

AI Music Tracker:

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Logbook

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Planning

2/02/2021 - 2/09/2021

Project Title/Topic	AI Music Tracker
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Goal	
Goal: Formulate an inquiry question or statement that clearly shows your goal, based on your personal interests. Be concise but specific and clear.	Our goal is to make a AI app that will track as you sing to the lyrics, and automatically scrolls the page as you sing, as well as jump up and down the page as needed
What is the purpose of the goal? What do you hope to achieve?	We hope to create a product that assists musicians in their performances
What prior learning and subject specific knowledge is relevant to the project? How does the project relate to an academic class you are currently enrolled in or have taken?	We need to know how to train an AI and make an app. All of us have taken or are taking computer science classes, and are learning the principles of coding.

Global Impact	
Identify how this will impact the community/world:	It will help musicians as the AI will do the job of moving the music with the sound so the musician can keep following it

Product/Outcome	
What product/outcome will you create in response to the goal, global context and criteria?	We will create an app that will track where a musician is in a piece of music, making the music easier to read
Form: Function: User/Audience: Costs:	<ul style="list-style-type: none"> • A type of application • Meant to track your voice through the document and follow • Meant for musicians who are singing • \$0 as it is an app

Research	
What will be the focus of your research?	Understanding and figuring out how to put the AI into our app in a proper functioning way
Media: (Includes books and articles, etc.)	AI Platform: colab.research.google.com
Surveys: Would surveying your potential audience be useful?	It could be useful to help tailor to the wants of actual musicians as we only have 1 person in our group who is actually a musician
Interviews: What human resources can you tap into for your project?	Isaac knows a lot of musicians and guitarists who would be quite interesting in this type of app that could follow your voice through the document
Data:	I was able to survey and get data by other

	musicians whether they agree if this is a problem. I was able to identify 28 people that said this is a problem, which is a significant amount of people
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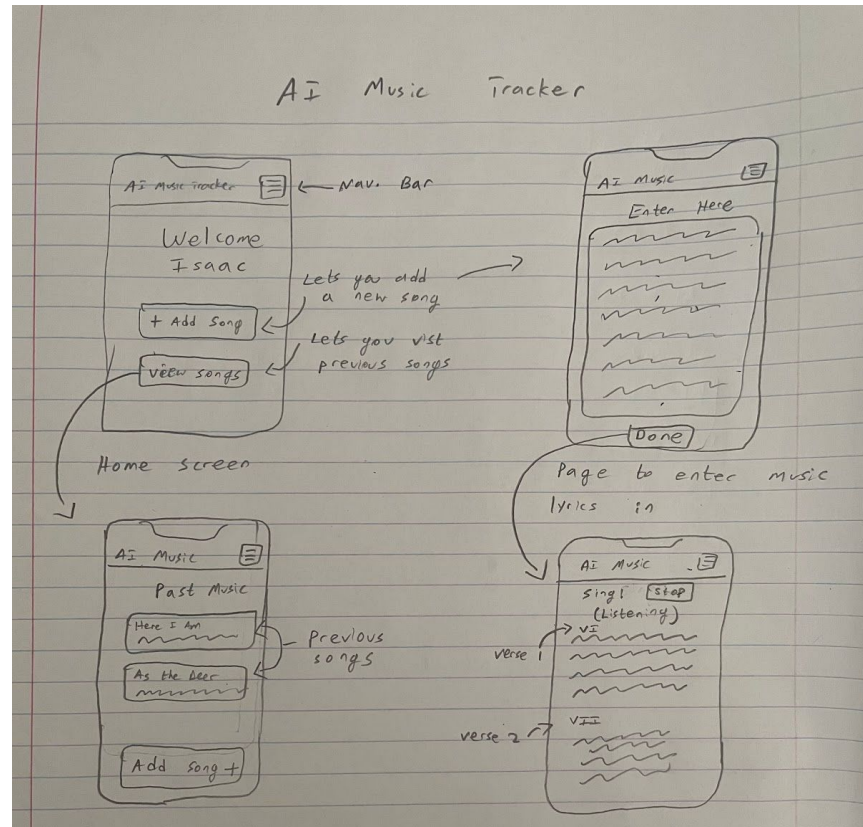
Specifications

Prompts	Student-Designed Criteria	Test or method of evaluation
Form: What will your project look like? What materials will you use? What size will your project be? What tools will you use? How will you assemble your project?	Our project will be a digital app. We will use a prototyping app like figma and Visual Studio Code to make our prototypes. Our project won't be too big, because the sole purpose of the app will be to help musicians. We will use Figma, Visual Studio Code, and XCode We will assemble our project by coding an app.	Looks clean and is satisfying visually Send out app to other people to review.
Function:	The purpose of our project is	Our project properly follows

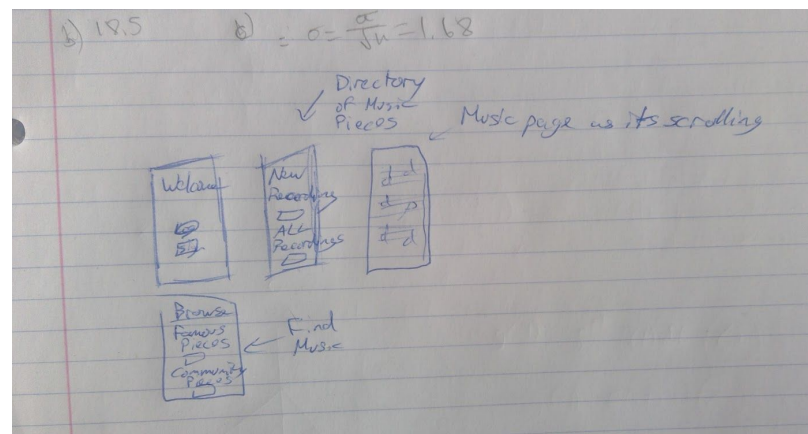
What is the purpose of your project?	to eliminate the need for musicians to scroll through their music by using an AI to do it for them	through the music and does not go ahead or fall behind
User/Audience: Who is your project for? What needs do you expect your project to satisfy? Where/why will you project be used?	Our project is for musicians It will follow a musician through music without any human help Project will be used when musicians want to focus on the music and not have to flip through it well playing	Musicians are satisfied with our product and agree that it makes playing easier due to have one less thing to worry about
Costs: How much will your project cost to make? *How much will you sell it for? *How much profit could be made on your item/project?	We are using free resources and it will not cost us anything The app will be sold for free, but could have a \$3 subscription fee 100% profit	It does not cost us anything as we will use free resources to make it

Brainstorm Sketches:

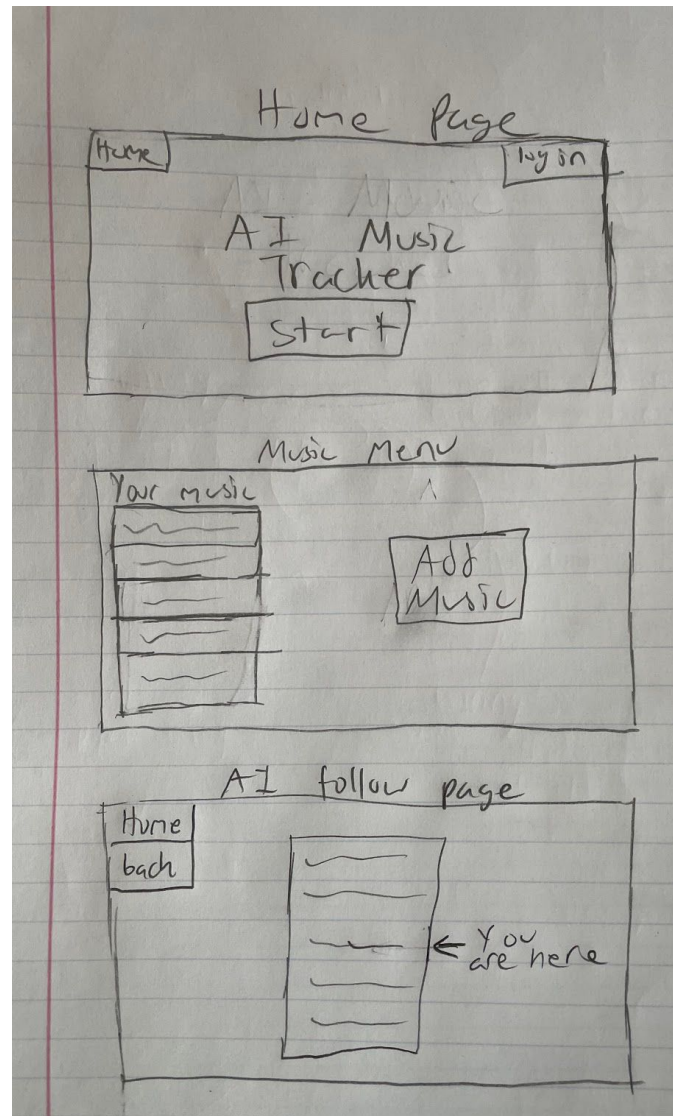
Isaac



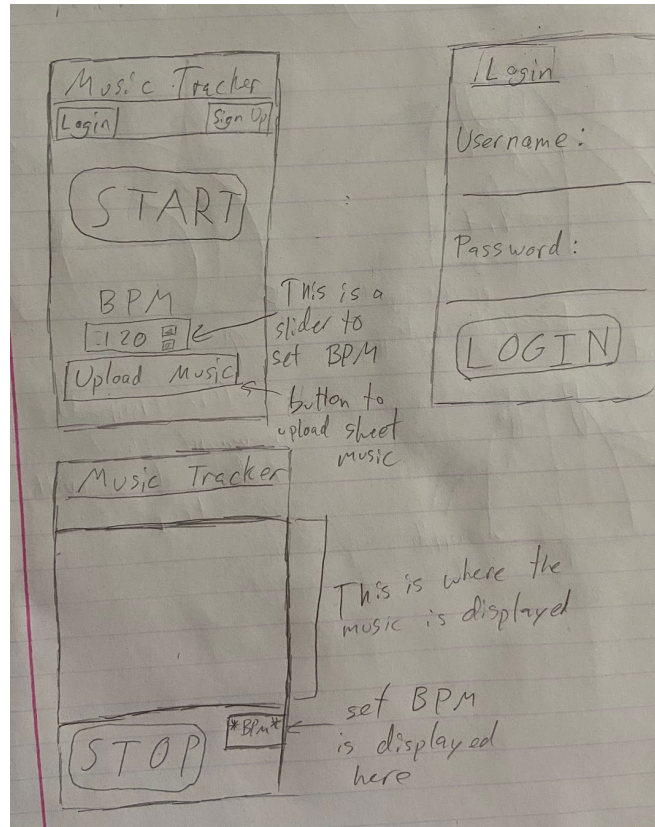
Mike



Prathik



Josh



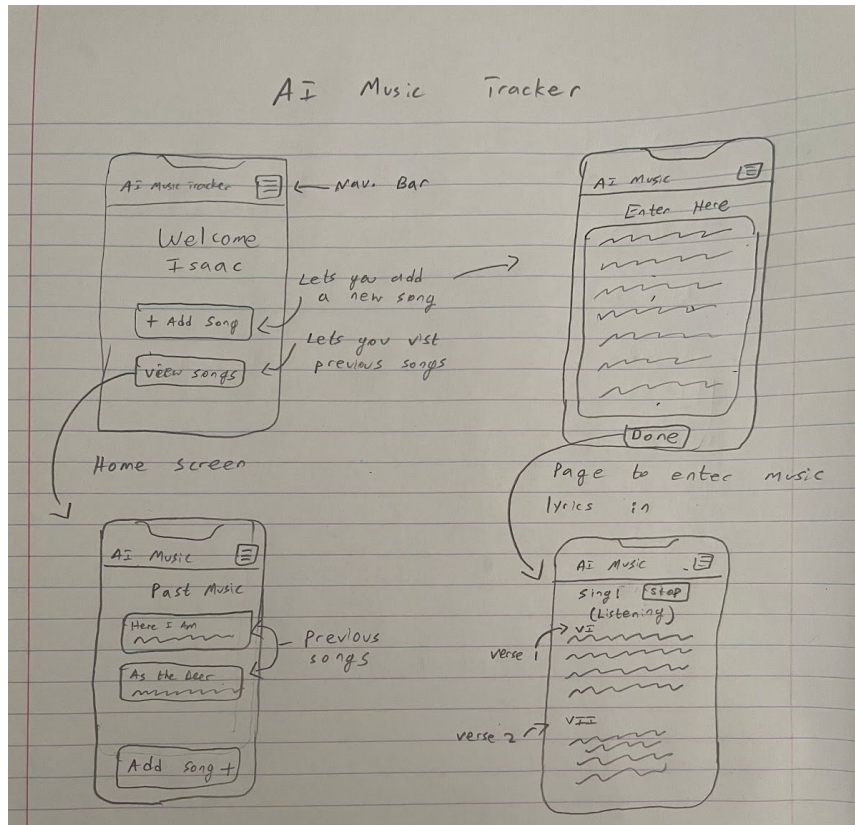
Decision Matrix:

Design	Mike	Prathik	Josh	Isaac
Aesthetics	7	7	6	8
Usability	6	8	8	9
Functionality	8	6	7	9
Code/AI Complexity (Least Complex)	9	6	6	7
Solution Effectiveness	7	8	7	8

Total	37	35	34	41
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We chose Isaac's design as it was the most detailed and it was the best one.

Final Design:



(Same as brainstorm sketch as it is detailed enough to provide very good information about the design.)

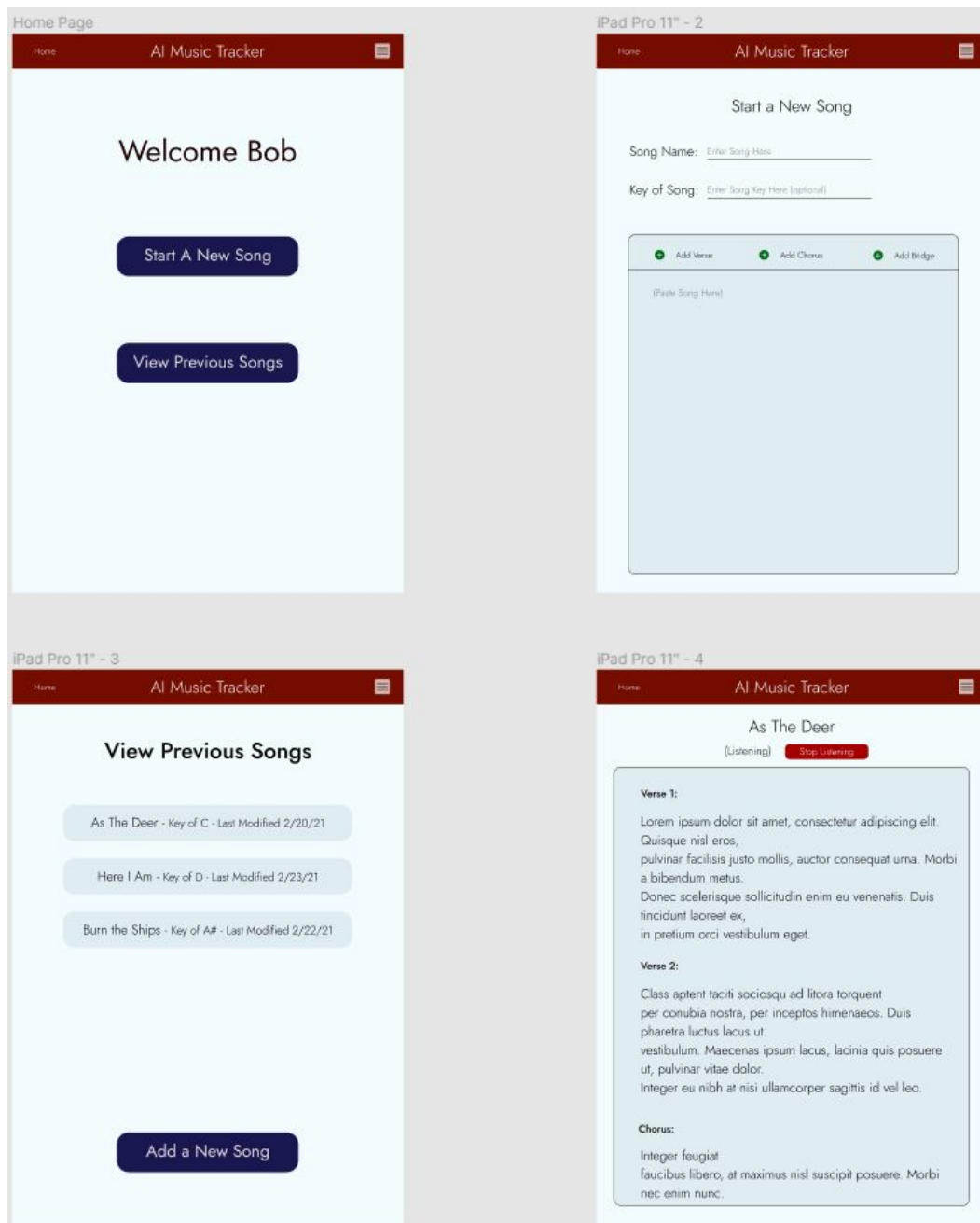
2/9/2021:

Original Plan:

- Iteration 1: Train an AI to identify keywords and follow along in document
- "Verse 1", "Chorus" - keywords correspond to place in document
- Tensorflow, Google Colab, and Python
- Iteration 2: Train AI to follow all words in music document
- This AI will be integrated into a app (Using Xcode to built an iPad Swift app)

CAD Progress:

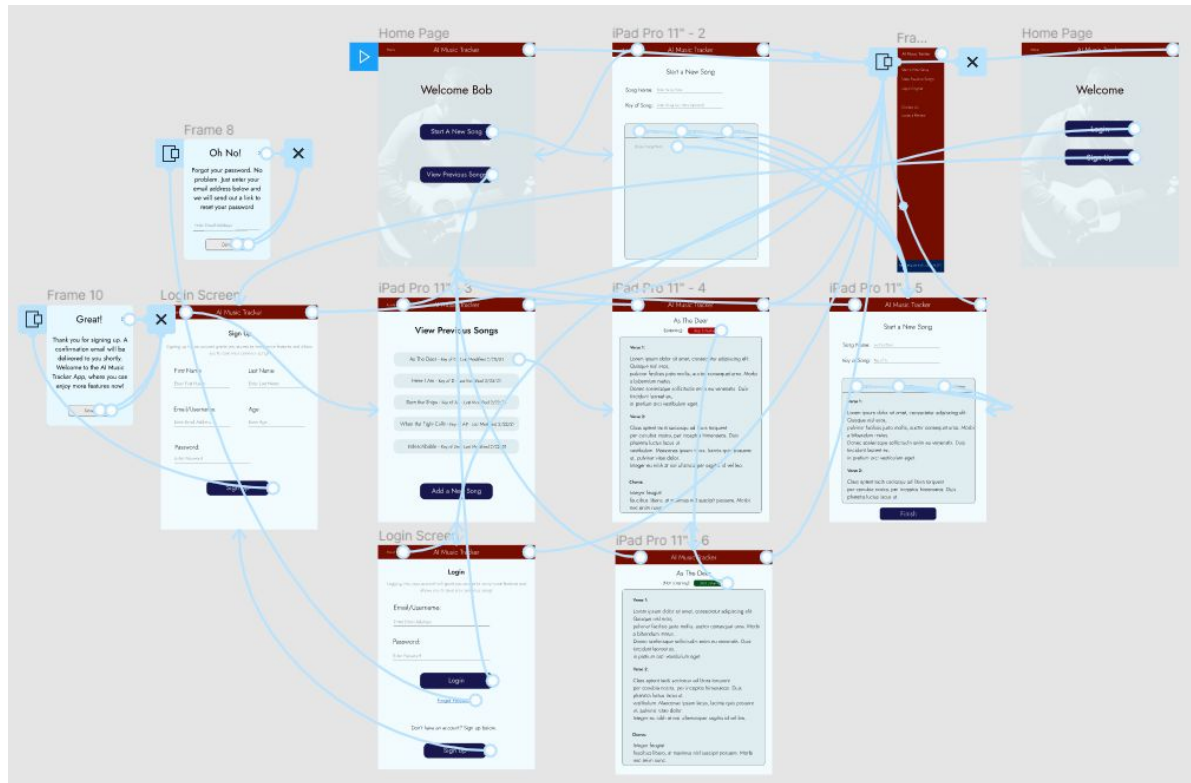
2/16/2021:



Here we were able to start creating the “CAD” for our project, and we decided on using Figma for our project, as it acts as a collaboration tool where multiple people can work on the design at the same time.

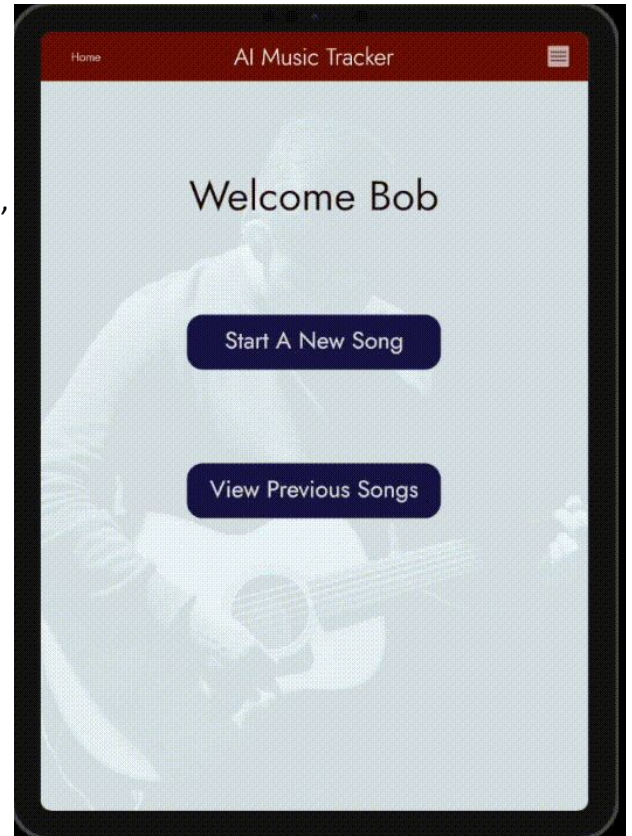
As you can see above, we started with four pages, which are the same four pages as the initial brainstorm/final design sketch. We have the home page, the page to view all previous songs, a page for the user to input the lyrics, and a page that activates the AI where it listens to the user. No animations have been done to this point yet.

2/23/2021:



As you can see above, we were able to create all of the necessary pages on this design. All the blue lines you see showcase the different connections between the different pages, and if you click the link, it will take you to the corresponding page. We were able to make many overlays, and add a navigation bar that opens to the side.

As you can see to the right, here is a GIF that goes through some of the pages in the Figma design.

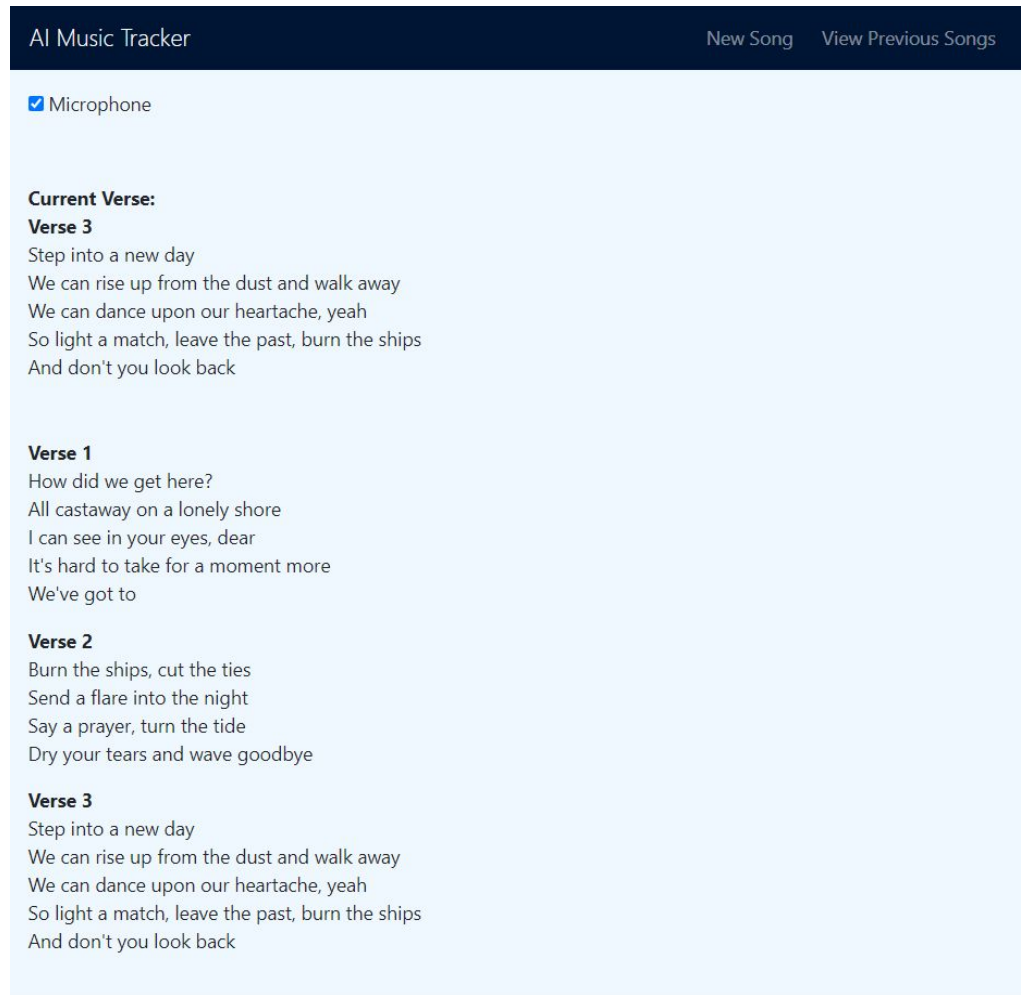


Code Progress:

2/22/2021:

I was able to get a rough prototype working. As seen below, what the application does is that using AI, it is able to detect keywords such as 'one', 'two', 'three'. After detecting the keyword, it then brings up the corresponding verse and the words to the current verse. While this was captured on a desktop, on a phone, or iPad, you would only see the current verse as that would take up the whole screen.

What I have done to create this is that this is running on a web browser, using HTML, CSS, and JavaScript. I was able to use VS Code to code this website. I have to give credit to Juan Cruz Martinez on livedevelopment.com, as I was able to use his AI script that allowed me to identify which words were being said. Then after the key-word was identified, I was able to create a script that linked the key-word to the verse number. What happens below is that whenever the key-word (like 'three'), is said, the current verse content switches to the corresponding verse, in this case, Verse 3.



I also used the Bootstrap library in order to stylize the page and make it look nice. However, the main goal at this point is still to create a Swift iOS application.

2/23/2021:

I tried experimenting with how to handle user input in JavaScript for this code. I tried adding a popup window to let the user add verse, but it did not allow for line breaks, so I could not use that. I tried using form input, but the page refreshes whenever a form is submitted, so I could not store the value like I wanted to.

2/24/2021:

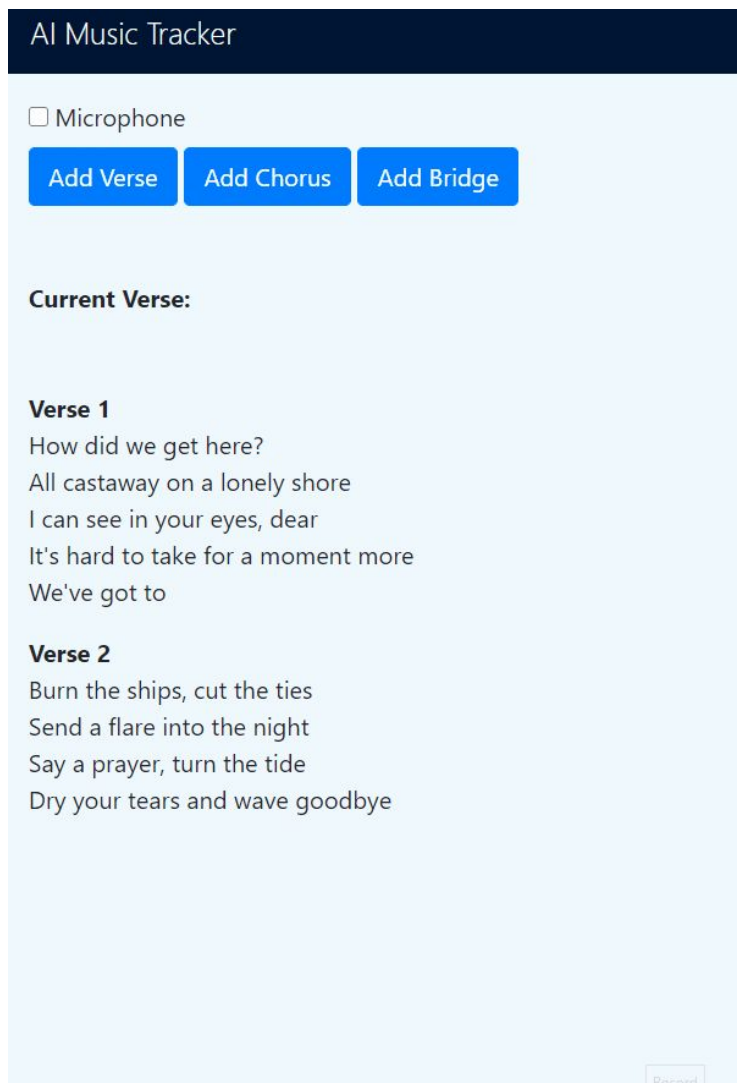
I finally was able to get user input working properly. All I needed to do was to add `contenteditable="true"` and I was able to get the user to dynamically edit the text box as needed. I was able to find this on the Mozilla Web Docs.

I was able to get a button system working for the application. You can add a verse, chorus, or bridge to the application now. What happens code wise is that I am able to append a div tag with the proper name of chorus, verse, or bridge to the document.

Example of Current Prototype: (sorry for slight blurriness)

Below are three gifs showcasing different aspects of the design.

This gif shows how the user can click the buttons and add a verse, chorus, and bridge as necessary.



The screenshot shows a web application titled "AI Music Tracker" in a dark blue header. Below the header, there is a light blue area containing a "Microphone" icon and label. Underneath, there are three blue buttons labeled "Add Verse", "Add Chorus", and "Add Bridge". Below these buttons, the text "Current Verse:" is displayed. Underneath, there are two sections of text. The first section is titled "Verse 1" and contains the lyrics: "How did we get here?", "All castaway on a lonely shore", "I can see in your eyes, dear", "It's hard to take for a moment more", and "We've got to". The second section is titled "Verse 2" and contains the lyrics: "Burn the ships, cut the ties", "Send a flare into the night", "Say a prayer, turn the tide", and "Dry your tears and wave goodbye". In the bottom right corner, there is a small "Record" button.

This gif here shows how the user can dynamically change the text inside the text boxes, and put whatever lyrics they want to put.

AI Music Tracker

☐ Microphone

Add Verse

Add Chorus

Add Bridge

Current Verse:

Verse 1

How did we get here?
All castaway on a lonely shore
I can see in your eyes, dear
It's hard to take for a moment more
We've got to

Verse 2

Burn the ships, cut the ties
Send a flare into the night
Say a prayer, turn the tide
Dry your tears and wave goodbye

Chorus

(Edit here)

Verse 3

(Edit Here)

Verse 4

(Edit Here)

Bridge

(Edit here)

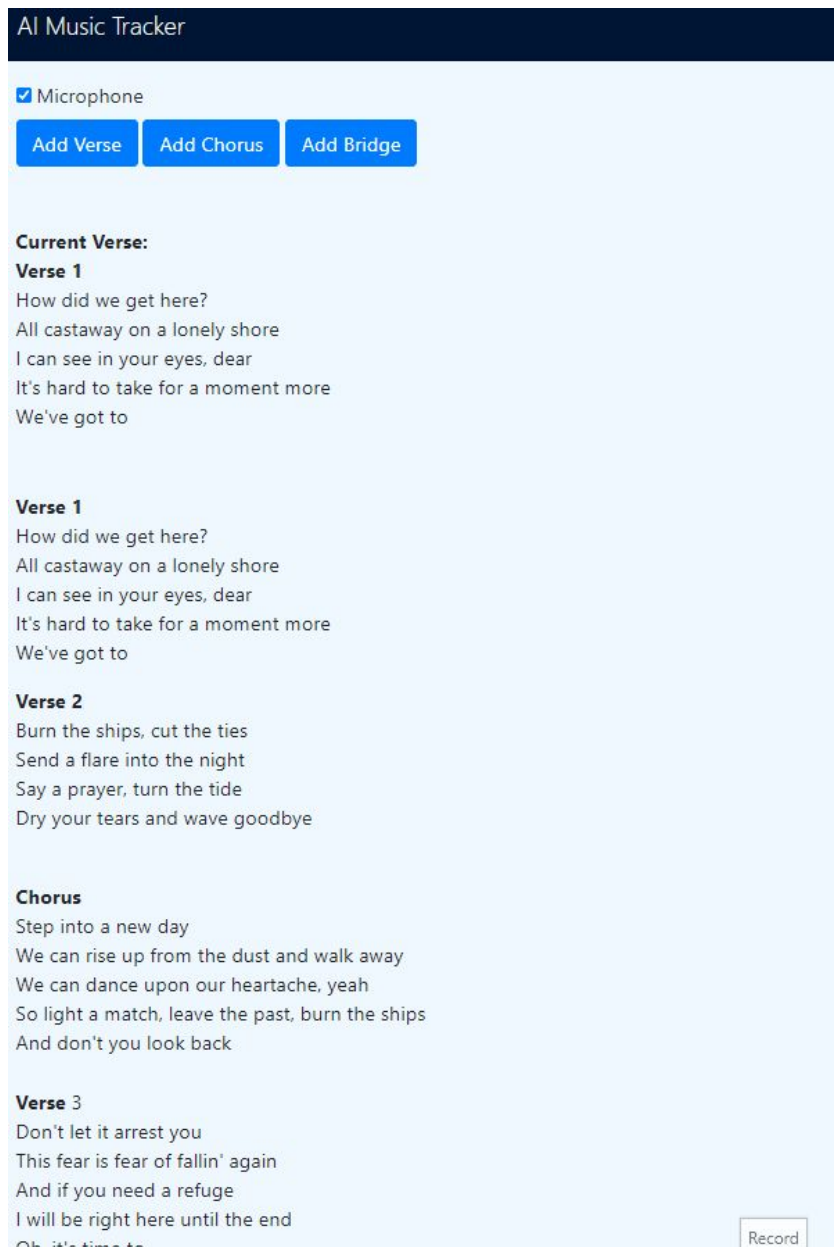
This gif illustrates the AI in action, as the user says key words such as “one” or “two”, the website sets the current verse at the top to what the user wants.

This is a little different than the original plan, which was to scroll through the document as needed, but I changed it to this method of setting the current verse at the top to what verse the user wants.

However, as I mentioned earlier, I was able to use Juan’s training dataset for the AI. In the dataset, there were only a limited number of keywords. Therefore, I couldn’t set the keyword to “Verse 1”, “Verse 2”, “Chorus” as I had previously wanted, but had to use from the list.

And so, Verse 1 became “one”, Verse 2 became “two”. While simple enough, for Chorus and Bridge, there were no similar words, and so I used “left” for Chorus and “right” to signify the Bridge. This is a temporary issue, and in future iterations, this will be fixed.

Also, something to note is that while in this model this is the only page that exists, in the future we plan to have more pages in the application.



And while this application was written in HTML, CSS, and JavaScript, we plan to still code the app in Swift in the future.

And below are some pictures of the application.

This is a default state with two verses automatically added

AI Music Tracker

☐ Microphone

Add Verse Add Chorus Add Bridge

Current Verse:

Verse 1
How did we get here?
All castaway on a lonely shore
I can see in your eyes, dear
It's hard to take for a moment more
We've got to

Verse 2
Burn the ships, cut the ties
Send a flare into the night
Say a prayer, turn the tide
Dry your tears and wave goodbye

Here is the chorus being activated and moved to the current verse:

AI Music Tracker

☐ Microphone

Add Verse Add Chorus Add Bridge

Current Verse:

Verse 1
How did we get here?
All castaway on a lonely shore
I can see in your eyes, dear
It's hard to take for a moment more
We've got to

Verse 2
Burn the ships, cut the ties
Send a flare into the night
Say a prayer, turn the tide
Dry your tears and wave goodbye

Chorus
(Edit here)

Verse 3
(Edit Here)

Bridge
(Edit here)

Here are the verses, chorus, and bridge being edited to a new song right within the same page

AI Music Tracker

☐ Microphone

Add Verse

Add Chorus

Add Bridge

Current Verse:

Verse 1

Ninety miles on the highway
Every day moving so fast
Taking all the wrong ways out
Never saw you coming
Stopping me in my tracks
Keeping me from the long way down

Verse 2

Doesn't matter just how many times I tried
There could only be a single reason why
So tell me

Chorus

How do miracles just happen like that
Happen like that, happen like that
You can say the stars align but
I know that it's more than timing
How do miracles just happen like that
Happen like that, happen like that
Right before I hit the ground some
How You came along and found me

Verse 3

Some will say it's magic
But I know that You did all that
You're the reason, there's no doubt
Doesn't matter just how many times I tried
There could only be a single reason why
So tell me

Bridge

There's no doubt when I feel Your love
Call me crazy and out of touch
But I know that it's from above
Tell me

Here is the chorus being activated and moved to the current verse:

AI Music Tracker

☒ Microphone

Add Verse

Add Chorus

Add Bridge

Current Verse:

Chorus

How do miracles just happen like that
Happen like that, happen like that
You can say the stars align but
I know that it's more than timing
How do miracles just happen like that
Happen like that, happen like that
Right before I hit the ground some
How You came along and found me

Verse 1

Ninety miles on the highway
Every day moving so fast
Taking all the wrong ways out
Never saw you coming
Stopping me in my tracks
Keeping me from the long way down

Verse 2

Doesn't matter just how many times I tried
There could only be a single reason why
So tell me

Chorus

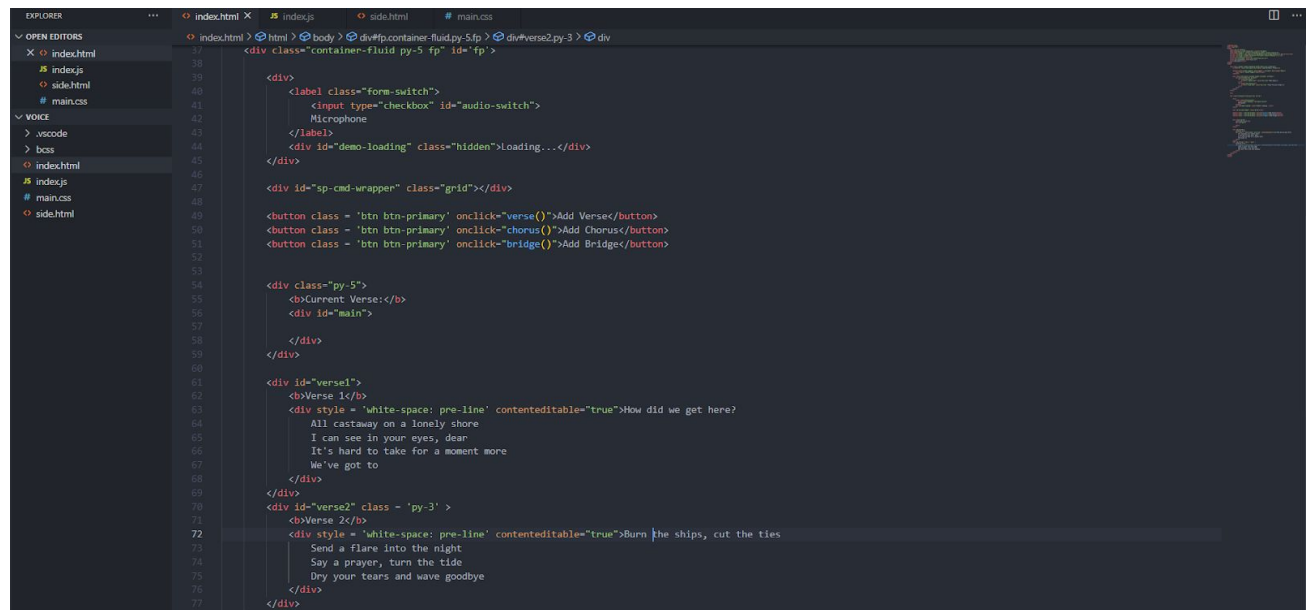
How do miracles just happen like that
Happen like that, happen like that
You can say the stars align but
I know that it's more than timing
How do miracles just happen like that
Happen like that, happen like that
Right before I hit the ground some
How You came along and found me

Verse 3

Some will say it's magic
But I know that You did all that
You're the reason, there's no doubt
Doesn't matter just how many times I tried
There could only be a single reason why
So tell me

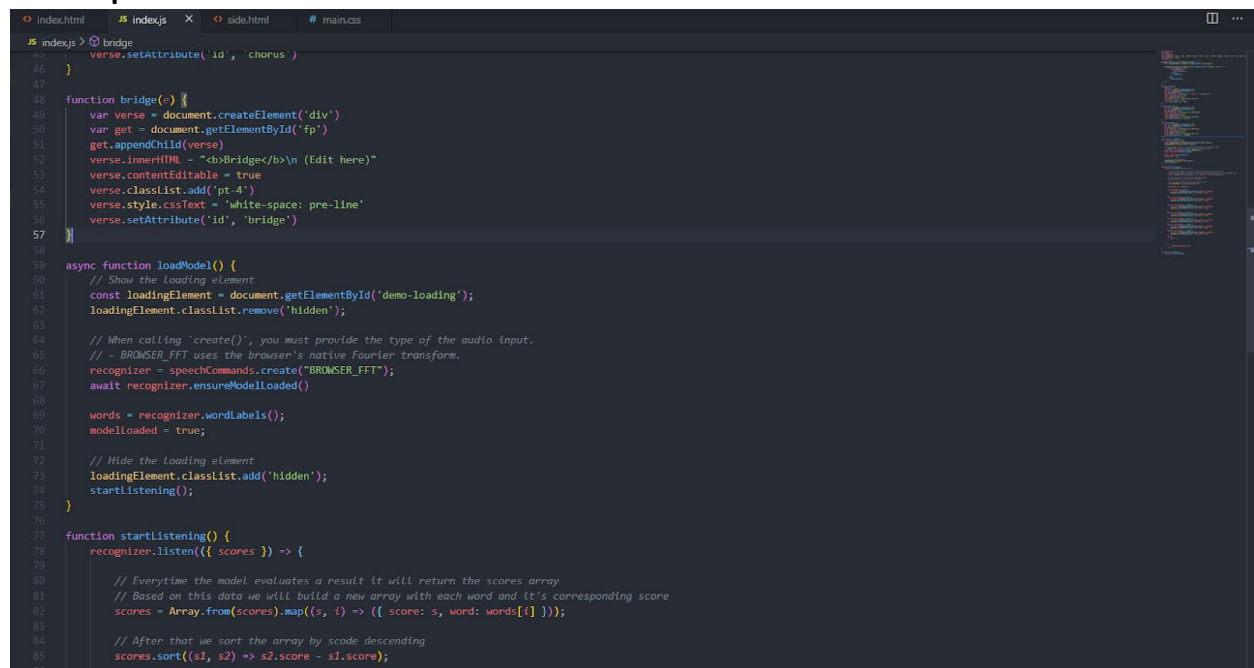
Here are some pictures of the code (All using Visual Studio Code):

HTML File



```
37 <div class="container-fluid py-5" id="fp">
38
39   <div>
40     <label class="form-switch">
41       <input type="checkbox" id="audio-switch">
42       Microphone
43     </label>
44     <div id="demo-loading" class="hidden">loading...</div>
45   </div>
46
47   <div id="sp-cmd-wrapper" class="grid"></div>
48
49   <button class = 'btn btn-primary' onclick="verse()">Add Verse</button>
50   <button class = 'btn btn-primary' onclick="chorus()">Add Chorus</button>
51   <button class = 'btn btn-primary' onclick="bridge()">Add Bridge</button>
52
53   <div class="py-5">
54     <b>Current Verse:</b>
55     <div id="main">
56
57     </div>
58   </div>
59
60   <div id="verse1">
61     <b>Verse 1</b>
62     <div style = 'white-space: pre-line' contenteditable="true">How did we get here?
63       All castaway on a lonely shore
64       I can see in your eyes, dear
65       It's hard to take for a moment more
66       We've got to
67     </div>
68   </div>
69
70   <div id="verse2" class = 'py-3' >
71     <b>Verse 2</b>
72     <div style = 'white-space: pre-line' contenteditable="true">Burn the ships, cut the ties
73       Send a flare into the night
74       Say a prayer, turn the tide
75       Dry your tears and wave goodbye
76     </div>
77   </div>
```

JavaScript File



```
45   verse.setAttribute('id', 'chorus')
46 }
47
48 function bridge(e) {
49   var verse = document.createElement('div')
50   var get = document.getElementById('fp')
51   get.appendChild(verse)
52   verse.innerHTML = "<b>Bridge</b>\n (Edit here)"
53   verse.contentEditable = true
54   verse.classList.add('pt-4')
55   verse.style.cssText = 'white-space: pre-line'
56   verse.setAttribute('id', 'bridge')
57 }
58
59 async function loadModel() {
60   // Show the loading element
61   const loadingElement = document.getElementById('demo-loading');
62   loadingElement.classList.remove('hidden');
63
64   // When calling 'create()', you must provide the type of the audio input.
65   // - BROWSER_FFT uses the browser's native Fourier transform.
66   recognizer = speechCommands.create("BROWSER_FFT");
67   await recognizer.ensureModelLoaded()
68
69   words = recognizer.wordLabels();
70   modelLoaded = true;
71
72   // Hide the loading element
73   loadingElement.classList.add('hidden');
74   startListening();
75 }
76
77 function startListening() {
78   recognizer.listen(({ scores }) => {
79
80     // Everytime the model evaluates a result it will return the scores array
81     // Based on this data we will build a new array with each word and it's corresponding score
82     scores = Array.from(scores).map((s, i) => ({ score: s, word: words[i] }));
83
84     // After that we sort the array by score descending
85     scores.sort((s1, s2) => s2.score - s1.score);
```

CSS File:

```
<> index.html × JS index.js <> side.html # main.css ×
# main.css > .fp
1  .hidden {
2    display: none;
3  }
4
5  .active {
6    background-color: #090;
7  }
8
9  .nicec {
10   background-color: #001433;
11 }
12
13 .fp {
14   background-color: aliceblue;
15   min-height: 100vh;
16 }
17
```