

Mujawwad

(Project Proposal)

Project Code

TAJWEED-AI-25-26

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1. Abstract

Traditional Quranic learning relies on one-to-one instruction through Madarsa or personal teachers, limiting accessibility due to time, geography, and cost constraints. This project proposes developing an intelligent mobile application that captures user recitation, applies forced alignment for phoneme-level analysis, and provides automated feedback on Tajweed rules. The system will highlight specific mistakes with explanatory feedback, enabling users to learn correct Quranic recitation independently without continuous instructor supervision.

2. Background and Justification

Correct Quranic recitation requires mastery of Tajweed rules governing pronunciation and articulation. Traditional methods depend on qualified instructors, creating barriers related to geographical access, scheduling flexibility, and instructor availability.

Existing applications like Islam360, described as the “World’s 1st & Only Islamic Search Engine,” provide Quranic text with multiple translations, Tafseer, and audio from various Qaris [1]. Similarly, Tarteel AI, the world’s first AI-powered Quran companion, utilizes artificial intelligence for Quran memorization with word-level mistake detection [2]. A 2024 study confirmed Tarteel’s effectiveness in developing memorization and recitation skills among students [3]. However, these solutions primarily focus on memorization or basic word-level feedback rather than detailed phoneme-level Tajweed error detection.

Research in automated Tajweed checking demonstrates promising results. A study by Ibrahim et al. using Mel frequency Cepstrum Coefficient (MFCC) algorithm and Hidden Markov Model (HMM) classification achieved recognition rates of 91.95% for Ayats and 86.41% for phonemes when tested on Surah Al-Fatihah [4]. Recent work by Ahmad et al. on rule-based embedded HMMs achieved accuracy ranging from 99.87% to 100% for Medd classification [5]. This project builds upon such research by integrating forced alignment technology with comprehensive Tajweed rule verification at the phoneme level, supporting Hafs recitation style and Naskh script to provide detailed feedback for learners.

3. Project Methodology

The project will follow an iterative incremental development approach with systematic phases for building the Mujawwad.

3.1 Literature Review and Requirements Analysis

A comprehensive review of classical Tajweed texts, forced alignment techniques for Arabic speech, and existing automated Tajweed solutions will establish the theoretical foundation. Technical requirements will be defined through consultation with Tajweed

experts and potential users.

3.2 Data Collection and Model Development

Training datasets will be collected from EveryAyah.com [6] featuring professional Qari recitations in Hafs style. The forced alignment model will be trained on phoneme-level transcriptions. Rule-based algorithms will be implemented for each Tajweed category including Madd, Ghunnah, Qalqalah, and Noon/Meem Sakin variations.

3.3 System Implementation

The mobile application and backend infrastructure will be developed with cross-platform compatibility. The user interface will provide verse selection, audio recording, and interactive feedback visualization with error highlighting in Naskh.

3.4 Testing and Validation

Comprehensive testing will validate system accuracy through unit testing of individual components, integration testing of the complete pipeline, and user acceptance testing with 10-20 learners. System feedback will be compared against expert assessments to ensure reliability.

4. Project Scope

4.1 In Scope

1. Phoneme-level recitation verification with error detection
2. Detection and feedback for Tajweed errors: Madd, Ghunnah, Qalqalah, and Noon/Meem Sakin rules
3. Visual highlighting of error locations within verse text
4. Support for Hafs recitation style
5. Support for Naskh script
6. User interface for verse selection and audio recording

4.2 Out of Scope

1. Automatic verse identification from audio (users must manually select the verse)
2. Multi-dialect or multi-Qiraat support
3. Advanced Tajweed rules beyond the specified core set
4. Quran search or browsing features
5. Social or competitive features

5. High Level Project Plan



Figure 1: Project Gantt Chart (Sep 2025 - May 2026)

References

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