



RAJALAKSHMI
ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

Design of Voice of Care using Personalized Voice Technology for Emotional Support and Well-Being

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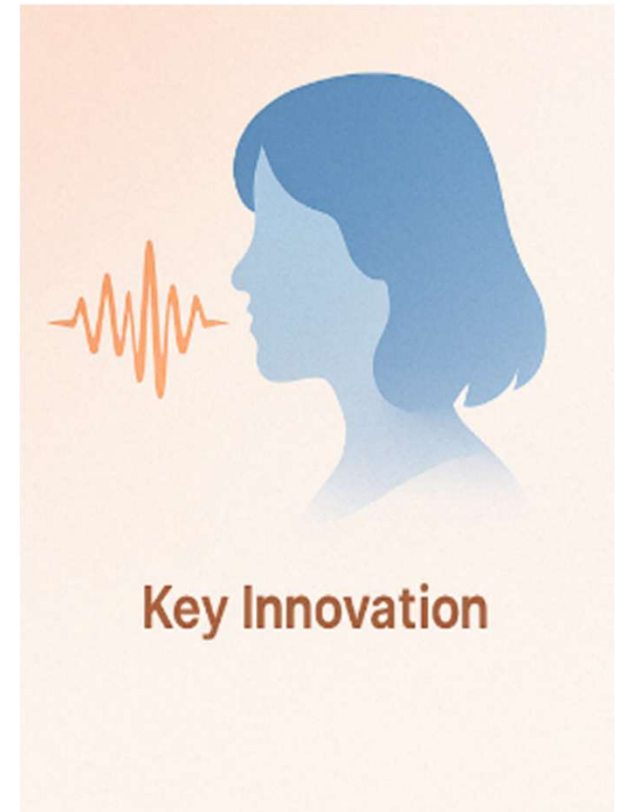
INTRODUCTION



Rising loneliness and depression worldwide with alarming statistics. According to **WHO Reports**, 1 in 4 adults globally experiences loneliness, with depression rates doubling since 2020.



Voice of Care (VoC) - A fully local, privacy-centric voice assistant that offers genuine emotional support



Personalized voice technology that replicates a loved one's voice to create familiar, comforting interactions

Digital
Connectivity
Human Connection



Digital Connectivity \neq Human Connection

According to **Social Media Paradox**, 72% of frequent social media users report feeling isolated (Journal of Social and Personal Relationships, 2024)

Technical Foundation & Impact



Built on **dual Raspberry Pi** architecture with local speech recognition, NLP, and text-to-speech capabilities

PROBLEM STATEMENT

Fri, Nov 08, 2024 | Mumbai ☀️ 25°C

Oneindia

LIVE TV

News US Election City Sports Movies Lifestyle Auto Gadgets Coupons Money


Home / International

Japan's Alarming Loneliness Crisis: Nearly 40,000 People Died Alone At Home In First Half Of 2024

By Amit Vasudev | Updated: Saturday, August 31, 2024, 23:26 [IST]

Japan is grappling with a growing crisis of loneliness among its aging population, as nearly 40,000 people were found to have died alone in their homes during the first half of 2024, according to a report by the National Police Agency.

Latest Updates



Tarot Card Reading November 08, 2024: Zodiac-Based Tarot Card Revelations

Medical Xpress

Topics Conditions

Week's top Latest news

Home / Psychology & Psychiatry

Home / Gerontology & Geriatrics

AUGUST 28, 2024

Editors' notes

New research reveals crucial insights on loneliness and death ideation among older adults

by Trinity College Dublin

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Woman, 60, dies by suicide due to loneliness

TNN / Nov 18, 2023, 08:17 IST

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Chennai: A 60-year-old woman died by suicide when she jumped from the 15th floor of an apartment complex at Porur on Thursday night, citing loneliness.

The victim, Latha was a resident of an apartment of Madhananthapuram. Latha's husband died last year and her

son was living in London.

TH India World Opinion Elections e-Paper

HOME / SCI-TECH / HEALTH Loneliness in India

India's loneliness epidemic | Explained TH PREMIUM

What does data show about loneliness in an Indian context? What related health concerns in the long run could impact other disease outcomes? What kind of community support do Indians need?

December 26, 2023 01:21 pm | Updated December 27, 2023 10:29 am IST

SAUMYA KALIA

2

PRINT

MOTIVATION

Why Voice of Care Matters



Digital Paradox

Despite increased connectivity, loneliness and mental health challenges are worsening globally



Barriers to Support

Traditional therapy faces accessibility, stigma, and cost limitations



Gap in Current Solutions

Existing voice assistants lack:

- a) Emotional intelligence
- b) Privacy safeguards
- c) Personalization capabilities



Target Demographics

Elderly, students, and individuals in crisis need accessible emotional support



Real Need

Demand for privacy-conscious voice interactions that provide immediate psychological support through early intervention

Objectives



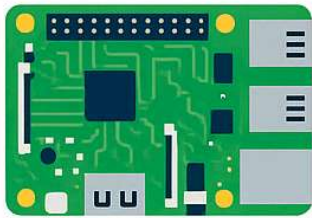
Develop a fully local, privacy-centric voice assistant system without cloud dependencies



Create personalized voice synthesis technology that replicates familiar voices



Implement real-time interaction and assistive responses



Design a hardware solution using affordable, accessible components (Raspberry Pi)



Ensure complete data security by processing all information locally



Validate the system's effectiveness in reducing feelings of loneliness and providing meaningful emotional support

Literature Survey

Title of paper	Year	Author	Technique	Inference
AI and Language: Transforming Communication in Health and Wellness	2025	P. T. Joshi et al.	NLP, Sentiment Analysis, Multimodal Data Fusion	Simulates human conversation; supports scalable emotional interventions
Feel Good AI: Voice-Enabled Emotion-Based Music Recommender	2024	A. Sharma et al.	CNN-based Emotion Detection, Voice Integration	Delivers mood-based therapy; raises emotional privacy concerns
Advancements in Language Processing Algorithms	2024	P. Mishra et al.	BERT, GPT, Whisper	Enables accurate real-time multilingual speech processing
AI Test Modeling and Analysis for Intelligent Chatbot Mobile App – A Case Study on Wysa	2024	J. Gao et al.	CBT-based chatbot, Mood Tracking	Reduces anxiety; validates AI's therapeutic potential

Literature Survey

Title of paper	Year	Author	Technique	Inference
Personal Virtual Assistant “DANI”	2023	S. Sarwate et al.	Cloud NLP, Privacy Analysis	Highlights privacy concerns in cloud-based assistants
Open Source Advantage in LLMs	2024	J. Manchanda et al.	LoRA, Mixture-of-Experts	Enables lightweight, transparent speech-based AI systems
Period VITS: Emotional Speech Synthesis	2024	P. Mishra et al.	VITS, ONNX Runtime, Piper	Enables low-latency neural TTS for edge devices
Voice Assistant Tech: The Case of Jarvis AI	2023	M. Gupta & R. Kumar	Sentiment & Intent Analysis	Supports emotionally intelligent, offline personalization

Summary of Literature Survey

Current Limitations:

1. Cloud dependency compromises privacy and data security
2. Lack of emotional intelligence in voice interactions
3. Generic voices create impersonal experiences

Technical Opportunities:

1. Recent advances in embedded AI enable edge computing solutions
2. Open-source speech models (Whisper, Piper, LLaMA) allow local deployment
3. Voice personalization technology becoming more accessible

Research Gap: Need for privacy-focused, emotionally intelligent voice systems that operate without cloud dependency

EXISTING SYSTEM

Popular Systems: Alexa, Google Assistant, Siri, etc.

- Effective for automation and information retrieval
- Not designed for emotional support or mental wellbeing

Key Shortcomings:

- Privacy Concerns:** Cloud-based processing exposes personal data
- Emotional Disconnect:** Generic, scripted responses lack empathy
- Constant Connectivity:** Requires internet connection to function
- Generic Voices:** Impersonal interaction experience

VoC Differentiation:

- Local Processing:** Complete privacy with no data leaving home
- Personalized Voice:** Familiar voice creates emotional connection
- Sentiment Analysis:** Adapts responses based on user's emotional state
- Offline Functionality:** Works without internet dependency

PROPOSED SYSTEM

Dual Hardware Setup:

- Raspberry Pi 5: Core AI processing (STT, NLP, TTS)
- Raspberry Pi 3B+: Audio I/O handling and user interface

Key Components:

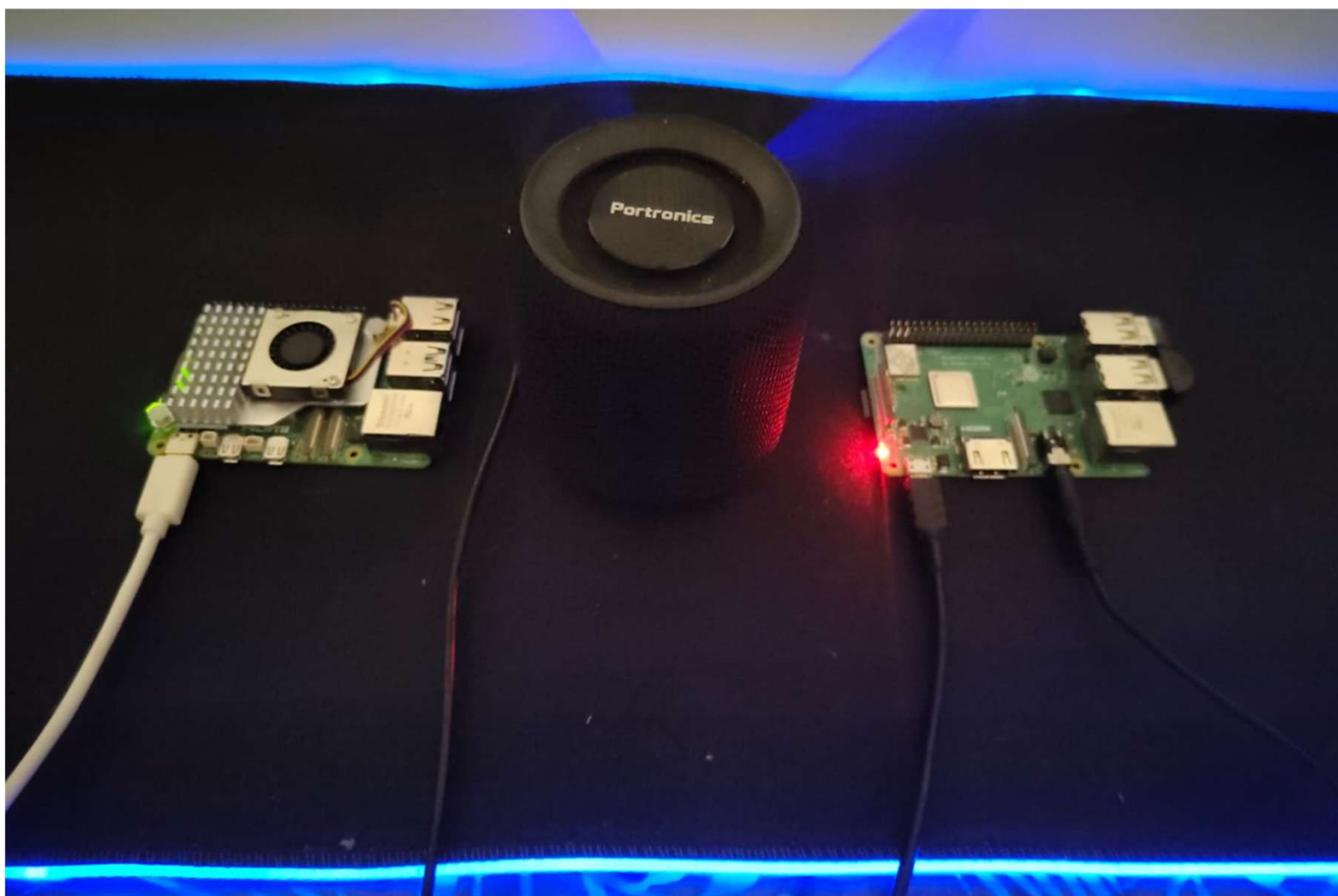
- Whisper STT: Local speech recognition
- LLaMA: Contextual natural language processing
- Piper TTS: Personalized voice synthesis

Communication:

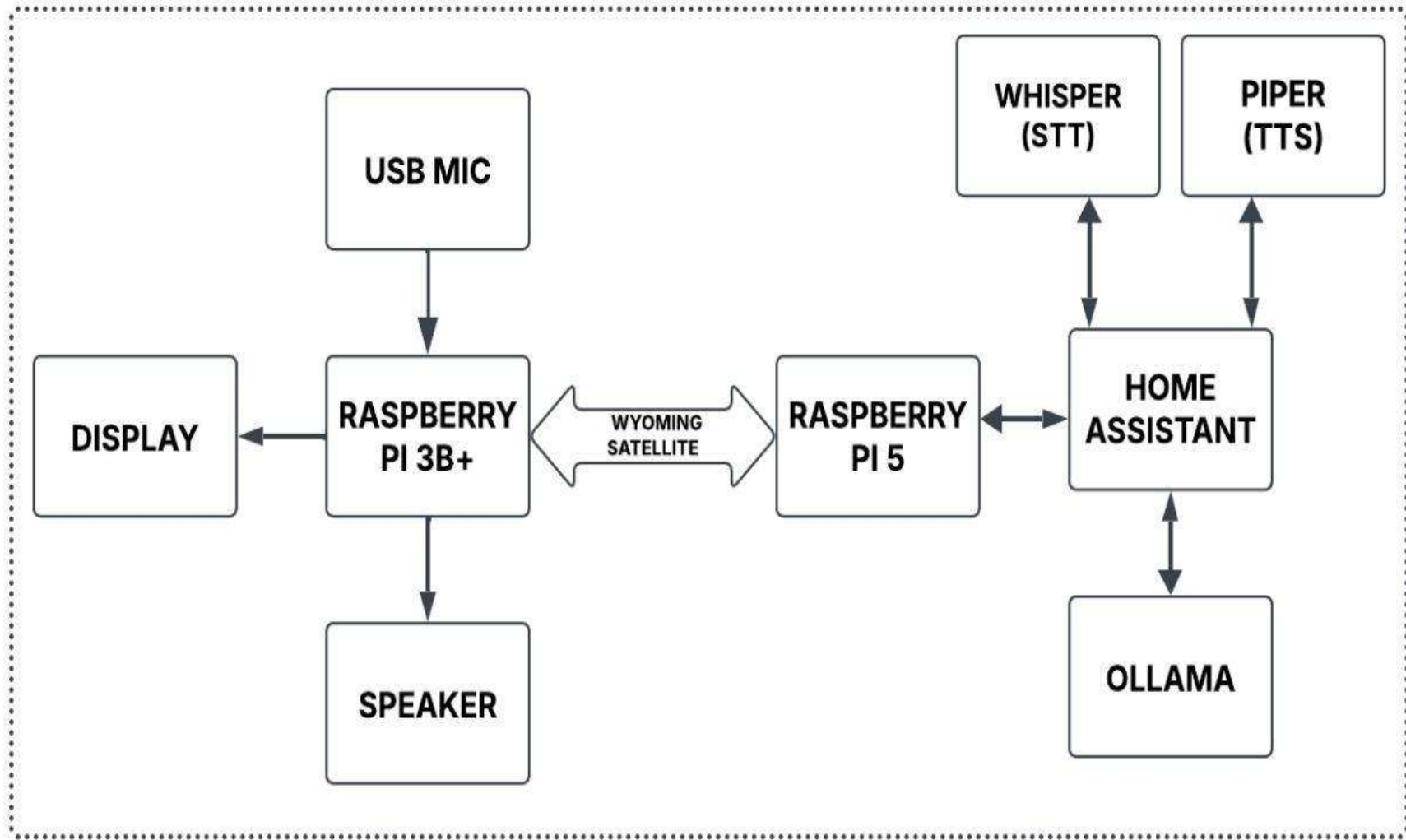
- Wyoming Satellite protocol for inter-device communication
- Home Assistant OS for system orchestration

End-to-End Latency: ~10 seconds (complete query-response cycle)

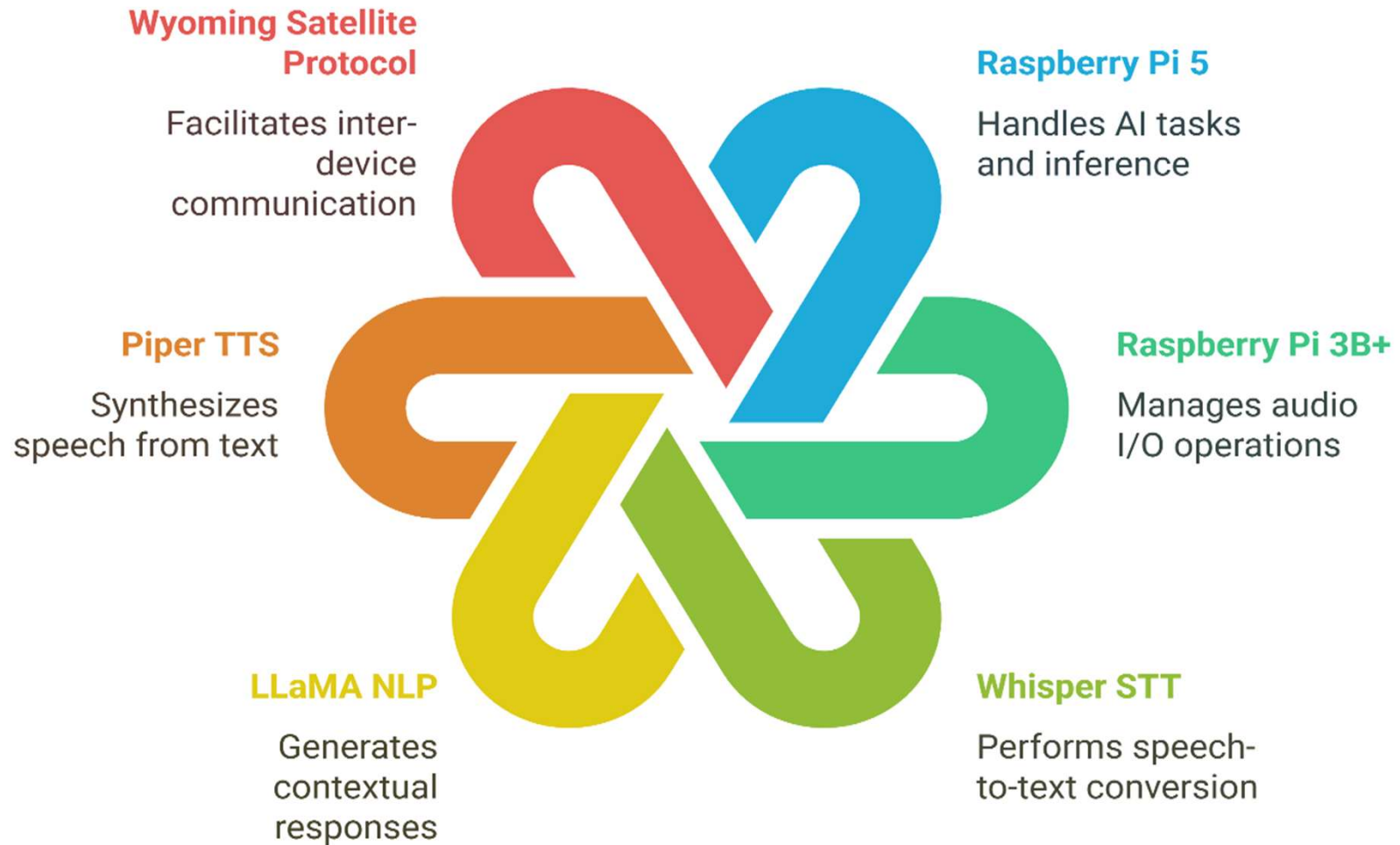
HARDWARE SETUP



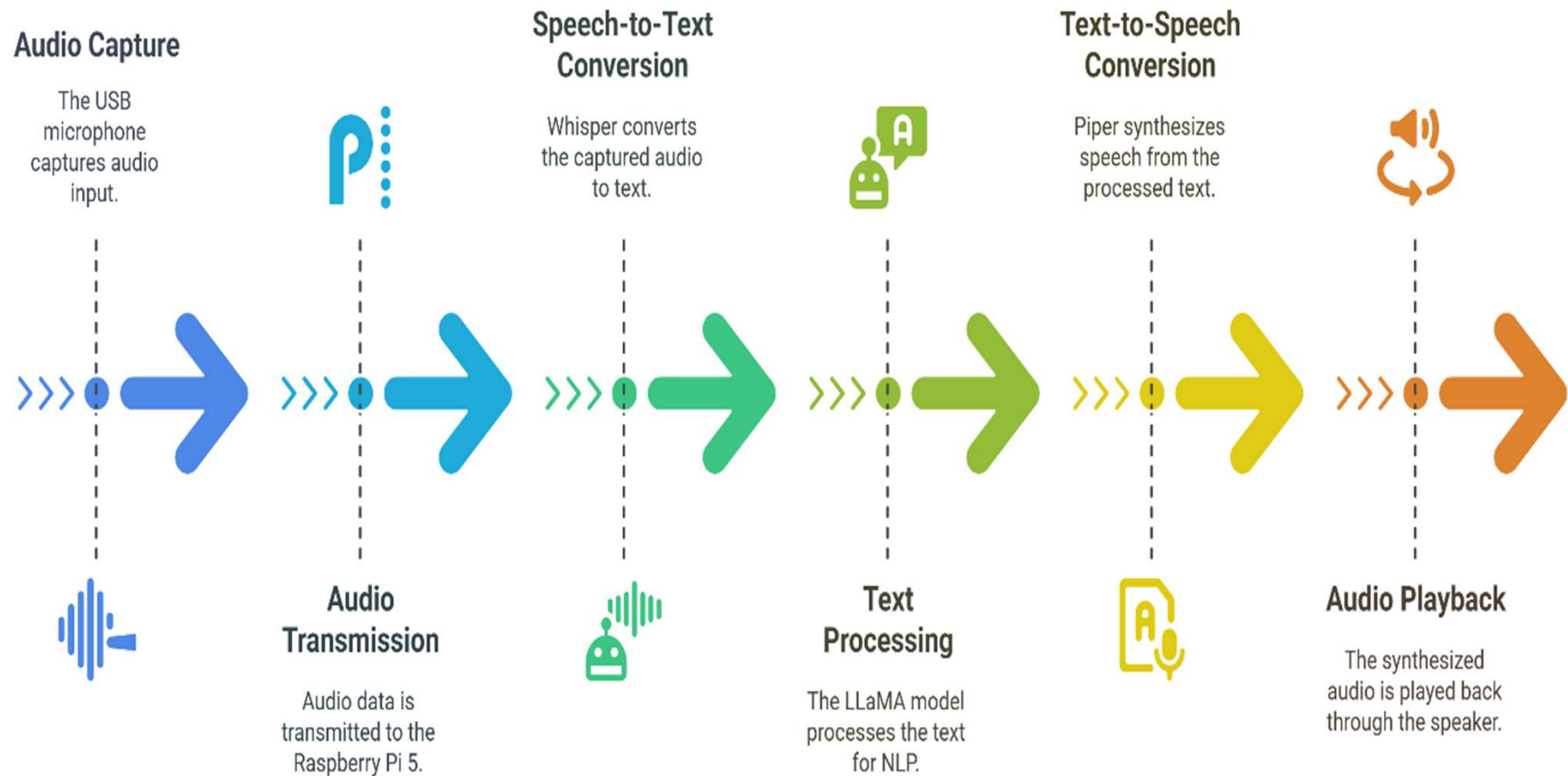
BLOCK DIAGRAM




OVERVIEW OF VoC SYSTEM



VoC SYSTEM FLOW




PERSONALIZED VOICE CREATION



Recording Studio

Contribute to the [Year of Voice](#) by recording yourself!

Choose a language ▼



Start Recording

Read sentences in your native language




Waiting for microphone to be enabled

Record yourself speaking the text below. You can play it back or re-record before submitting.

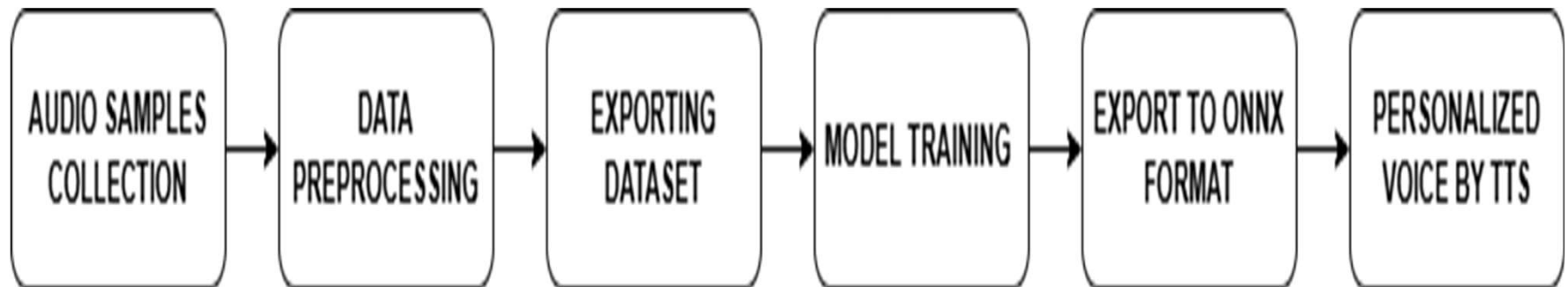
 Enable Microphone

Yes, I'm really looking forward to it.

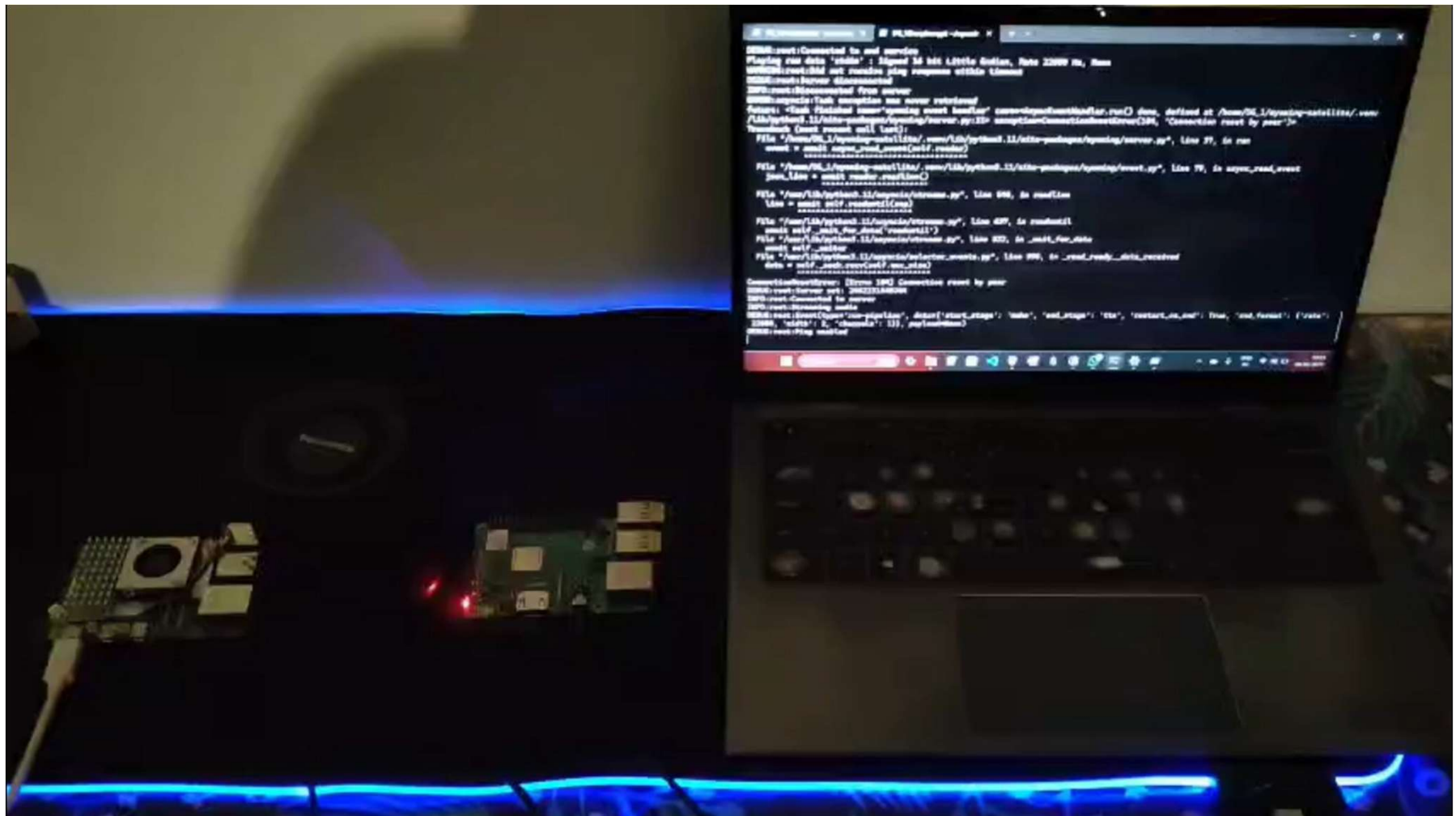
 Submit [s]

By clicking **Submit**, you agree to dedicate your recorded audio to the [public domain \(CC0\)](#)

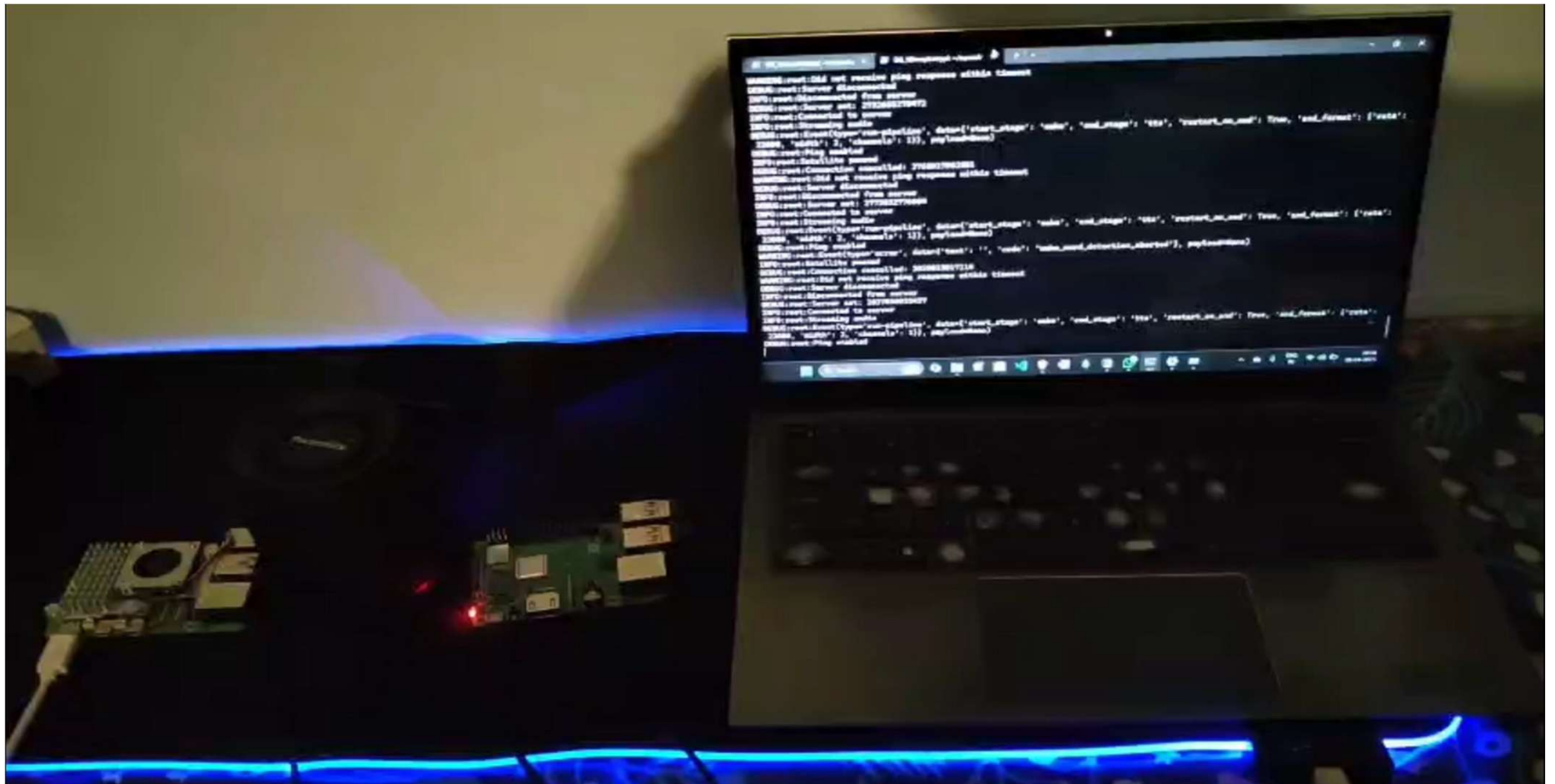
Progress: 623 / 1150



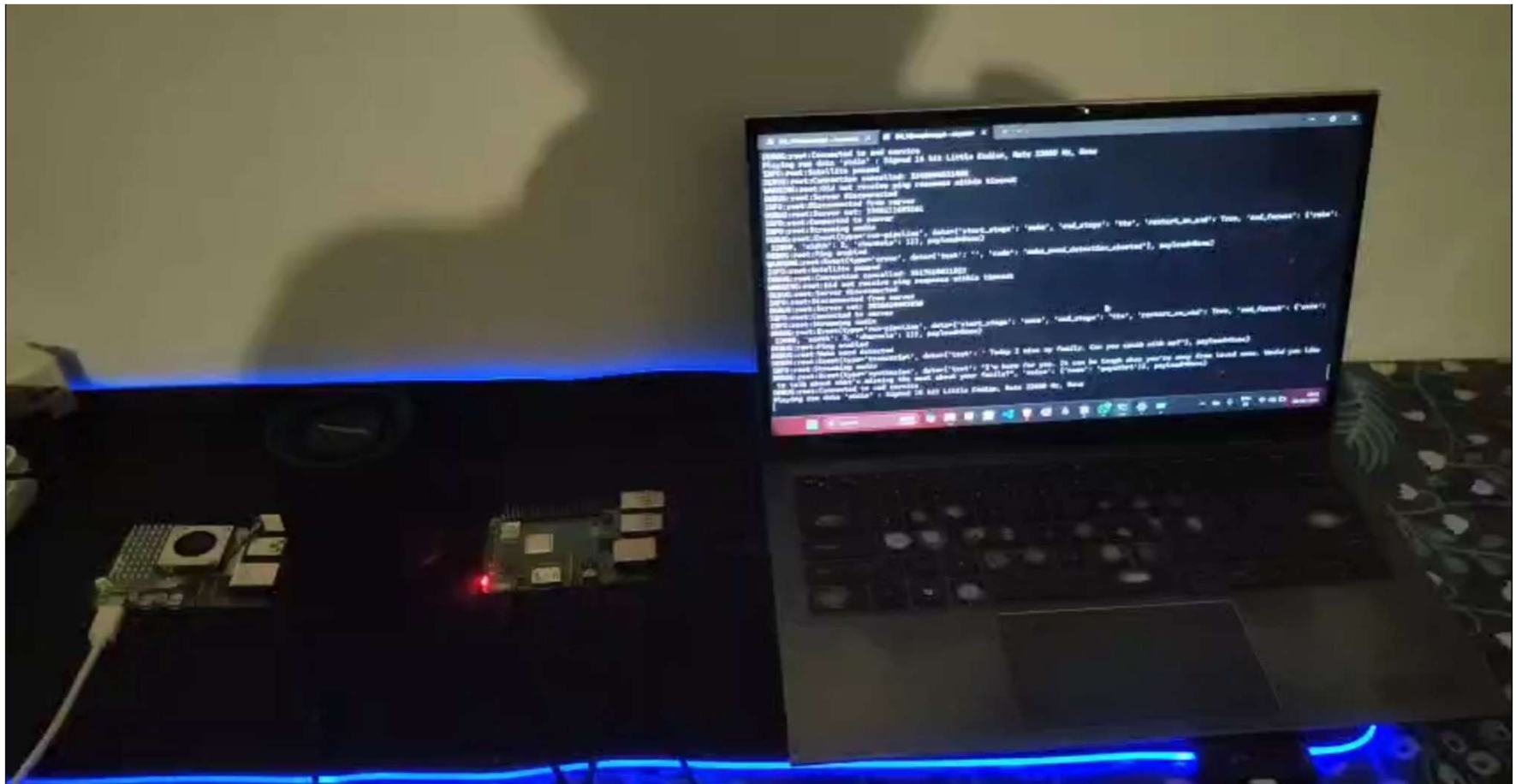
DEMO INTERACTION 1



DEMO INTERACTION 2



DEMO INTERACTION 3



Novelty in Proposed System

- Local Voice Processing:** Complete privacy with no cloud dependency
- Voice Personalization:** Replication of loved ones' voices creates emotional connection
- Edge AI Architecture:** Optimized execution on resource-constrained devices
- Digital Well-being Focus:** Designed specifically for emotional support rather than task automation
- Open-Source Foundation:** Uses transparent, customizable technologies

Hardware/Software Requirements

HARDWARE REQUIREMENT

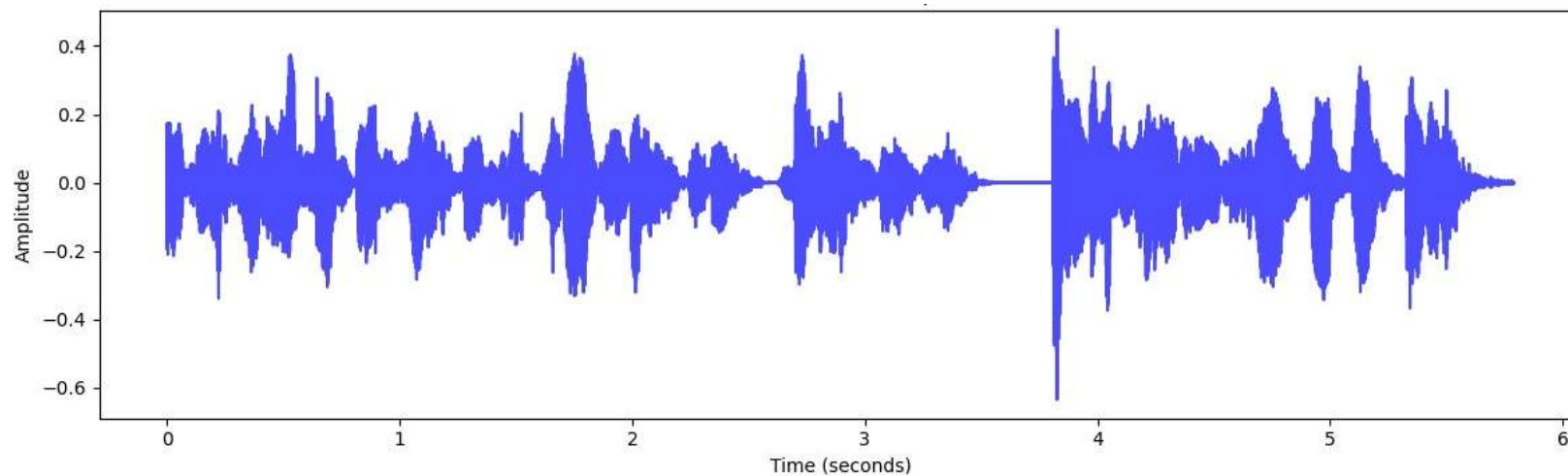
- Raspberry Pi 3B+ (1GB RAM): I/O processing unit
- USB microphone and external speaker
- Raspberry Pi 5 (8GB RAM): Main inference engine

SOFTWARE REQUIREMENT

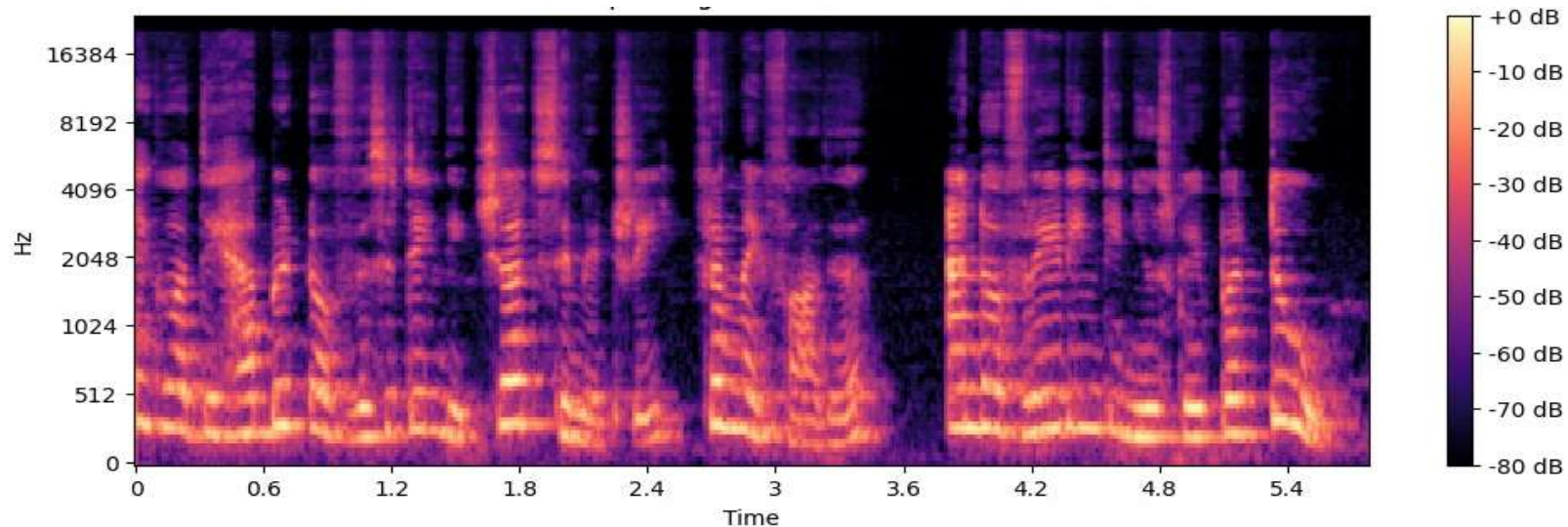
- Home Assistant OS: System orchestration
- Whisper: Speech-to-text conversion
- LLaMA: Natural language processing
- Piper: Text-to-speech synthesis
- Wyoming Satellite: Inter-device communication

Results

Waveform of Initial Speech

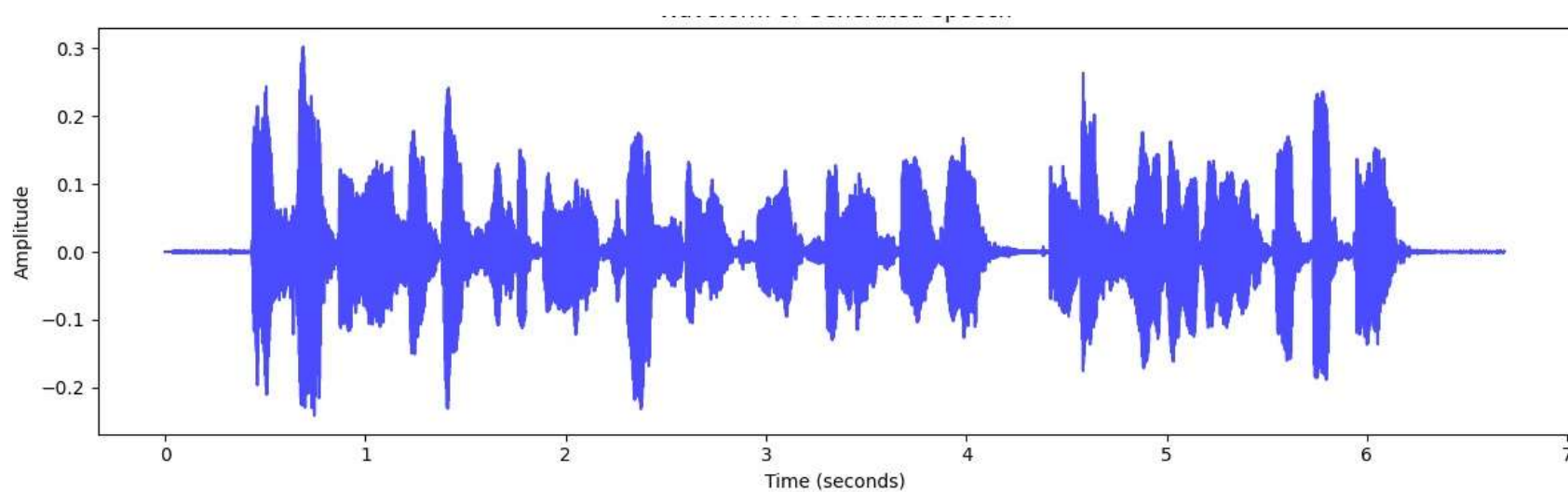


Mel Spectrogram of Initial Wave

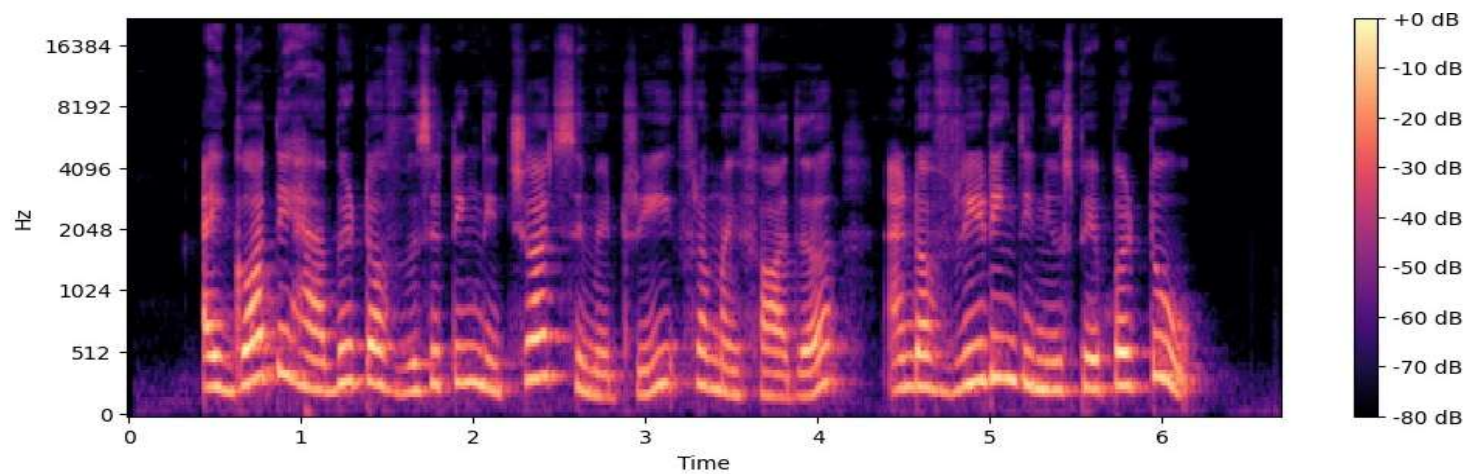


Results

Waveform of Generated Speech



Mel Spectrogram of Generated Wave



Conclusion & Future Work



Achievements:

- Created fully local, privacy-centric voice assistant
- Implemented personalized voice synthesis for emotional connection



Future Enhancements:

- Multimodal emotion detection (audio and visual)
- Advanced interactive journaling features
- Expanded sentiment analysis capabilities
- Integration with broader digital well-being tools



Potential Applications:

- Elderly care, student mental health support, crisis intervention

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