



UNIVERSITY OF
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School of Computing and Mathematical Sciences

CO7201 Individual Project

Final Report Template

SongAssist

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DECLARATION

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Introduction

SongAssist Overview

SongAssist is an all-in-one practice app for guitarists to learn new songs and refine their skills in a user-friendly, distraction-free environment. The application implements cutting edge stem-separation models to isolate the guitar from the rest of a track uploaded as an MP3. *SongAssist* also features AI-powered advice and tablature generation to give guitarists a deeper understanding of the song they are learning.

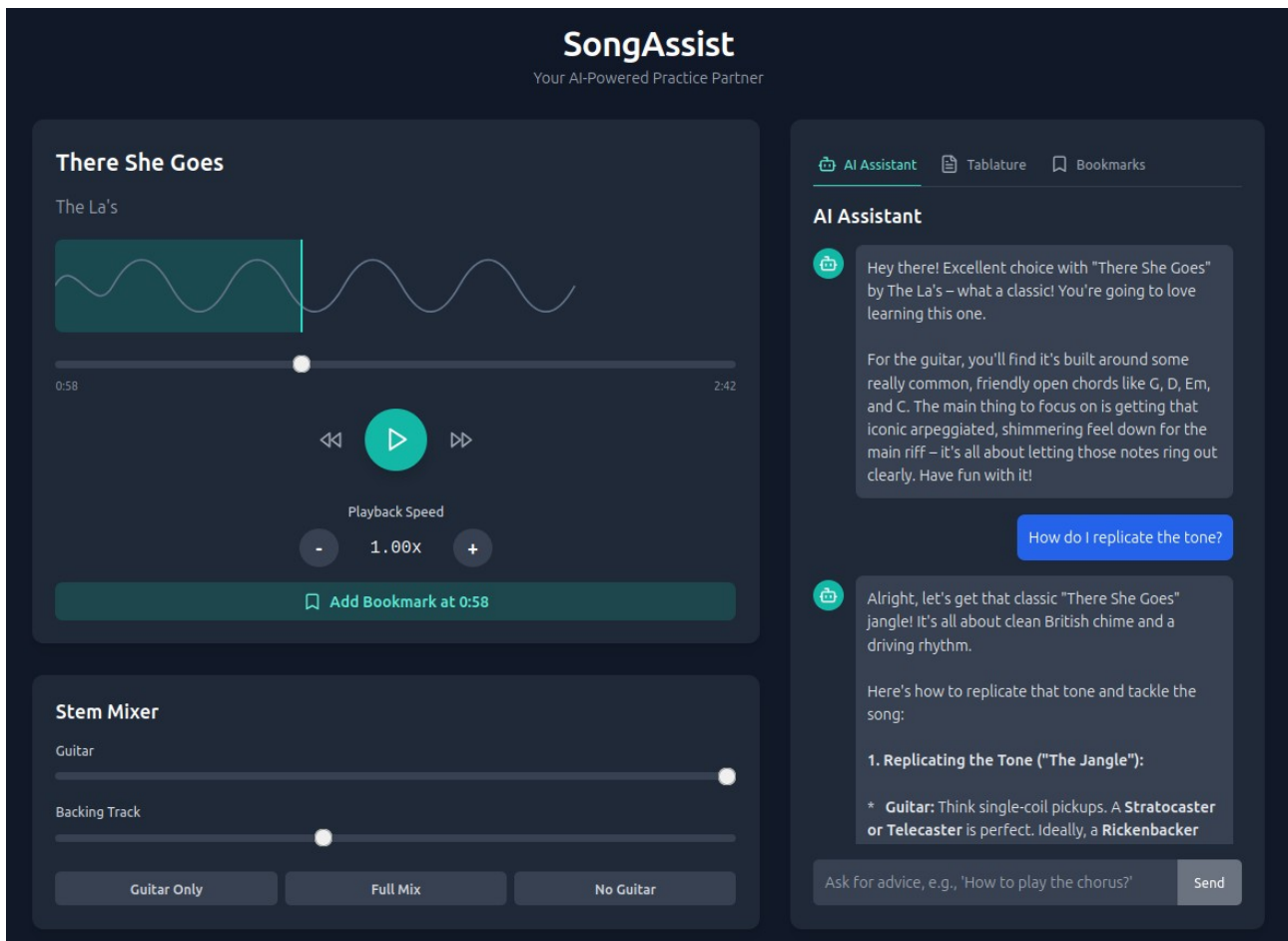


Figure 1: Screenshot of SongAssist main screen

Project Rationale

Learning a new song as a guitarist, even in the age of modern technology, can present significant challenges. One of the most significant barriers in achieving this is often replicating nuances and intricacies in the songs guitar part which requires a deep understanding of the sound and technique [1]. By simply listening to a track it can be difficult to pick up on such subtleties, especially with all other instruments playing alongside the guitar track. Since the late 2010s stem-separation technology has been widely available as a proposed solution to this issue whereby each instrument in any given track can be isolated using deep learning AI models [2].

While existing stem-separation applications can isolate guitar tracks, no leading applications in this field cater specifically to guitarists by offering further insight on the isolated part; this leads to an incomplete user-experience where users can hear the isolated guitar but have to navigate to a separate app in order to fully learn how to play it through chord-sheets and tablature notation.

Literature Review

Workflow Interruptions

Research consistently shows that an excessive amount of information being presented to an individual at once can impair their ability to take in new information, this is known as *cognitive load theory* [11]. It is for this reason that a fragmented workflow is entirely uncondusive to learning a new song as a guitarist. Developing a user-experience that supports simplicity and intuitiveness has shown to increase a user's capacity to learn with many users in this study stating their lowered barriers to engagement after experiencing a straightforward user-interaction [12].

Stem Separation Software

With stem-separation having existed as a technology for over 20 years, it was mainly looked upon as a complex studio technique until the late 2010s. The introduction of deep neural networks led to significant advancements in this field, stem-separation went from being performed using frequency filtering to deep-learning models trained on specialized music datasets [13]. Some of the most powerful deep neural networks developed at this time include *demucs*, which features high quality at a high computational expense, and *Spleeter*, a simpler model with fast stem-separation at a lower quality [14].

Moises.ai is one of the leading stem-splitting web applications with its own proprietary high-quality separation models, it has been stated that the separation offered by the application can be 'studio-quality'[15]. Although Moises.ai offers high-quality separation, it doesn't provide any qualitative advice on how to replicate guitar tone or technique, another app is required for this functionality.

Technical Specification

High-Level Architecture

When a file is uploaded through the frontend, React sends this file to *SongAssist*'s Python-based FastAPI backend in order to be processed and separated by the *htdemucs_6s* model. Upon separation, the frontend then loads each individual audio stem to be manipulated by the user. The user can also ask questions to the Gemini assistant implemented through the *@google/genai* library.

Implementation

Testing and Evaluation

Future Improvements

Generative AI Contributions

References

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