

Chapter 11

Integrating AI in Assistive Devices for Cognitive Support in the Elderly: Design, Usability, and Ethical Frameworks

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ABSTRACT

The ageing global population brings challenges and opportunities, particularly in addressing cognitive decline. This study explores integrating artificial intelligence (AI) into assistive devices for elderly cognitive support. AI-driven technologies like machine learning and natural language processing can provide personalized assistance, enhancing the elderly's independence and quality of life. This research focuses on design principles, usability considerations, and ethical frameworks necessary for effective AI integration. The study highlights the importance of user-centered design, accessibility, and ethical practices in developing AI-assisted devices to support the cognitive health of the elderly.

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1. INTRODUCTION

An important demographic trend that offers society both possibilities and challenges is the ageing of the world's population. The number of adults 60 and over is expected to increase from 1 billion in 2020 to 2.1 billion by 2050 (World Health Organisation [WHO], 2021). The prevalence of cognitive decline is rising along with the ageing population, which can have a serious negative influence on a person's capacity to live freely and lead a fulfilling life. According to Prince et al. (2015), cognitive impairments place a significant burden on patients, carers, and healthcare systems. These illnesses range from mild cognitive impairment (MCI) to more severe conditions like dementia. The use of assistive technologies has become essential in helping the elderly maintain their general and cognitive well-being. These technologies cover a broad spectrum of tools and frameworks intended to facilitate daily tasks, improve communication, and offer mental stimulation. The development of artificial intelligence (AI) has greatly increased the capabilities of assistive technology. By utilising machine learning techniques, natural language processing, and data analytics, AI can provide individualised and flexible help (Czaja & Lee, 2007). The integration of AI into assistive technologies for senior cognitive assistance is examined in this study, with particular attention paid to design principles, usability issues, and ethical frameworks.

The Role of AI in Cognitive Support

AI has shown to have a great deal of promise for improving the efficiency and usability of assistive technology. Artificial intelligence (AI) powered solutions can offer personalised interventions, real-time feedback, and ongoing monitoring—all essential for maintaining cognitive health in the elderly. For instance, AI-enabled smart home systems are able to keep an eye on everyday activities, spot irregularities in schedule, and send out reminders for things like taking medications as prescribed (Chan et al., 2008). In a similar vein, wearable AI technology can monitor health indicators, identify falls, and notify carers of crises (Rashidi & Mihailidis, 2013). These developments lessen the strain on carers and healthcare systems while simultaneously enhancing safety and freedom.

Design Principles for AI-Driven Assistive Devices

AI-driven assistive device design necessitates a user-centred strategy that puts senior users' requirements, preferences, and skills first. Interoperability, simplicity, and personalisation are good design principles. By customising the features and interactions of the device for each user, personalisation improves the usability and

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