**Detailed Design Document**

**Introduction**

The Guitar Teacher Recommendation System is designed to help users enhance their guitar learning by recommending songs based on chords they know and their preferred difficulty level. This document outlines the detailed design of the system, including its architecture, component interactions, and technical specifications.

**System Overview**

**System Objectives:**

* Recommend songs based on user-selected chords and preferences.
* Provide a scalable, efficient platform for guitar learners.
* Optimize recommendations using caching and advanced filtering algorithms.

**Components:**

* **User Interface (UI):** Developed using React Native, it displays song recommendations and progression dashboards, collects user input.
* **Backend:** Built with Java (e.g., Spring Boot) to process API requests, recommendation logic, and database interactions, ensuring compatibility with the React Native frontend and leveraging the team's familiarity with Java.
* **Database:** PostgreSQL stores user profiles, chord data, and song metadata.

**Design Considerations**

**Assumptions:**

* The system will primarily be used on iPhone and Android devices, leveraging a React Native frontend for a seamless mobile experience.
* Users will have a basic understanding of guitar chords and difficulty levels.
* A maximum of 500 concurrent users.

**Constraints:**

* The current system is designed to support both iPhone and Android mobile apps using React Native for the frontend, ensuring a seamless experience across platforms. While React Native allows for shared code between platforms, this approach may limit access to native device features compared to fully native solutions
* Focused on foundational features for proof-of-concept purposes.

**System Architecture**

**Architecture Diagram:**

[View] <--> [Controller] <--> [Model] <--> [Database]

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* **View:** User interface for playing songs and tracking user`s progression, users input data.
* **Controller:** Processes user requests and fetches responses from the Model.
* **Model:** implementing algorithms for song recommendations, processing input data from the Controller, managing relationships between users, chords, and songs, and interacting with Database for data retrieval and updates.
* **Database:** Persistent storage for user, chord, and song data.

**Frontend Layer (Mobile App)**

The frontend layer hosts the Guitar Teacher Recommendation System as a mobile application for iPhone and Android devices. It contains three primary user interface components:

* **Song Recommendation View:**
  + Displays a list of recommended songs with chord diagrams and difficulty levels.
  + Displays suggested chords to learn next based on user`s level and previus known chords.
* **Progress Tracker:**
  + Visualizes user progress and mastery over time.
  + Includes a dashboard for tracking practiced songs and chords.
* **Playing Interface:**
  + Real-time chords interface for playing chosen song from spotify.

**Backend Layer (Backend Server)**

The backend layer consists of specialized services:

* **Recommendation Engine:**
  + Executes the pruning algorithm and additional recommendation logic.
  + Queries the database for songs.
  + Recommendations based on users playlists on spotify.
* **User Management Service:**
  + Handles user authentication, profile updates, and learning history.

**Data Design**

**Database Schema**

1. **Users:**
   * user\_id: INT
   * name: VARCHAR
   * email: VARCHAR
   * password: VARCHAR
   * created\_at: TIMESTAMP
   * level: INT
2. **Chords:**
   * chord\_id: INT
   * name: VARCHAR
   * complexity: INT
3. **Songs:**
   * song\_id: INT
   * title: VARCHAR
   * artist: VARCHAR
4. **Genres:** 
   * genre\_id: INT
   * A diagram of a computer

     Description automatically generatedname: VARCHAR

**Class Diagram**

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**User Interface Design**

* **Recommendation View:**
  + Displays songs with visual chord diagrams.
  + Allows quick access to chord tutorials.
* **Progress Dashboard:**
  + Tracks user progress over time.
* **Chord Selector:**
  + Drag-and-drop interface with real-time validation.

This design follows a structured, modular approach to deliver an intuitive and efficient guitar teaching experience.