Ethical Robot Design for Individuals Suffering from Neurodegenerative Disease

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Introduction

Objective: The essence of this project is to delve into the technological landscape of Intelligent Assistive Technologies and their application in aiding individuals with cognitive impairments. It seeks to explore the myriad of possibilities these technologies present in assistive living, focusing on their potential to reduce caregiver strain, ensure safety, and promote independence and self-reliance amongst users.

The aging population is vulnerable to neurodegenerative disorders like Alzheimer's and Parkinson's disease.

Neurodegenerative disorders cause significant cognitive, motor, and functional impairments.

Intelligent Assistive Technologies can potentially support individuals with these disorders.

Primary Challenges

Neurodegenerative disorders significantly hinder daily activities, causing problems in memory retention, communication, and motor proficiency.

Simple tasks become monumental challenges, degrading quality of life and independence.

These conditions require advanced solutions that are cognizant of the wide array of difficulties faced by individuals.

Technological Landscape

Intelligent assistive technologies (IATs) hold potential for aging-in-place among cognitively impaired individuals, offering an alternative to caregiver-dependent living. In addition to their aims to enhance well being, and ensure safety and independence, they can also address socio-psychological issues, promoting social interactions and reducing distress and can assist with daily tasks both indoors and outdoors.

Examples:

Proposed Solution	Purpose
MATY [1]	Improvement in general quality of life by promoting routine and communication
AIWALKER [2], MindMate [3], COGKNOW [4]	Support safety and independence

Ethical Guidance

1) Safeguards for Privacy:

Concerns: Potential to capture sensitive personal information. Challenges in obtaining informed consent from individuals with diminished cognitive capacities.

Solutions: Robust security features and privacy supporting technologies, like federated learning. Adherence to local and federal policies on data handling in healthcare settings.

Example: *John, a senior resident in an assisted care facility, may ask the assistive robot to retrieve his wallet from his private room. As the robot carries out the task, it has the potential to inadvertently capture sensitive personal information, such as financial statements or health related information, that may be visible within the room.*

2) Nonmaleficence and Beneficence:

Goal: To enhance the autonomy, quality of life, and daily functioning of Persons with Dementia and complement human care.

Considerations: Rigorous testing and continuous monitoring. Involving caregivers, family members, and medical professionals in the design and deployment process. Ensuring transparency, explainability, and understandability in design to assess potential impacts effectively.

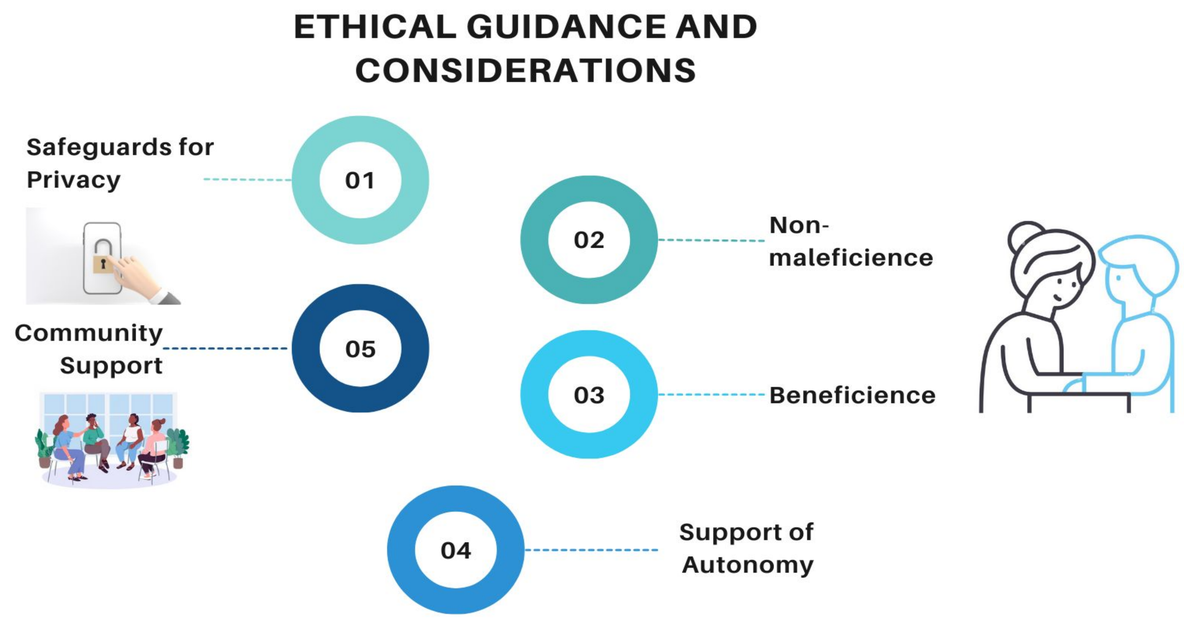
Example: *Mrs. Anderson, an elderly resident with advanced Alzheimer's in a nursing home, relies on an assistive robot named "Robi" for companionship and medication reminders. If Robi malfunctions, potentially causing distress and medication errors, the nursing home faces an ethical dilemma.*

3) **Supporting Autonomy and Community:**

Concerns: Ethical considerations for humanoid robots and potential "implicit deception" giving a false sense of human-like companionship.

Solutions: Multisensory approach, adaptability, personalization, and emotion recognition technologies. Integration of multisensory stimuli and customization to individual requirements.

Example: *Emma, a resident showing early signs of dementia, may request her medication through a fetch robot. However, due to her condition, she may struggle to remember if she has already taken her medication or may refuse to take it altogether.*



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