SentiCare

Voice Based Mental Health Support System

Project Code

EWZ-473254

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1. Abstract

Mental health issues in Pakistan remain critically underserved due to stigma, a lack of professionals, and limited awareness, leaving millions without access to timely help. Existing digital mental health tools are mostly English-based and text-driven, excluding Urdu-speaking individuals who prefer natural, verbal communication. This application is an AI-powered Urdu voice chatbot designed to provide empathetic emotional support through speech-based interaction. It integrates Speech-to-Text (STT), emotion detection, and Reinforcement Learning (RL) to recognize emotional cues in Urdu speech and deliver context-aware, compassionate responses. The system aims to support users dealing with anxiety, loneliness, and stress while offering culturally appropriate guidance and crisis referrals. By combining language inclusivity, emotional intelligence, and accessible AI, the system seeks to bridge the mental health service gap in Pakistan and contribute to AI research for low-resource languages.

Keywords: Urdu, Speech Recognition, Emotion Detection, Voice Biomarkers, Mental Health, Chatbot, AI, Reinforcement Learning, Crisis Support

2. Background and Justification

Pakistan faces an escalating mental health crisis, with around 50 million individuals experiencing psychological distress and less than one psychiatrist per 600,000 citizens [1]. Stigma, cost, and lack of professionals prevent timely care. Most mental health applications, such as Woebot or Youper, are text-based and operate in English, making them inaccessible to the majority of Urdu speakers.

AI-driven conversational agents have proven effective in reducing stress and providing emotional support in low-resource regions [2]. Research highlights that culturally adapted, language-specific systems increase user trust and engagement [3]. However, Urdu remains a low-resource language for speech and emotion recognition [4].

The system addresses these gaps by integrating Urdu speech emotion recognition and adaptive dialogue generation. It is designed to fit Pakistan's cultural and linguistic context, providing personalized, stigma-free emotional support. The system aims to act as a supportive companion rather than a diagnostic tool, focusing on accessibility, empathy, and ethical design.

3. Project Methodology

The project follows an iterative and modular approach, divided into three layers: **Frontend**, **Backend**, and **AI/ML Core**. Each layer will be improved through continuous feedback and evaluation.

- **Frontend Layer:**
  A voice-enabled Urdu interface developed for mobile and web use. It supports real-time speech input and generates natural Urdu responses using text-to-speech.

The design prioritizes simplicity and accessibility for users with low literacy..

- **Backend Layer:**
  A secure server framework to handle API requests, manage conversations, and store anonymized data. Data privacy and encryption will ensure user confidentiality.

- **AI/ML Core:**
  The core includes modules for Speech-to-Text (STT), Natural Language Understanding (NLU), Emotion Detection, Reinforcement Learning (RL), and Text-to-Speech (TTS).

    - **STT:** Converts Urdu speech to text for processing.
    - **NLU:** Interprets user intent and sentiment.
    - **Emotion Detection:** Uses voice biomarkers (pitch, jitter, MFCCs) and textual cues to infer emotional states [5].
    - **Dialogue Management:** Applies reinforcement learning to refine response selection and empathy through continuous user feedback.
    - **TTS:** Generates human-like Urdu responses for natural communication.

The system will use publicly available Urdu speech emotion datasets such as UrduSER and locally collected conversational samples. All user data will be anonymized. Ethical protocols include informed consent, secure storage, and crisis referral in case of self-harm indicators.

4. Project Scope

The chatbot's goal is to provide immediate, language-friendly emotional support for Urdu-speaking individuals in Pakistan using AI-driven interaction and psychological sensitivity.

In Scope:

- Urdu voice-based conversations for emotional support.
- Emotion and sentiment recognition through speech and text.
- Reinforcement learning for adaptive, empathetic responses.
- Crisis detection and referral to verified helplines.

Out of Scope:

- Medical diagnosis or prescription.
- Multilingual and video communication features.
- Clinical trials or large-scale deployment.

5. High-Level Project Plan

The project spans approximately 36 weeks, divided into phases with clear tasks, descriptions, durations, timelines, and dependencies. This plan ensures iterative development and risk mitigation.

Phase	Task	Description	TimeLine
Initiation	Define Objectives	Identify goals, datasets, and technical resources	30 Oct 2025
Data Preparation	Collect Urdu Speech Data	Gather and preprocess Urdu speech and emotion datasets	30 Nov 2025
Speech Integration	Implement STT & TTS	Integrate Urdu voice recognition and synthesis	15 Dec 2025
Model Development	Emotion & NLU Model	Train and test models for intent and emotion detection	1 Jan 2025
RL Optimization	Dialogue Adaptation	Apply RL to enhance empathy and response generation	15 Jan 2025
Backend Setup	Develop APIs	Implement secure APIs and databases for data handling	30 Feb 2025
Frontend	Interface Design	Create Urdu voice-based user interface	15 March 2025
Testing	System Evaluation	Conduct integration and usability testing	15 April 2025
Deployment	Launch Prototype	Deploy chatbot on a secure server for demonstration	15 May 2025

6. References

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