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# Multifactor Impact of Accent Localization in AI Customer Service Agents on User Emotional Engagement

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***Abstract*—AI voice customer service agents are increasingly utilized in various contexts, enhancing efficiency but exhibiting limitations in terms of diversity and emotional interaction. This study explores the influence of accent localization in AI customer service agents on users' emotional responses, considering factors such as age, dialect familiarity, and usage scenarios. The findings indicate that although AI customer service agents with localized accents score lower in pleasure compared to Mandarin-speaking agents, they significantly excel in arousal, reflecting a dual effect on emotional response. Interaction effect analyses reveal that younger users familiar with the dialect exhibit higher satisfaction levels, while older users' emotional resonance does not necessarily translate into increased satisfaction. These findings provide new insights for the design of AI voice, emphasizing the importance of personalized language adaptation in enhancing user experience.**

***Index Terms*—AI voice customer service agents; accent localization; emotional feedback; user experience**

## I. Introduction

With the advancement of AI and speech recognition technologies, AI voice customer service agents have progressively replaced traditional interactive voice response (IVR) systems, becoming pivotal tools in customer service [1]. These agents, as variants of AI voice assistants, are extensively applied in domains such as e-commerce [2], psychological counseling, healthcare [3] [4], and digital governance systems [5], demonstrating a strong focus on enhancing operational efficiency.

Although AI customer service agents have made notable progress in comprehending user requests, studies reveal persistent shortcomings in terms of diversity and human-like interaction, which limit their ability to fully cater to a wide range of users [6]. Most AI voice systems currently employ Mandarin; however, existing research suggests that the use of dialects can foster greater trust and affinity between users and voice agents, thereby enhancing the overall interaction experience [7]. Despite this, the emotional impact of accent localization in customer service contexts remains underexplored.

This study aims to investigate the emotional effects of accent localization (Mandarin vs. Shanghainese) in AI voice customer service agents, focusing on two representative contexts: e-commerce and government public services. The analysis centers on the differences in emotional responses across age groups, dialect familiarity, and service scenarios, with the objective of offering insights and strategies for optimizing accent localization and emotional design in AI customer service systems.

## II. Related Work

### A. The Rapid Development of AI Voice Customer Service and Deficiencies in Emotional Experience

In recent years, AI voice customer service robots have rapidly emerged, reshaping the customer service industry. By reducing waiting times and efficiently resolving issues, these technologies have enhanced user experience [8] [9]. However, despite the rapid technological advancements, some users still harbor incomplete trust in these services [10]. This lack of trust is partly attributable to the deficiencies in emotional interaction and diversity within AI customer service, which directly affect users' emotional experiences.

Research has shown that elements of human-like design, such as warmth and perceived intelligence, can significantly enhance users' trust in robots and increase their satisfaction [11] [12]. Nevertheless, many AI voice customer service systems fall short in this regard, making it difficult for users to naturally express their emotions or needs when interacting with AI assistants. This lack of human-like interaction leads users to feel that the assistance they receive is insufficiently empathetic, ultimately lowering their overall satisfaction with the service.

Moreover, the shortcomings in diversity among AI customer service systems exacerbate the deficiencies in emotional experience. Wenzel et al. [6] have noted that voice assistants perform poorly when serving users from racial minorities and non-native English speakers, resulting in diminished emotional experiences and even frustration among these users. This phenomenon indicates that existing robot designs do not adequately reflect users' diversity and values, limiting their applicability across different cultural contexts [13]. Such deficiencies not only affect service quality but also weaken

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users' emotional resonance, further exacerbating the trust crisis among users.

Therefore, although AI voice customer service technology has made significant progress in functionality, its shortcomings in emotional experience and cultural diversity remain major barriers to user acceptance. This is particularly critical in customer service contexts, where trust and emotional connection are essential. To enhance user satisfaction and experience further, it is imperative to place greater emphasis on emotional interaction and cultural adaptation in the design of these technologies.

### B. The Impact of Accent and Dialect on User Emotion

Accent, as a vocal characteristic, can rapidly convey the speaker's social background and sense of belonging to the listener. This sense of group identity leads individuals to be more inclined to interact with members of the same social group. Research by Kühne et al. [7] indicates that dialects enhance users' trust in voice robots, reflecting the important role of dialect in emotional connection. Furthermore, Lee et al. [14] found that the "interaction quality" in voice communication has a greater impact on user trust than information quality and system quality. This finding further suggests the potential value of accent in enhancing trust and emotional connection in human-computer interaction.

However, despite Kühne et al.'s emphasis on the positive effects of dialect, a survey of over 500 individuals in the UK reveals that users exhibit distinct preferences for specific accents [15]. This indicates that while dialects can significantly enhance users' trust in voice robots, the increase in trust may not be universally effective for all users, as some may hold biases or discomfort towards particular accents.

Therefore, accent serves as a critical element in voice interaction, fostering emotional connections and trust between users and voice systems, but it may also lead to negative emotional experiences for users in certain contexts. When designing AI voice customer service systems, a thorough consideration of users' accent preferences and potential emotional responses will help improve user satisfaction and interaction quality, thereby achieving a better balance in the overall experience.

## III. METHODS

### A. Hypothesis

Based on the aforementioned literature, we propose the following hypotheses:

- H1: Localized-accent AI customer service agents will elicit more positive emotional responses from users compared to Mandarin-speaking AI customer service agents.
- H2: Age, dialect familiarity, and usage context will influence users' emotional feedback across different accents.
  H2a: Users familiar with the dialect will have more positive emotional responses to localized-accent AI customer service agents.
  H2b: Users' emotional responses may vary across different contexts.

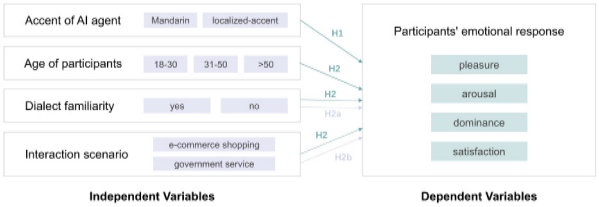


Fig. 1. The Impact of Mandarin and Localized Accent Customer Service on User Emotional Responses

### B. Participant

This study recruited 30 participants via social media, comprising 13 males and 17 females (M = 37.83, SD = 12.76). The selection criteria included age group categorization (18-30 years, 31-50 years, and over 50 years) as well as an assessment of proficiency in the Shanghainese dialect. Participants were balanced based on age, gender, and dialect familiarity.

### C. Procedure

This study employed a within-subjects design, with the primary independent variable being the type of accent used by the AI voice customer service agents: a Mandarin group (control condition) and an accented group (experimental condition, using Shanghainese). Secondary independent variables included participants' age, dialect familiarity, and the interaction scenario.

Participants were exposed to two interaction task scenarios. The first scenario was an e-commerce shopping task, which included four steps: product inquiry, price inquiry, inventory check, and order processing for a mobile phone. The second scenario involved a government service system related to social security card processing, with tasks including service consultation, policy explanation, issue reporting, and appointment scheduling. Each scenario consisted of four steps. The AI customer service responses were pre-determined using prompts to eliminate the influence of response quality.

Each participant engaged in four interactions: two scenarios with both a Mandarin-speaking and Shanghainese-accented AI customer service agent, conducted via voice call on an online experimental platform. The task sequence was randomized to control for order effects.

The dependent variable was participants' emotional response, assessed using the PAD scale and a Likert scale. Emotional states were evaluated across three dimensions: Pleasure, Arousal, and Dominance, with three questions per dimension. Additionally, satisfaction was measured using a five-item scale. Open-ended questions were included to gather subjective feedback from participants. After each interaction, participants completed a questionnaire.

## IV. RESULT

Participants were anonymized through assigned IDs, with a total of 30 participants completing 120 trials (each participant conducted four trials under four conditions). Based on age

and familiarity with Shanghainese, participants were grouped as follows: 18-30 years (36.67%), 31-50 years (33.33%), and over 50 years (30%). Regarding familiarity with Shanghainese, 14 participants (46.67%) reported being familiar, while 16 participants (53.33%) indicated they were not.

The study first examined the main effect of accent on emotional responses. Paired sample t-tests were conducted to analyze the differences in Pleasure, Arousal, Dominance, and Satisfaction between the Mandarin and Shanghainese groups.

In terms of Pleasure, a significant difference was found between the Mandarin group (M = 4.04, SD = 0.73) and the localized-accent group (M = 3.68, SD = 1.16), with t = 2.63, p = 0.01087. For Arousal, significant differences were also observed, with the Mandarin group (M = 3.40, SD = 0.88) showing different results from the dialect group (M = 3.74, SD = 0.75), t = -2.80, p = 0.00691. However, no significant difference was found in Dominance, with the Mandarin group (M = 3.92, SD = 0.86) and the localized-accent group (M = 3.74, SD = 0.88) showing comparable scores. Regarding Satisfaction, the difference between the Mandarin group (M = 4.14, SD = 0.73) and the dialect group (M = 3.85, SD = 1.03) approached significance but did not meet statistical criteria.

In summary, localized-accent AI customer service agents significantly influenced users' emotional responses in terms of Pleasure and Arousal, while differences in Dominance and Satisfaction were not significant. Overall, Mandarin showed a slight advantage in emotional dimensions, but the use of localized accents enhanced users' Arousal levels.

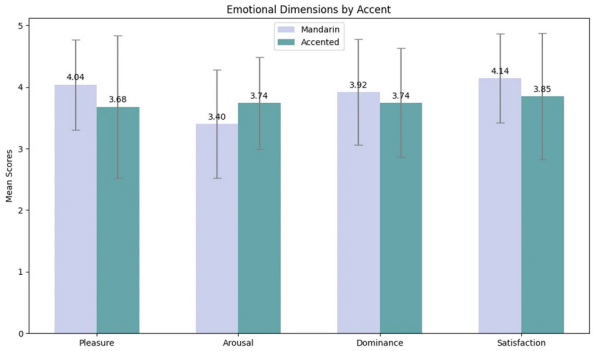


Fig. 2. The Impact of Mandarin and Localized Accent Customer Service on User Emotional Responses

Subsequently, this study conducted an analysis of interaction effects. We employed a multifactor ANOVA to examine the main effects and interaction effects of various factors (age, dialect familiarity, and scenario) on user emotional feedback. A Tukey HSD (Honest Significant Difference) test was performed to compare mean differences between different groups. Although the main effects of these factors on user emotional feedback did not reach statistical significance, the analysis of interaction effects revealed some noteworthy results.

Specifically, the individual variables of age, dialect familiarity, and scenario did not have a significant impact on emotional dimensions, with p-values all above 0.05. This indicates that these factors, when considered in isolation, have a limited influence on user emotions, suggesting that dialect familiarity and the scenario do not directly affect the various emotional dimensions of users.

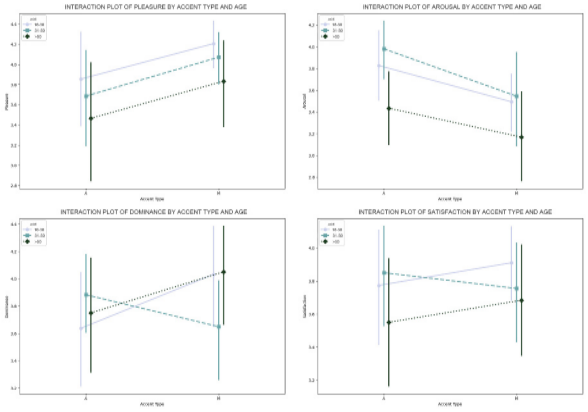


Fig. 3. Interaction Effect of Mandarin (M) and Localized Accent (A) Agent on User Emotional Responses Across Different Age Groups

However, the interaction between age and familiarity showed statistical significance in the satisfaction assessment (F(2,96)=6.864, p=0.0016, $\eta^2$= 0.124), indicating significant differences in satisfaction responses among different age groups under varying levels of familiarity. Similar significance was found in the analyses of pleasure (F(2,96)=6.735917, p=0.0018) and dominance (F(2,96)=10.2462, $p < 0.001$), suggesting that the combination of age and familiarity influences user perceptions of AI voice customer service. For example, younger users may be more receptive to new accent features, while older users may have a deeper emotional connection to certain dialects.

Additionally, among younger users familiar with the dialect, satisfaction ratings were significantly higher than those in other groups (mean-diff=0.1722, p=0.2817), although this difference did not reach significance. This finding suggests that familiarity with the dialect may have a potentially positive impact on user emotional responses, particularly within the younger demographic. Furthermore, other factors, such as the main effect of scenario, did not achieve statistical significance, with $\eta^2$ approaching 0. This indicates that these factors have a minimal impact on user emotions, which may imply that, in specific contexts, users' acceptance of accents is relatively uniform or that the scenario settings failed to sufficiently elicit emotional responses from participants.

## V. DISCUSSION

### *A. The Impact of Accent Localization on User Emotional Engagement*

Although the hypothesis posited that localized accents would enhance user emotional engagement, this study demonstrates that the use of Shanghainese by AI customer service agents did not yield the anticipated outcomes. Users rated

their pleasure and satisfaction levels lower in the Shanghainese group compared to the Mandarin group, potentially due to inconsistencies in users' language preferences [15]. While some users were familiar with Shanghainese, their non-Shanghai hometown origins limited the potential for emotional resonance. The diversity of emotional feedback suggests that accent localization may, in certain contexts, decrease rather than enhance user pleasure. The effect of the scenario on emotional dimensions and satisfaction did not reach statistical significance, which may indicate that users prioritize the efficiency enhancements provided by AI customer service [8] [16].

### *B. Disconnection Between Emotional Activation and Overall User Experience*

The research findings indicate that Shanghainese performs better than Mandarin in terms of arousal, suggesting that localized accents can more effectively stimulate user emotions. However, this increase in arousal did not successfully translate into higher satisfaction levels, highlighting a disconnection between emotional activation and overall user experience. This suggests that while dialects may introduce novelty or enhance user alertness, these emotional shifts are insufficient to significantly improve the service experience for users.

### *C. Interaction Between Age and Dialect Familiarity*

The analysis of interaction effects reveals that younger users who are familiar with Shanghainese exhibit higher satisfaction during their interactions with AI customer service representatives. In contrast, the emotional recognition of older users did not manifest as higher satisfaction levels. The emotional resonance older users have with dialects failed to translate into increased satisfaction across all emotional dimensions, which may be related to differences in cognitive patterns and life experiences. Furthermore, the main effect of the scenario did not reach statistical significance, suggesting that users may prioritize the efficiency and problem-solving capabilities of AI customer service over variations in accent.

Thus, accent localization in AI customer service systems exhibits a dualistic effect, highlighting the complexity of designing such systems. While accent localization may enhance arousal, it does not necessarily lead to increased satisfaction. Future research should focus on the mixed reasons behind emotional responses, specific contexts or cultural connections, and consider a more diverse participant sample to gain deeper insights into users' emotional reactions across different cultural backgrounds.

## VI. CONCLUSION

This study evaluated the impact of Mandarin-speaking and localized-accent AI customer service agents on user emotional responses. Results indicated that localized-accent AI agents scored higher in arousal but lower than expected in pleasure, potentially diminishing satisfaction. The interaction effect of age and dialect familiarity was significant, revealing that younger users were more accepting of localized accents. The findings suggest that while accent localization enhances affinity, it may also affect communication efficiency. This research provides insights for the design of user experience and personalized language adaptation in AI customer service.


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## REFERENCES


[1] Wang L, Huang N, Hong Y, et al. Voice-based AI in call center customer service: A natural field experiment[J]. Production and Operations Management, 2023, 32(4): 1002-1018.

[2] Yu S, Qu X. Research on the influence of artificial intelligence customer service on consumers' purchase process under the background of Internet[C]//Proceedings of the 2022 13th International Conference on E-business, Management and Economics. 2022: 137-141.

[3] Jin L, Liu T, Haroon A, et al. Emsassist: An end-to-end mobile voice assistant at the edge for emergency medical services[C]//Proceedings of the 21st Annual International Conference on Mobile Systems, Applications and Services. 2023: 275-288.

[4] Mehandru N, Robertson S, Salehi N. Reliable and safe use of machine translation in medical settings[C]//Proceedings of the 2022 ACM Conference on Fairness, Accountability, and Transparency. 2022: 2016-2025.

[5] Lin K H, Shen C A, Cheng S C. Applications of AI in Digital Governance Services for Local Taxes-a case of the Local Tax Bureau of Taichung City Government[C]//Proceedings of the 25th Annual International Conference on Digital Government Research. 2024: 6-18.

[6] Wenzel K, Kaufman G. Designing for Harm Reduction: Communication Repair for Multicultural Users' Voice Interactions[C]//Proceedings of the CHI Conference on Human Factors in Computing Systems. 2024: 1-17.

[7] Kühne K, Herbold E, Bendel O, et al. "Ick bin een Berlina": dialect proficiency impacts a robot's trustworthiness and competence evaluation[J]. Frontiers in Robotics and AI, 2024, 10: 1241519.

[8] Roslan F A B M, Ahmad N B. The rise of AI-powered voice assistants: Analyzing their transformative impact on modern customer service paradigms and consumer expectations[J]. Quarterly Journal of Emerging Technologies and Innovations, 2023, 8(3): 33-64.

[9] Huang Y K, Hsieh C H, Li W, et al. Preliminary study of factors affecting the spread and resistance of consumers' use of AI customer service[C]//Proceedings of the 2019 2nd Artificial Intelligence and Cloud Computing Conference. 2019: 132-138.

[10] Condliffe J. AI Voice Assistant Apps are Proliferating, but People Don't Use Them[J]. Technology Review, 2017.

[11] Zhuang K. A study of anthropomorphic behavior of intelligent service robots on user satisfaction[C]//Proceedings of the 4th International Conference on Artificial Intelligence and Computer Engineering. 2023: 1243-1246.

[12] Moussawi S, Koufaris M, Benbunan-Fich R. How perceptions of intelligence and anthropomorphism affect adoption of personal intelligent agents[J]. Electronic Markets, 2021, 31(2): 343-364.

[13] Barfield J K. Towards Diversity, Equity, and Inclusion in Human-Robot Interaction[C]//International Conference on Human-Computer Interaction. Cham: Springer Nature Switzerland, 2023: 3-17.

[14] Lee O K D, Ayyagari R, Nasirian F, et al. Role of interaction quality and trust in use of AI-based voice-assistant systems[J]. Journal of Systems and Information Technology, 2021, 23(2): 154-170.

[15] Torre I, Le Maguer S. Should robots have accents?[C]//2020 29th IEEE International Conference on Robot and Human Interactive Communication (RO-MAN). IEEE, 2020: 208-214.

[16] Brandtzaeg P B, Følstad A. Why people use chatbots[C]//Internet Science: 4th International Conference, INSCI 2017, Thessaloniki, Greece, November 22-24, 2017, Proceedings 4. Springer International Publishing, 2017: 377-392.