Music Learning Application

Application Requirements and Specifications

CSCE 247: Software Engineering

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1. Introduction

Purpose

Many people are interested in learning how to play instruments and read sheet music, but don't have the time, energy, or money to teach themselves how. This app is meant to assist in this learning process affordably. It will be designed to help people follow along with sheet music on their device. This app will have a user-friendly interface that will guide users on how to play the piano, guitar, or other instruments. It will also give previews to the songs, allow users to upload and play along to their own sheet music, and more.

Scope

This document will cover the following:

- A brief overview of the platform's stakeholders as well as personas of users.
- Potential project constraints and limitations.
- A description of the application's uses and features.
- An overview of the application's requirements.
- A competitive analysis focusing on the application's strengths and weaknesses.

2. Stakeholders

- **Working professionals**
  - Individuals with low time availability.
- **Musical students**
  - Individuals who want to practice and learn more.
- **Hobbyists**
  - Those who want to learn an instrument without having to buy one.
- **Composers**
  - People who want to license and sell their pieces to practicing users.
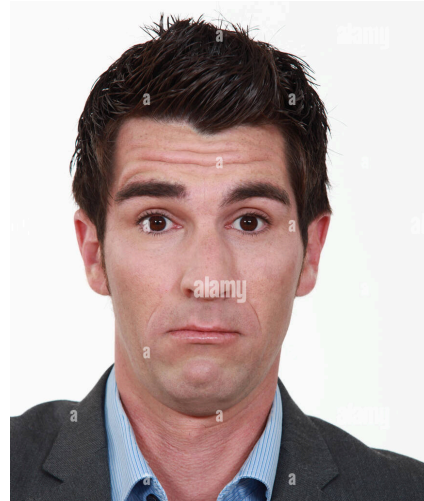
Personas

Bailey Bach

Age: 34
Hometown: New York, NY
Grouping: Working Professional
Employment: Investment Banker
Traits: Hardworking

Bio: A working professional without much free time, he wants to be able to practice with high efficiency. He cares about getting the most learning out of the shortest practice sessions. He loves to play blues and classic rock.

Goals: To learn quickly and effectively. Wasting little time on extra features and game mechanics.

Frustrations: Ineffective practice techniques, slow progress, wasting time.

Influences: Stevie Ray Vaughn, Lynyrd Skynyrd, Led Zeppelin.

Edith Wagner

Age: 72
Hometown: Aynor, SC
Grouping: Hobbyist
Employment: Retired
Traits: Patient

Bio: A retired grandmother. Edith has lots of time to learn. She enjoys going slow and mastering all of the music she wants to learn. She wants social features to connect with her friends and grandchildren. She enjoys classical music.

Goals: Enjoy the learning process and share her progress.

Frustrations: Small music library, confusing interfaces.

Influences: Beethoven, Chopin, Rachmaninoff.

John Brahms

Age: 10
Hometown: Norfolk, VA
Grouping: Musical Student
Employment: Elementary School Student
Traits: Energetic

Bio: John is an elementary school student. He wants to be able to learn how to play an instrument through lessons and practice. He wants to be able to learn through work that is difficult enough to challenge him, but not so difficult as to be discouraging. He also wants to have fun.

Goals: Learn more about music and how to play an instrument while seeing his progress happen.

Frustrations: Distracting advertisements, lack of beginner friendly options.

Influences: Miles Davis, Dave Brubeck, Carlos Santana.

Ludwig Smith

Age: 26
Hometown: Vienna, Austria
Grouping: Composer
Employment: Self-employed
Traits: Passionate

Bio: Ludwig is a composer that writes music of varying difficulty. He wants a platform where he can share his compositions with others. Being self-employed, he'd love to be able to make some extra income selling his compositions for people to practice on.

Goals: Compose and share his own music.

Frustrations: Inability to add his own songs, lack of features for experienced musicians.

Influences: John Williams, Ludwig Gorannson, Hans Zimmer.

3. Constraints

Time Constraints
- The project is to be completed within the span of the Spring 2025 semester.
- The time to work on this project must fit the schedule of all members.
- The project will have various weekly/biweekly checkpoints in which certain quotas of progress must be met.

Monetary Constraints
- The budget for this project is $0.

Technical Constraints
- The project must be coded completely in Java.
- The project must operate on and be fully accessible cross-platform, including desktop and mobile devices.

4. Overall Description

The application will be based completely in Java and will be developed using Visual Studio Code. It will be accessible from both desktop and mobile devices. The application will allow users to listen to, play along with, and explore various songs through sheet music. Users will be able to sort through collections of music to choose from. The application will contain a variety of options to customize the experience both in the music playing section and the general app atmosphere. The application will have a social aspect where users can compare performances.

5. Business Use Cases
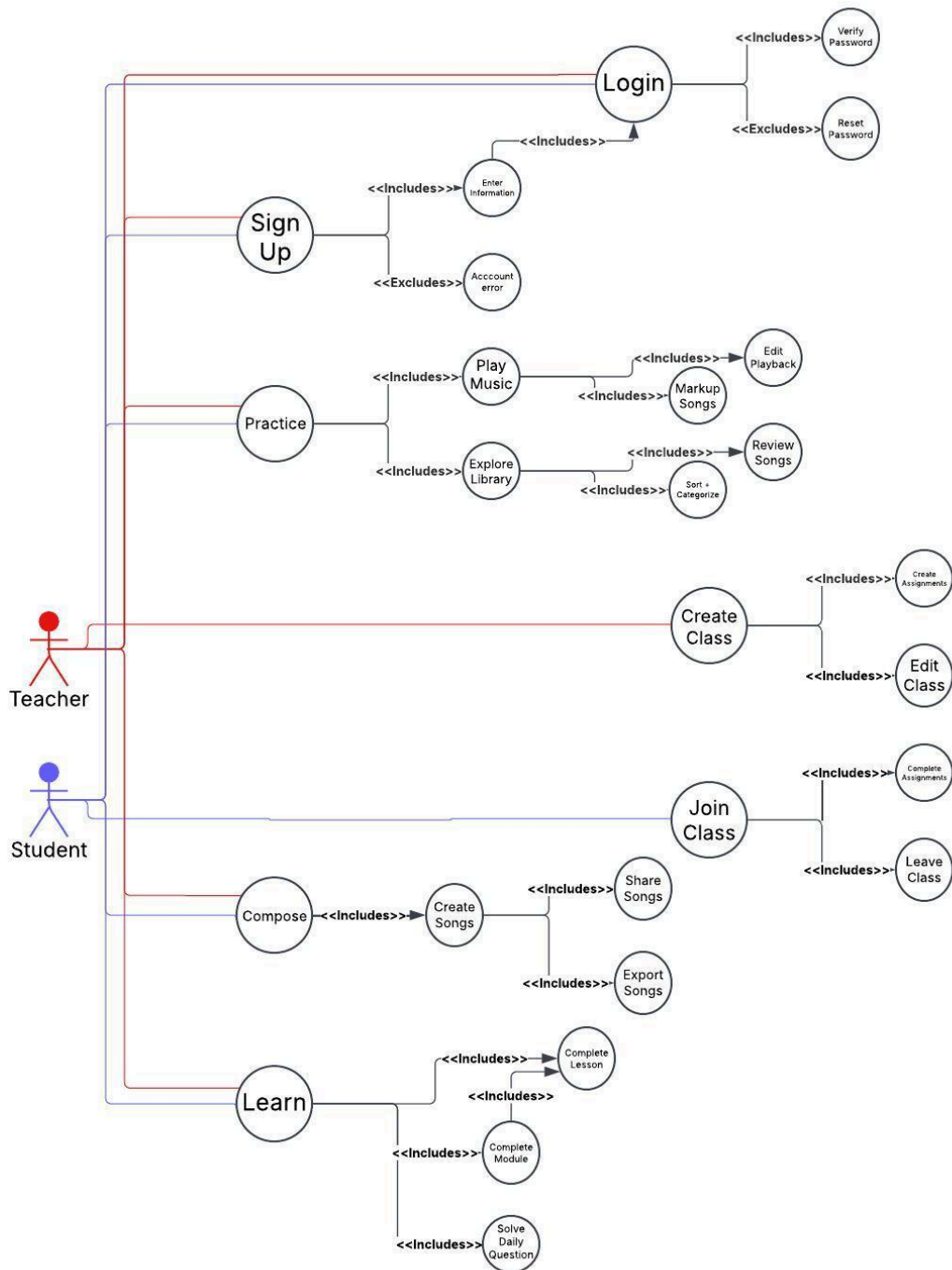
6. Functional Requirements

Requirements Spreadsheet

7. Non-Functional Requirements

- Look and Feel
    - The system will be easy to pick up with a simplistic and straightforward design.
    - The system and design will feel smooth from one section to another.

- Usability
    - The system will be accessible and effortless to all types of users.

- Performance
    - The system will run on any decently powerful platform with access to the internet.

- Maintainability and Support
    - The system will be cross platform and work on Mac, Linux, and Windows OS systems.
    - The system will be well kept and up to data with changes in software.

- Security
    - The user's information shall be securely stored so as to prevent data leaks.

- Cultural
    - The system will keep in mind cultural differences and stay accessible to all peoples.

- Legal
    - The system shall comply with all school regulations and the Carolina Creed.
    - The system shall comply with all local, state, and federal US law.

8. Definitions

Tablature: Musical notation for stringed instruments, in this case, guitar.
Chord: A group of multiple notes played simultaneously.
Tempo: The speed that the music is played at, measured in beats per minute (BPM).
Metronome: A device that plays a repeated sound at a selected BPM, to keep time.
Tuner: A device to aid in the tuning of an instrument, in this case, by playing a steady tone at a specific pitch.
Note: A specific pitch played on an instrument.
Time signature: Notation that tells the reader how to read the rhythms in the piece.
Measure: A grouping of notes of a standard length, defined by the time signature.

9. Competitive Analysis

	Flowkey
Strengths	Provides a thorough and user-centered approach to teaching the piano. The user may choose to learn a song immediately or look at the courses tab to watch videos on the fundamentals of pianos. While learning a song, the user has many options for how they would like to learn, such as difficulty level from beginner to pro; playing notes on just the left or right hand; learning a selected section of the song; or entering "wait mode," where the site will play one note at a time, moving on when the user plays the correct note on their piano. This gives the user the freedom to choose how and what they learn, at their own pace. Intuitive interface: a bar on the side of the screen lets the user take piano courses, browse and search for songs, and save their favorite songs, and change their settings. There is a video tutorial on how to best learn a piece. Accessibility: flowkey is available in the app store and as a website. Some songs are free for use before being blocked behind a subscription paywall. With a subscription, hundreds of songs are ready for use. Available in 11 languages.
Weaknesses	The app only assists in learning the piano. People who do not have access to their own piano, or those looking to learn other instruments will not gain anything from this site.

	There are little to no social elements to this site. It is strictly for learning piano as an individual, and does not provide any space to comment on a song or interact with other accounts.
	There is not much variety in artists. Many of the songs are classical or otherwise targeted at an older audience. A younger user would likely have a better experience browsing the library than searching for their favorite artist.
Audience/Focus	This site seems to be primarily targeted at hobbyists, especially those from an older demographic. There is some variety, such as higher difficulty ratings for some songs, or songs that might be popular with a young demographic, but it seems that the website is ideal for those looking for a low-commitment hobby.

	Ultimate Guitar
Strengths	Includes the sheet music for guitar, ukelele, and piano versions of a song. At the beginning of a song, all of the chords being used and their configurations on the instrument will be displayed. There is also optionally a video preview of the song being played by another person
	This app has a strong social interface, including comment sections under each song, forums for music-specific discussions, and recent articles about music.
	Includes a feature to upload original work, including videos of a performance, music tabs for your original work or another artist's song. There are plenty of guidelines for what is acceptable to include in the upload.
	Extremely large library: there is some kind of tab for virtually any song the user might want to play. If there is no tab, the user has the opportunity to upload their own.
	Available in 3 languages.
Weaknesses	Interface is unintuitive. All of the text is the same font and nearly the same size. There is no clear tutorial on how to use the interface, and new users may become stuck looking for song chords, education material, or something else.
	Songs may or may not have an "Official" tab of the music. If it does not, the quality of the sheet music may decline because it was submitted by users and not rigorously checked for quality.
	The site does not actually provide sheet music, leaving a lot of room for error. There is little instruction for tempo or rhythm, and it is clear that the

	user is expected to learn more minute details of the song and copy it by ear. Most useful features, including the official tabs, are locked behind the paywall which can be a turn-off for a lot of users.
Audience/Focus	Ultimate Guitar seems to be a hub for musicians to access tabs for music and discuss various subjects. There is some expectation that the user is already familiar with their instrument or is taking supplemental lessons.

	Simply Piano/Simply Guitar
Strengths	The learning process is streamlined: the app will ask for your preferences and then move you through some simple lessons before letting you learn your first song. Simple interface: There are few buttons you can press, and they all have a clear use. Gamification: the lessons are framed in a way that make the user feel as if they are making progress in learning the piano. Bright colors and a menu containing "levels" to learn each concept is used to achieve this. Available in 11 languages, for the piano or the guitar.
Weaknesses	Accessibility: requires a free trial to access any of the features. Only available as an app for a phone or tablet. The user must already own a piano/guitar to learn using this app. There is no in-app piano or guitar feature for the user to play. There is very little flexibility in how the user can learn. They must progress through the lessons to start playing a song, and the user must choose from a small pool of songs to start. The lessons may be overly simplistic. There are some exercises to familiarize the user with sheet music, but it can be repetitive if the user already knows the material. There is very little explanation of the lessons, such as vocabulary or technique. It seems to have the approach of "learn by doing."
Audience/Focus	The app is aimed at beginner piano players, likely those learning as a hobby who do not have a lot of free time. The lessons are incredibly structured and short, which can be useful for those just starting to play the piano.

Summary

	Strengths	Weaknesses	Focus
Flowkey	+ Progressive + Freedom	- Limited instruments - Lacking variety	Beginners, Hobbyists
Ultimate Guitar	+ Social + Extensive	- Overly complex - Lacks quality	Musicians, Experienced users
Simply Piano/Guitar	+ Simple + Progressive	- Requires instrument - Too simple	Beginners, Hobbyists

This analysis suggests that our product should focus on creating a simple, intuitive interface while incorporating features that enhance user engagement and flexibility. Key takeaways include the importance of providing tools for customization, such as interactive sheet music and performance comparisons, alongside fostering a social element where users can connect through discussions and reviews. Additionally, ensuring accessibility across devices and offering a wide variety of genres and instruments will make the platform appealing to both beginners and experienced musicians. By addressing these priorities, our product will stand out as a comprehensive and user-friendly solution for music learning and exploration.

10. References

www.bbc.co.uk/bitesize/articles/zpmj6rd#zyhmnk7
www.ultimate-guitar.com
www.flowkey.com
www.hellosimply.com