APOLLOTRAX

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Background

- With the growing number of users who listen to music on some sort of streaming platform, it becomes difficult for users to decide exactly what music they want to listen to at any given moment
- There are many Android and Apple apps which offer state of the art functionality in terms of streaming music from various sources, but very few of these claim to detect a person's mood and influence the music the user listens to
- With the introduction of **Apollo Trax**, our aim is to seamlessly blend artificial intelligence technologies along with machine learning and mood detection to provide state of the art music selection to suit mood and surroundings.

Objectives

Why make a mood-based music app?

- The Journal of Positive Psychology conducted a study in 2013 which discovered that an individual's choice of music could significantly improve their mood and overall happiness in just a few weeks.

In line with the above, our app sets out to:

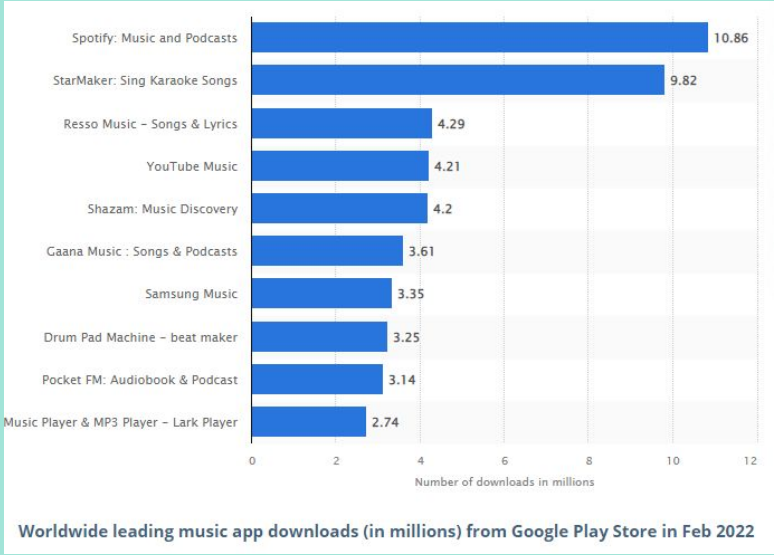
- Personalize music selection based on individual mood or surroundings
- Remove uncertainty in music selection or music source
- Enhance mood based music selection via machine learning and data mining techniques
- Introduce user feedback into the selection process to further personalize the experience
- Promote and foster positive individual mental health and stress management through positive coping strategies via auto selection of music choices

Specifications and Constraints

- It must be compatible with other music apps on Android and iPhone (Spotify, Apple Music, Pandora, etc.)
- Login and access to personal account
- Works with Internet and/or Cellular Data
- Can run when the app is not open
- Options to like/dislike songs when they change to improve algorithm
- Should be able to access location data for algorithm-for example, if the user only plays high energy music at the gym the app can suggest music of that genre when the user is in that location
- Either offer a subscription to make up for development costs or offer a premium version of the app where there are more features available
- Must be able to integrate with Apple Watch and FitBit to match music with physical activity
- Must be able to integrate with Siri and other speech recognition features on mobile devices

Feasibility Analysis

- Demand levels for music streaming worldwide shows continued growth
- Wellness industry is well entrenched from a body and fitness perspective with future movement towards mental wellness showing significant and strong growth



Worldwide leading music app downloads (in millions) from Google Play Store in Feb 2022

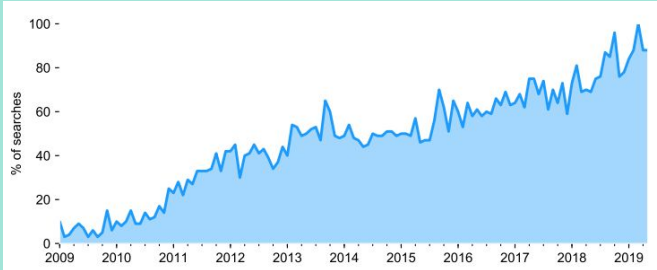


Figure 1. Number of searches of "mood app" during the last 10 years. Values expressed in percentage relative to the total amount of searches on that topic. Source: Google Trends [17].

Proposed Approach

- Break down a song into quantifiable musical components such as rhythm, harmony or timber.

- Research into music theory and analyze each track's audio features (BPM, key, valence, chord progression, etc.) from Spotify and Apple Music API.

- Devise advanced algorithms to analyze whether a track belongs the happy, sad, nervous, confused, calm, energetic, etc. category.

Tempo Research [1]

Mode	Tempo (beats per minute)		
	72	108	184
Musicians			
Lydian	Sadness (56.7%)*	Serenity (63.3%)	Happiness (90%)
Ionian	Serenity (63.3%)	Happiness (50%)	Happpiness (96.7%)
Mixolydian	Sadness (53.3%)*	Serenity (66.7%)	Happiness (80%)
Dorian	Sadness (56.7%)	Serenity (60%)	Happiness (73.3%)*
Aeolian	Sadness (53.3%)*	Serenity (46.7%)*	Happiness (53.3%)*
Phrygian	Sadness (70%)	(Serenity 33.3%; Sadness 33.3%; Fear/anger 30%)	(Happines 43.3%; Fear/anger 40%)*
Locrian	Sadness (60%)*	(Serenity 33.3%; Sadness 33.3%)*	Fear/anger (50%)
Nonmusicians			
Lydian	Serenity (63.3%)*	Serenity (56.7%)	Happiness (80%)
Ionian	Serenity (70%)	Happiness (66.7%)	Happpiness (100%)
Mixolydian	Serenity (70%)*	Serenity (50%)	Happiness (83.3%)
Dorian	Sadness (66.7%)	Serenity (50%)	Happiness (43.3%)*
Aeolian	Sadness (83.3%)*	Sadness (60%)*	(Happiness 43.4%; Fear/anger 40%)*
Phrygian	Sadness (63.3%)	(Serenity 33.3%; Sadness 33.3%)	Fear/anger (40%)
Locrian	Fear/anger (56.7%)*	Fear/anger (56.7%)*	Fear/anger (60%)

Data are reported as percent (mean). Pieces that were not associated with a dominant emotion are given in parentheses. *P ≤ 0.005 compared to musicians' or nonmusicians' responses (ANOVA).

Mood	Intensity	Timbre	Pitch	Rhythm
Happy	Medium	Medium	Very High	Very High
Exuberant	High	Medium	High	High
Energetic	Very High	Medium	Medium	High
Frantic	High	Very High	Low	Very High
Anxious/Sad	Medium	Very Low	Very Low	Low
Depression	Low	Low	Low	Low
Calm	Very Low	Very Low	Medium	Very Low
Contentment	Low	Low	High	Low

Advanced classification [2]

Table 3: Chord types and their associated emotions [25].

Chord Type	Example	Associated Emotions
Major	C	Happiness, cheerfulness, confidence, satisfaction, brightness
Minor	Cm	Sadness, darkness, sullenness, apprehension, melancholy, depression, mystery
Seventh	C^7	Funkiness, moderate edginess, soulfulness
Major Seventh	C^{maj7}	Romance, softness, jazziness, serenity, exhilaration, tranquillity
Minor Seventh	Cm^7	Mellowness, moodiness, jazziness
Ninth	C^9	Openness, optimism
Diminished	Cdim	Fear, shock, spookiness, suspense
Suspended Fourth	C^{sus4}	Delightful tension
Seventh, Minor Ninth	$C^{7/9\flat}$	Creepiness, ominousness, fear, darkness
Added Ninth	C^{add9}	Steeliness, austerity

Chords & Emotions [3]

Major Tasks

Agile development model

Available on the App Store

GET IT ON Google Play

Register App

(incl Apple Watch, FitBit etc.)

Cloud Processing & Data Storage

Mockup UI and wireframes

. Integrate backend music sources & fitness devices
. Testing phase

Research/Finalize Requirements

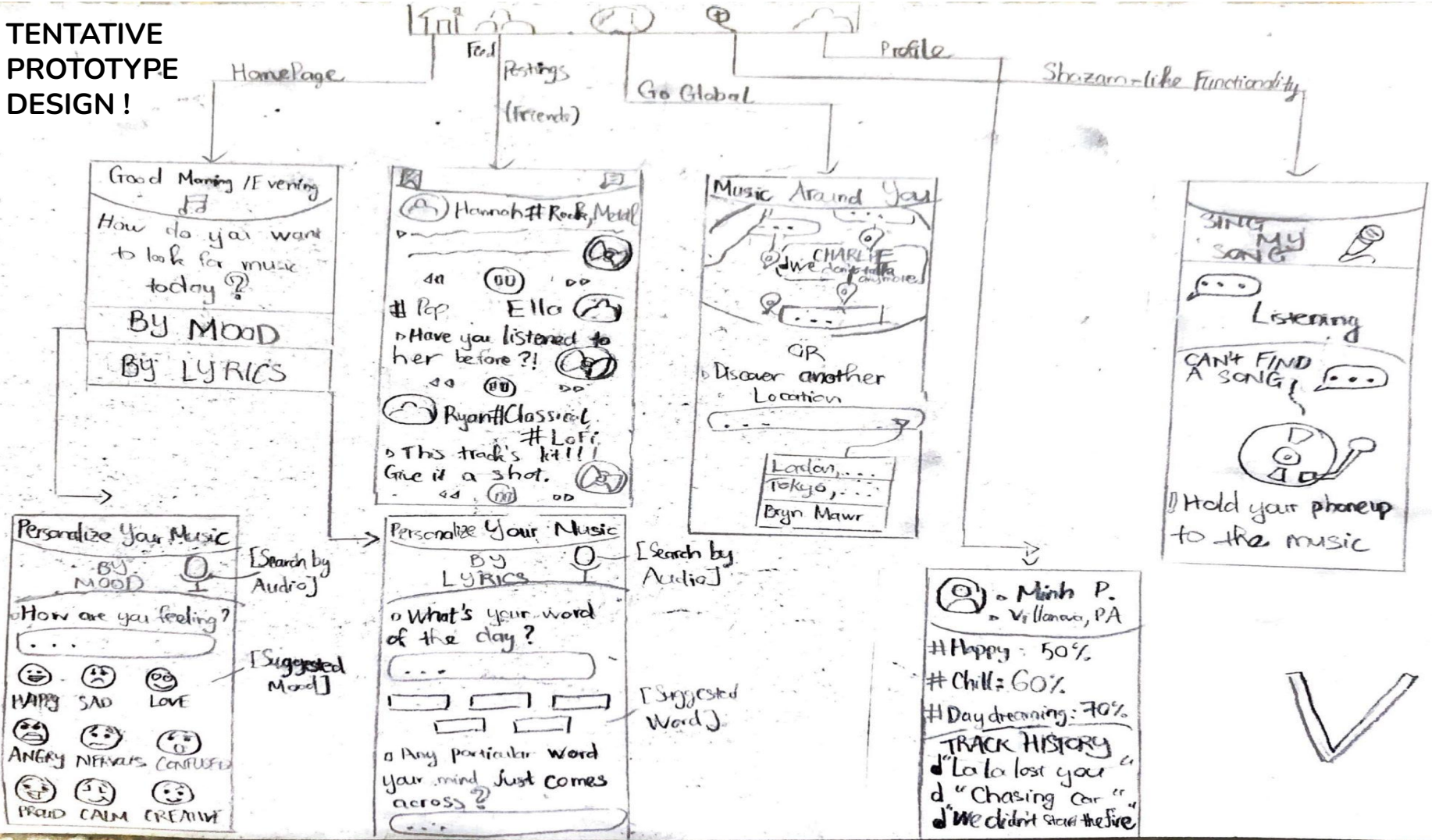
Develop AI Algorithms

Pilot Phase

Select cross demographic of users to gauge feedback and reiterate into development process

Present application to stakeholders

TENTATIVE PROTOTYPE DESIGN !



Schedule

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9
Research and finalize requirements									
Mockup UI and wireframes for user interaction									
Develop AI algorithms for mood detection and music selection									
Develop application and integrate backend music sources									
Testing Phase									
Present application to stakeholders									
Register app in both Goodle Play Store and Apple App Store									
Utilize Google Cloud Platofrm or Amazon Web Services for processing and data storage									

Budget

Item	Unit Cost	Total
Labor Costs	$80/hr	$115,200 (9 weeks, assuming 9-5 work week and 4 group members)
App Development	$80,000	$80,000
Adding app to Apple App Store	$99.00	$99.00
Adding app to Google Play	$25.00	$25.00
UI/UX Design	$5,000	$5,000
Quality Assurance	$9,500	$9,500
Project Management	$10,000	$10,000
Total Cost		$219,824

Studies from multiple software development companies found that the average app costs $140,000-$250,000 to develop and deploy. Our budget is based on the assumption that we would have this funding through shareholders[4].

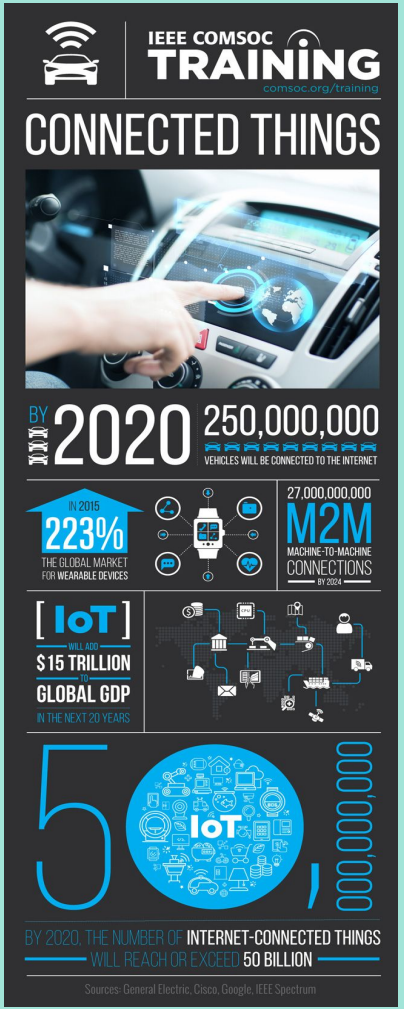
Facilities and Resources

Resources

- Partnerships with music apps (Spotify, Apple music, etc.)
- IoT compatibility to help AI determine appropriate music
- Baseline serverwide AI (general purpose)
- Localized AI to adapt on an individual basis
- HMM(Hidden Markov Model) speech recognition

Facilities

- Computers for local development
- Office



Personnel

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- Psychology Department
  - Determine customer needs and provide information to engineering to improve AI capabilities
- Engineering Department
  - Construct app and AI
- Marketing Department
  - Find customers and promote interest
- Management
  - Encourage collaboration between departments and ensure specifications are met

Conclusion

The **Apollo Trax** app seeks to make a music experience more tailored to the user's mood and environment, thus improving the way that they enjoy music. By utilizing information such as user input (liking/disliking songs), music theory, location, and the user's physical activity through devices such as the Apple Watch and Fitbit, we hope to create an individualized experience for each user that takes the guessing out of choosing music.