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Research on the Impact of Algorithmic Bias in Different Categories on Consumers' Intention to Use

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Abstract

The emergence of algorithmic bias leads to unfair decision outcomes for consumers. However, due to the complexity and opacity of algorithms, the phenomenon of algorithmic bias has become widespread, thus drawing attention to related issues in the field of intelligent services. Currently, most studies have discussed the causes and specific manifestations of algorithmic bias conceptually, but few scholars have investigated the different categories of algorithmic bias in intelligent service algorithms and their differential impacts on consumers' intention. Clarifying the reasons for the differences and their underlying mechanisms can supplement the theoretical basis of current research on algorithmic bias in intelligent services and provide guidance for enterprise services. Therefore, studying the impact of intelligent service algorithmic bias on consumers' intention to use is of great significance. This paper explores the differences in the impact of different categories of algorithmic bias on consumers' intention to use. This study proves that compared with the application bias, the contextual bias leads to lower intention to use among consumers. This is because the contextual bias induces consumers to have stronger suspicion, which results in a lower intention to use such intelligent services.

Keywords

Intelligent Services; Algorithmic Bias; Consumer’s Intention.

1. Introduction

Artificial intelligence, as a product of social development and technological innovation, has an extremely profound impact on the world economy, social progress, and people's lives. On one hand, since intelligent technologies are automated, they can provide services and assistance to customers at any time, enhance user experience, and reduce the burden on enterprises[1]. On the other hand, machine learning technology embedded with artificial intelligence has almost completely transformed various aspects of people's daily lives[2]. The accumulation of big data has endowed algorithms with the ability to learn from experience, understand and express human language, and even recognize and imitate human emotions. Nowadays, in the face of complex prediction and decision-making tasks, artificial intelligence products centered on algorithms can provide services to users with accuracy surpassing that of experts[3].

Based on algorithms, artificial intelligence services are increasingly integrated into people's production and daily lives. However, the problem of algorithmic bias cannot be ignored. Various algorithmic recommendations and models increasingly influence consumers' perceptions and decisions, and the problems of bias and discrimination brought about by algorithmic bias have gradually emerged. Algorithmic bias may result in discriminatory and biased outcomes based on consumers' race, gender, age, income, and other characteristics, including special biases towards certain groups in reality, which are reflected in algorithmic results, and consumers' behaviors will also be accordingly affected[4]. Such discrimination and bias not only harm

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consumers' rights and interests but also violate the principles of social justice and equality. People are worried that discrimination based on gender, race, age, and status will spread to artificial intelligence and algorithmic technologies, thereby replicating the biases, injustice, and inequality from reality to the technical field, exacerbating the crisis of social division and ideological fragmentation. Similar algorithmic bias phenomena will also have certain negative impacts on enterprises. If the algorithm is biased, it may lead to unfair recommendations or services for consumers, making consumers feel ignored or discriminated against. This will result in a decline in consumer satisfaction, thereby lowering the evaluation of the enterprise by consumers, losing user trust, and even triggering consumer complaints and negative word-of-mouth dissemination, having a negative impact on the business's customer relationship and causing user churn.

From the perspective of consumers, does the algorithmic bias of artificial intelligence services have any impact on them? Are the influence mechanisms of different types of algorithmic biases different? This is the main focus of this study. At the current technological level, algorithmic bias is difficult to be fundamentally resolved, but consumers' usage intention determines the survival and development of intelligent service products of intelligent service products. Exploring the impact of different types of algorithmic biases on consumers' intention to use is helpful for enterprises to better understand consumers' needs and formulate improvement plans for intelligent service products in the direction of enhancing consumers' intention. Therefore, exploring the influence mechanism of algorithmic bias of artificial intelligence services on consumers' intention is of great significance for the theoretical research and practical development of artificial intelligence services.

2. The Impact of Different Categories of Algorithmic Bias on Consumers' Intention to Use

Technology itself does not cause discrimination or injustice, but it can trigger individuals' perceptions, leading consumers to accept or reject biased information and technologies[5]. Akter et al.'s research classified algorithmic bias types into the design bias, the application bias, and the contextual bias[6]. The design bias refers to the algorithmic bias resulting from the design of the application. Its root cause lies in inappropriate data sets, insufficient algorithm model specifications, and unreasonable method selection. The resulting biases include: training data bias, model bias, and method bias. The internal causes are complex, and the external manifestations are diverse. Consumers find it difficult to directly perceive the differences in algorithmic bias at the design level. Therefore, this article distinguishes and explores from two other perspectives.

The contextual bias refers to the situation where enterprises provide differentiated services to individuals based on users' personal information, such as gender, age, income, membership information, and consumption history. The resulting biases include cultural bias, social bias, and personal bias. The application bias refers to the situation where enterprises provide differentiated services to specific regions, certain devices, or specific groups of people, with the aim of maximizing profits or minimizing costs. The audience of intelligent services is mostly ordinary consumers. Therefore, this study selects the types of algorithmic bias in intelligent services from the perspective that consumers can perceive, and ultimately chooses the contextual bias and application bias in the research of Akter et al.[6] as the research objects to conduct in-depth exploration of their impact on consumers.

Compared to other external fixed factors, people have a lower tolerance for unequal distribution caused by their inherent characteristics[7]. The external manifestations of application bias and contextual bias precisely correspond to these two aspects. Therefore, the differences in the impact of different types of algorithmic biases on consumers' intention to use

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are the further exploration direction of this article. Different types of algorithmic biases in intelligent services can lead to varying degrees of negative feelings and behaviors from consumers. Combined with previous research[8], the application bias has consistency in group decision-making, thereby making this intelligent service have certain procedural fairness, and thus making the acceptance of consumers relatively higher. Therefore, even if intelligent services have application algorithmic biases, consumers' tolerance for unfair results is relatively higher, while contextual bias is generated based on the personal trait information of consumers. Compared to other difficult-to-change external factors (regional differences, program settings, etc.), consumers have a lower tolerance for unequal results caused by individual inherent characteristics (gender, age, etc.)[7], and thus, compared to fixed factors such as algorithm design procedures, consumers have a lower acceptance of bias results caused by their own inherent characteristics, that is, they are more difficult to accept the phenomenon of social background algorithmic bias in intelligent services. Therefore, this article believes that compared to the application bias, the contextual bias has a stronger negative impact on consumers' intention to use.

3. The Differences in the Mediating Role of Suspicion

Suspicion refers to a tendency of a person to distrust or question something[9]. Suspicion is not only a personality trait but also a consumer emotional state induced by situational factors, and it can change due to changes in the environment[10]. Therefore, it can be considered that suspicion is a consumer emotional state induced by situational factors. Suspicion usually occurs when an individual encounters contradictory assumptions regarding the intentions of others, and it can hinder the individual's positive attitude[11]. Ahmad et al. demonstrated that suspicion of motivation can cause consumers to reduce their purchase intentions[12]. Pizzi et al. explained the influence of the characteristics of intelligent services on consumers' suspicion and how they affect consumers' behavior[13]. Suspicion can cause consumers to develop negative attitudes[14], and the deepening of suspicion prompts the strengthening of consumers' negative behavioral intentions.

Chinese consumers usually have a reserved personality and are emotionally restrained. Unlike previous studies by foreign scholars, which focused on analyzing the aversion to algorithms, this research analyzes suspicion as a more complex and subtle negative emotion as an intermediary. When algorithmic bias occurs, consumers are more likely to doubt the service itself[13]. In this case, the algorithmic bias of intelligent services may intensify their suspicion and resistance, thereby hindering users from accepting the suggestions and requests of intelligent services. The occurrence of algorithmic bias inevitably leads to consumers' suspicion, and the application of algorithmic bias has certain procedural fairness, thus making consumers' acceptance relatively higher.

In situations contrary to expectations, negative outcomes often lead consumers to suspicion the motives behind the event, thereby reducing their intention to act. In this study, algorithmic bias in intelligent services is a specific situation. The algorithmic bias results deviate from consumers' expectations, causing them to doubt the intelligent services and further reducing their intention to use them. Regarding algorithmic bias in intelligent services, compared to the external fixed factor of application settings, people tend to find it more difficult to accept unequal results caused by their own user information. For unequal results caused by fixed factors, the service process is regarded as fair, and consumers' level of suspicion is relatively low. However, unfair services based on users' own information are highly related to personal interests, and consumers often have a higher degree of suspicion about their motives. From this analysis, compared to the application bias, the contextual bias of intelligent services is more likely to stimulate consumers to have a higher level of suspicion. Therefore, this paper argues

that the mediating effect of algorithmic biases on consumers' usage intention is mediated by suspicion, and that different types of algorithmic bias may exert varying influences on this suspicion. Specifically, compared to the application bias, the contextual bias may deepen consumer suspicion, thereby reducing their intention to use the intelligent service.

4. Summary

This article mainly demonstrates that the impact of different types of algorithmic biases on consumers' intention to use varies significantly. Specifically, when using artificial intelligence services, compared to the application bias, consumers' intention to use is lower in the case of the contextual bias. Moreover, this article also considers the mediating role of suspicion, arguing that suspicion mediates the impact of different types of algorithmic biases on consumers' intention to use. And compared to the application bias, the contextual bias is more likely to trigger suspicion, causing consumers' intention to use intelligent services to be lower. Through the overall theoretical research, it demonstrates the mediating role of negative emotions between intelligent service algorithmic biases and consumers' intention to use.

This article's research on algorithmic bias is limited to preliminary theoretical arguments. In the future, further empirical analysis based on real consumer data is needed to enhance the reliability of this study. Additionally, in real life, consumers rarely actively distinguish different types of algorithmic bias. However, in various situations, they may still unconsciously cause different results. Therefore, in the future, the algorithmic bias generated by the design of intelligent services based on data and models can also be further studied as a research object. We will explore whether consumers' attitudes and behaviors towards intelligent services still differ when the algorithmic bias cannot be clearly distinguished.

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