EitherAssistant

Accessibility & Digital Inclusion Report

Executive Summary

EitherAssistant is an AI-powered voice assistant designed to bridge the digital divide for individuals with disabilities. By leveraging advanced speech recognition technologies (Whisper and Vosk) and cross-platform UI frameworks (Avalonia), the application provides accessible computer control through voice commands, supporting both online and offline modes to ensure availability for all users regardless of connectivity.

1. Global Accessibility Statistics

Disability Demographics

According to the World Health Organization (WHO), approximately **1.3 billion people** (16% of the global population) experience significant disability. This includes:

Disability Type	Global Prevalence	Digital Impact
Visual Impairments	2.2 billion people	Screen reading, navigation challenges
Hearing Loss	430 million people	Audio feedback, communication barriers
Motor Disabilities	75 million people	Keyboard/mouse usage difficulties
Cognitive Disabilities	Varies widely	Complex interface comprehension issues

Source: World Health Organization (2023). Disability and Health.
https://www.who.int/news-room/fact-sheets/detail/disability-and-health

Digital Accessibility Gap

People with disabilities face significant barriers in digital access:

• **Technology Adoption Gap:** Only 54% of people with disabilities use computers, compared to 81% of those without disabilities (Pew Research Center, 2021).
• **Internet Access:** 62% of adults with disabilities report having home broadband, compared to 81% of adults without disabilities.
• **Smartphone Ownership:** 72% vs 88% for individuals with and without disabilities respectively.
• **Website Accessibility:** 98.1% of home pages have detectable WCAG 2 failures (WebAIM, 2024).

Sources:
- Pew Research Center (2021). Americans with disabilities less likely than those without to own digital devices.
- WebAIM (2024). The WebAIM Million: Annual accessibility analysis of the top 1,000,000 home pages.

2. Disability Digital Divide: Key Challenges

Economic Barriers

Financial constraints significantly impact technology access for people with disabilities:

- Adults with disabilities are **twice as likely** to live in poverty compared to those without disabilities.
- Assistive technologies can cost between $1,000 and $15,000, creating substantial financial barriers.
- Internet connectivity costs disproportionately affect low-income disabled individuals.

Technical Barriers

- **Incompatible Technologies:** Many mainstream applications lack screen reader support or keyboard navigation.
- **Complex Interfaces:** Modern UIs often prioritize aesthetics over accessibility.
- **Limited Offline Capabilities:** Cloud-dependent services exclude users with unreliable connectivity.
- **Lack of Multimodal Interaction:** Few applications offer voice, touch, and keyboard alternatives simultaneously.

Educational and Employment Impact

The digital divide creates cascading effects on education and employment opportunities:

- Only **19.1%** of people with disabilities are employed, compared to 65.4% of people without disabilities (U.S. Bureau of Labor Statistics, 2023).
- Students with disabilities face barriers to online learning platforms, affecting educational outcomes.
- Remote work opportunities remain inaccessible due to non-compliant collaboration tools.

Sources:
- U.S. Bureau of Labor Statistics (2023). Persons with a Disability: Labor Force Characteristics.
- National Disability Institute (2022). Financial Inequality and Disability.
- United Nations (2020). Disability and Development Report.

3. EitherAssistant: Technical Approach

Technology Stack

OpenAI Whisper (Speech Recognition)

Whisper is a state-of-the-art automatic speech recognition (ASR) system developed by OpenAI, trained on 680,000 hours of multilingual data. Key features:

- **High Accuracy:** Achieves human-level performance on English speech recognition.
- **Robustness:** Handles various accents, background noise, and technical language effectively.
- **GPU Acceleration:** Leverages hardware acceleration for real-time processing.
- **Multilingual Support:** Recognizes 99 languages with translation capabilities.

• **Open Source:** Available under MIT license, ensuring transparency and customization.

Reference: Radford, A., et al. (2022). Robust Speech Recognition via Large-Scale Weak Supervision. OpenAI. https://cdn.openai.com/papers/whisper.pdf

Vosk (Offline Speech Recognition)

Vosk is an offline speech recognition toolkit that ensures accessibility without internet dependency:

• **Fully Offline:** Operates without internet connectivity, crucial for users with limited access.
• **Lightweight Models:** Models as small as 50MB enable deployment on resource-constrained devices.
• **Real-time Processing:** Provides immediate feedback for interactive voice control.
• **Privacy-First:** Voice data never leaves the user's device.
• **Cross-Platform:** Runs on Windows, macOS, Linux, Android, and iOS.

Reference: Alpha Cephei (2024). Vosk Offline Speech Recognition. https://alphacephei.com/vosk/

Avalonia UI (Cross-Platform Interface)

Avalonia is a cross-platform .NET UI framework that enables accessible interface design:

• **True Cross-Platform:** Single codebase for Windows, macOS, Linux, iOS, Android, and WebAssembly.
• **XAML-Based:** Declarative UI design supports accessibility patterns and screen readers.
• **Modern Architecture:** MVVM pattern ensures separation of concerns and testability.
• **Performance:** Lightweight and responsive, suitable for various hardware configurations.
• **Accessibility Support:** Built-in support for platform-native accessibility APIs.

Reference: AvaloniaUI Project (2024). Cross-Platform .NET UI Framework. https://avaloniaui.net/

4. Accessibility Features & Impact

Addressing Digital Divide Challenges

EitherAssistant directly addresses key barriers identified in the digital divide research:

Challenge	EitherAssistant Solution	Impact
Motor Disabilities	Voice-only computer control	Eliminates keyboard/mouse dependency
Visual Impairments	Voice feedback & screen reader support	Independent system navigation
Internet Access Gap	Offline Vosk mode	Functions without connectivity
Cost Barriers	Free & open source	No licensing or subscription fees
Complex Interfaces	Natural language commands	Intuitive interaction model
Platform Lock-in	Cross-platform support	Works on existing devices

Conclusion

The digital divide affecting people with disabilities is not merely a technical challenge but a social equity issue. By combining cutting-edge speech recognition (Whisper and Vosk) with accessible cross-platform design (Avalonia), EitherAssistant demonstrates how modern technology can be leveraged to create inclusive solutions. The dual-mode (online/offline) architecture ensures that connectivity limitations do not become barriers to accessibility, while the open-source nature promotes community-driven improvements and customization.

With 16% of the global population experiencing disability and 98% of websites failing basic accessibility standards, tools like EitherAssistant represent essential steps toward digital inclusion and equal opportunity in education, employment, and daily life.