Chapter 6
Enhancing User Experience in Smart Healthcare Through Personalized Multimodal Interfaces

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ABSTRACT

Multimodal interfaces hold significant promise in smart healthcare, aiming to enhance both clinical efficiency and patient outcomes. With the rise of digital health technologies, intuitive and adaptive interfaces are essential. This chapter explores the integration of modalities such as activity recog- nition via sensors and cameras, and biometric data tailored to

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individual needs. Leveraging AI, human-computer interaction, and sensor technologies, it highlights how personalized interfaces im- prove usability, accessibility, and engagement. It discusses real-world applications like real-time alerts and predictive analytics, addresses challenges in local and cloud data processing, and emphasizes the need for secure patient data protection.

1. INTRODUCTION

Traditional healthcare facilities often face many difficulties or limitations (Weinhold and S. Gurtner, 2014). High patient volumes can result in congested waiting rooms, extended waiting times, and delayed service. Due to this, the timely treatment of the patient will be delayed. The inability of various systems (e.g., electronic health records, lab systems) to communicate and share data smoothly leads to inefficiencies and potential medical errors. Insufficient numbers of doctors, medical technicians and staff cause reduced quality of care and increase medical errors and delay in service as well (Khoshmanesh et.al. 2021). This scenario is now changing with the development of information and communication technology (ICT) and the availability of the Internet of Things (IoT) have heralded a new age of healthcare facilities which is referred to as smart healthcare 9Baker et. al. 2017). Use of smartphone in smart healthcare gives significant advantages as it contains built-in sensors that can be used to capture heart rate and variability, blood pressure, oxygen levels (SpO2), and respiratory rate (Nasr et. al. 2021) as an important aspect of smart healthcare is monitoring and predicting patient's health condition in an automated system which uses Machine Learning (ML) and Deep Learning (DL) algorithms to identify and classify individual health data. This model was proposed to diagnose COVID like situation and was assisted by Convolution Neural Network (CNN) and Support Vector Machine (SVM). There are other proposed models which used Federated Learning (FL) and several DL algorithms. Normally for elderly persons or patients, it can monitor health conditions as well as daily activities. However, this method has drawbacks like high latency, communication cost, and susceptibility to malevolent assaults. For this reason, adoption of edge and fog computing solutions has increased,