data generated by neuro-physiological tracking systems in marketing and customer relationship management. Emotional AI, capable of recognizing and interpreting human emotions, offers significant opportunities for creating personalized customer experiences. The research investigates how emotional AI can enhance marketing strategies, improve customer satisfaction. It also addresses the ethical considerations and challenges associated with collecting and utilizing emotional data. By leveraging emotional AI, it is assumed brands can foster trust-based relationships and gain a competitive edge in the market.**

Keywords—Emotional Artificial Intelligence; AI in Marketing; AI in CRM.

I. INTRODUCTION

The rapid advancement of computer software and hardware technology in recent years has led to the proliferation of artificial intelligence (AI) applications. Today, AI software is integrated into almost every computer-based application, ranging from manufacturing to medicine, and from transportation to banking. AI is relied upon to interact with people [1]. AI applications are extensively designed to replicate human cognitive functions, and there have been developments in software and hardware capable of calculating, acting, and communicating like humans [2]. However, there is ongoing research into developing AI equipped with human-like emotions, raising important questions about the future of AI [3]. This study aims to explore and address these questions in the context of marketing and customer relationship management (CRM).

The question is can current AI applications be evolved into emotionally intelligent systems capable of understanding, interpreting, empathizing, and responding based on bio-sensing emotional cues during human interactions? What opportunities arise from AI's capacity to comprehend and respond to human emotions, particularly in marketing and customer relationship management? What potential challenges and ethical considerations may emerge from implementing this transformation in enhancing customer offers, relations and experiences?

Research into the intersection of emotional artificial intelligence and marketing applications is still in its early stages, offering fresh perspectives. Integrating emotional artificial intelligence reportedly appears crucial for the success of marketing efforts, as it can meet and even surpass consumer' needs, wants, and enhance customer relationships [4].

This study aims to highlight the significance of incorporating emotional intelligence into marketing practices, thereby empowering marketing professionals to develop successful applications. By prioritizing emotional AI, marketers can cultivate enriched, personalized customer experiences, fostering greater comfort and engagement among their clientele [4]. Ultimately, leveraging emotional AI in marketing applications can lead to improved speed, standardization, efficiency, and, consequently, higher profitability in customer interactions [5].

II. CONCEPTUAL AND THEORETICAL FRAMEWORK

Utilizing emotional intelligence in marketing provides brands with the potential to explore new opportunities in untapped areas. This section aims to delineate the concepts of artificial intelligence and emotional artificial intelligence and explore their correlation with marketing.

A. Artificial Intelligence

Artificial intelligence represents a cutting-edge information processing and the creation of technology that has rapidly advanced and continues to evolve. Powered by methods such as: deep learning, machine learning, and neural networks, computers equipped with AI can collect, process, and generate data for specific purposes while continuously enhancing their capabilities and minimizing the margin of error in their outputs [6].

While AI applications initially require human guidance, they can eventually operate autonomously or semi-autonomously. Examples of AI applications include self-driving electric cars, personalized Netflix recommendations, and targeted Instagram ads, call center automation of banks, mobile phone software, and real-time translation tools.

Although the concept of artificial intelligence has been discussed since the 1950s [7], AI applications have now become ubiquitous in our daily lives, thanks to the rapid advancements in computer technology and cloud computing, which have provided substantial speed, efficiency, and virtually limitless storage capacity[8]. For instance, AI can support

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medical professionals in fast decision-making processes, such as diagnosing diseases, by processing large volumes of data [9]. The wide array of AI applications benefiting people has led to the rapid acceptance of AI. In recent years, Large Language Model (LLM) applications, which utilize internet data for training, have significantly enhanced the interaction between artificial intelligence and humans [10]. These LLM applications utilize numerous algorithms to produce outputs that are understandable to humans. Their impact has propelled the private sector to guide academic studies and utilize extensive resources in this field [11].

B. Emotional Artificial Intelligence

Emotional artificial intelligence refers to a type of artificial intelligence that is capable of recognizing, distinguishing, understanding, and interpreting human emotions. By processing this information, it can generate personalized outputs. Similar to conventional artificial intelligence algorithms, emotional artificial intelligence utilizes deep learning, machine learning, neural networks, and large language models to process data. With a wider range of training data, it can produce more precise and purposeful outputs [12].

C. Emotion Recognition & Data Creation of Emotions

Emotional AI systems employ various techniques to identify emotions. Along with commonly used methods like facial recognition, voice analysis, and physiological responses, FMRI and EEG analyses are also utilized to understand emotional activity in the brain [3]. Facial recognition algorithms can predict a person's emotional state with 80% accuracy, discerning whether they are happy, sad, or surprised [13]. Emotional AI applications can achieve more precise emotion recognition by combining biometric data obtained from individuals. Apart from analyzing non-verbal communication cues such as facial expressions, posture and eye movements' insights can also be derived by assessing verbal factors such as tone and speed of speech as well as choice of words [3]. However, a comprehensive and accurate understanding of emotions from this emotional data is still in its early stages. It has been observed that facial recognition programs perform better for certain races, skin colors and cultures, but do not yield the same level of accuracy for different subjects [14]. Similarly, it has been noted that the stimuli which provoke emotions differ across cultures [15]. While the bodily response to the same emotion is uniform across individuals, the intensity of the emotion may vary [15].

The recognition of emotions can be leveraged to facilitate customized interactions. This form of emotional intelligence technology has the potential to provide tailored emotional support for individuals. Although they are in development, it will be feasible to develop more precise emotional responses using theory of mind [16]. These responses can demonstrate empathy and understanding, and adapt to the emotional context [4]. Chatbots integrated with emotional AI have the capability to offer highly personalized interactions [17].

The concept of Emotional AI involves the integration of various data sources to comprehend human emotions. Such data can be gathered through both invasive and non-invasive techniques. While some methods necessitate explicit consent, others can be applied without it. Non-invasive approaches include facial emotion recognition, eye movement and pupil size analysis, body language and motion analysis, as well as voice and odor analysis [3].

Invasive and semi-invasive methods, such as skin conductance measurement, FMRI, EEG, MEG, ECG, heart rate, and breathing analyses, are used to delve deeper into understanding human emotions. In cases of complete invasion, blood, urine, and saliva analyses, deep brain stimulation, and electrodes are employed [3].

D. Theoretical Framework

Emotions trigger physiological changes in the body, prompting individuals to approach or withdraw from a situation [18]. Different emotions manifest distinct effects on the body [19]. For instance, serotonin, dopamine and oxytocin are associated with happiness [20], while dopamine is linked to reward and pleasure [21]. Moreover, varied facial muscle movements accompany different emotional states [22]. Fear and arousal cause an increase in adrenaline, dilation of pupils, heightened skin conductivity, and slowed down heartbeat [23]. Conversely, individuals experiencing sadness and depression often exhibit a forward-leaning posture, tilted head, and expressions of unhappiness [24]. These physiological indicators serve as markers for different emotional states, which can be harnessed as emotional data and processed to derive valuable insights.

The experience of fear can be examined through physiological responses such as pupil dilation, hormone levels, and skin conductivity tests. Additionally, researchers have utilized EEG devices to study emotions. In a recent study, one of the authors of this study investigated the real-time detection of fear using a consumer-grade EEG device. Participants were exposed to visual stimuli, including both neutral and fear-inducing images, while their brain waves were recorded. The study revealed distinct differences in the brain waves of individuals experiencing fear compared to those exposed to neutral stimuli, as demonstrated by the ERP and FFT analyses of the EEG data [25].

Many studies on consumer behavior suggest that emotions play a significant role in consumer decision-making [26]. Consumers are drawn to brands that understand and connect with their emotions [27]. Emotional states directly influence consumers' choices, as they balance their emotions with logical considerations when making decisions [28]. Emotions are fundamental to fulfilling the primal instincts of survival and continuation, which drive the actions of all living beings. Consumers make brand choices and purchasing decisions based on these instincts. Key emotions such as fear, pleasure, love, and happiness are crucial in determining purchasing behavior [29]. Understanding and addressing the emotional needs of consumers is recognized as a key factor in successful marketing strategies [30].

In particular, fear has a pronounced impact on purchasing decisions [31]. For example, Apple effectively leveraged the fear of missing out in their marketing efforts [32]. Additionally, concerns about potential damage to products or financial losses are also powerful motivators for consumers[33].

E. Ethical Concerns

The increasing integration of artificial intelligence and emotional artificial intelligence applications into daily life has outpaced the development of relevant laws and regulations. Currently, there is no universally accepted legal framework for artificial intelligence. Countries are grappling with the question of whether there are ethical and legal implications arising from the impact of artificial intelligence in various domains. While the positive potential of artificial intelligence outputs for the betterment of society is evident, the possibility of their malicious use underscores the necessity for updated regulations.

The production of undetectable fake content in written, verbal, and visual forms poses a significant challenge. Furthermore, the emergence of issues related to emotional artificial intelligence, such as its use in marketing, influence on consumer behavior, and manipulation of emotional data without consent, need to be addressed [34].

Existing data protection laws like General Data Protection Regulation (GDPR) of EU, California Consumer Privacy Act (CCPA) of USA, and Personal Data Protection Law (KVKK) of Türkiye should be expanded to encompass emotional artificial intelligence. Additionally, ethical concerns regarding the use of emotional artificial intelligence applications on consenting individuals and the broader public warrant careful consideration. Questions about the ethical implications of using emotional data from approved individuals to generate outputs for a specific segment, and whether the consent of other consumers in the segment is required, need to be addressed. Defining which emotional data qualifies as personal and requires consent is also an important consideration.

While emotional artificial intelligence outputs may yield marketing success by directly influencing purchasing decisions, their impact on individuals' sense of justice and the overall trust in artificial intelligence must be scrutinized.

III. IMPLICATIONS OF THE STUDY AND FURTHER QUESTIONS

The effective use of emotional AI can lead to the creation of successful marketing applications that enrich the consumer experience. Through accurate analysis of emotions and personalized design approaches, consumer satisfaction will increase, leading to a preference for the brand.. The widespread use of emotional AI has the potential to foster trust-based relationships between consumers and brands, studies have shown that people tend to trust those who show them empathy [35], [36].

When consumers choose a brand, they expect it to make a positive impact in their lives, be it by fulfilling a need or desire, or by evoking a particular emotion. Consumer decisions are often driven by a sense of pleasure [36], while emotions such as fear, anxiety, relief, fun, and desire also influence their choices, [37]. Effective emotional AI applications that accurately analyze and respond to these emotions will help implement successful marketing strategies.

In addition to regulating brand-consumer interactions, emotional AI applications can also manage human-consumer interactions on behalf of the brand. In other words, emotional artificial intelligence can directly communicate with the consumer or guide brand representatives in their interactions.

For emotional AI to simulate human-like behavior, it must emulate a comparable level of theory of mind [25]. Thus, a deep understanding of theory of mind processes in humans is essential for transferring this capability to emotional AI.

At this point, it is imperative to ask some further questions:

Understanding Emotions

1. What additional emotions, can be measured and through which method?
2. Which measurement methods need to be triangulated to ground our understanding of emotions?

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3. How can emotional AI be optimally leveraged to create products that align with consumer demands and requirements?
4. Is there a necessity for emotional AI algorithms tailored to specific industries, esp. manufacturing vs. services?
5. Can emotional AI detect consumer state of being and generate appropriate responses to create experiences via online, ambient and implant connections?
6. Should the output of emotional AI vary based on consumer purchasing and consumption occasions?
7. Can cultural nuances be integrated into emotional AI practices?
8. How does a consumer's awareness of being exposed to emotional AI in their interactions with a brand, impact their overall experience?
9. Are there generational differences in responding to human- AI interactions?

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