Project Constraints Essay

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Our AI companion for individuals with dementia faces several possible constraints that will shape our design decisions and implementation. Firstly, security constraints are a big consideration as the device collects, stores, and transmits highly sensitive personal and health information about users. We must implement end-to-end encryption for all data transmission between the wearable device, mobile app, and backend, ensuring that private conversations, location data, and medical information cannot be intercepted or accessed by unauthorized parties. We also need to establish secure authentication for caregivers accessing the companion app and implement robust access controls to prevent data breaches that could compromise user privacy or safety. Secondly, economic constraints significantly impact our solution because LLMs and cloud infrastructure require a lot of upfront costs, yet as students we operate with limited funding. This pushes us toward leveraging open-source AI frameworks and free-tier or student plan cloud frameworks. With this however, we must balance cost reduction against the reliability and security requirements essential for a medical-assistive device. We must also consider the affordability of the final product for families and care facilities, as dementia care can already have a significant financial burden for many users. Thirdly, ethical constraints guide multiple aspects of our design as we are developing technology for a vulnerable population that may not fully understand or consent to how their data is used. We must ensure our AI companion respects user dignity while avoiding harsh language or misrepresenting the state of a patient. The system must be designed to enhance independence and quality of life without creating dependency or replacing essential human interaction with caregivers and family members. Finally, diversity and cultural constraints require us to design flexibility into the system because users come from varied linguistic, cultural, and social backgrounds that influence how they communicate and what brings them comfort. The voice features must support multiple languages, while the AI's conversational style should adapt to cultural norms around formality, personal space, and family dynamics. We must also consider that different cultures have different approaches to elder care and technology adoption, which affects both how the device should function and how it should be introduced to users and their families. Together, these constraints challenge us to create a solution that is secure, affordable, ethical, and inclusive while maintaining the technical quality to meaningfully improve lives.