**Requirements Specification & Data Modeling**

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1. **Specifying Functional Requirements in EARS.**
    a. Boot System **(Event Driven)**
    *When the user wishes to use our instrument tutorial system our system shall boot up AR device, instrument sensor and connect to our database.*
    b. Setting Instrument Sensor (**Event Driven)**
    *When the instrument sensor is activated our AR device shall connect to that instrument sensor to begin using our instrument tutorial system.*
    c. Sign up/Sign in (Choose User type) **(Unwanted Behaviour)**
    *If the user is not signed up or signed into our instrument tutorial system, then the instrument tutorial system will prompt the user to sign up or sign in.*
    d. Uploading Songs (For Artist) **(Event Driven)**
    *When the user artist attempts to upload songs to our song tutorial database the database shall store this specific song in its particular genre.*
    e. Assign Tutorials to Students (Teachers Only) (**Event Driven**)
    *When the user teacher assigns tutorials to user students, the song tutorial database shall return the selected songs stored within our database.*
    f. Select difficulty Level (Only for Students) **(State Driven)**
    *While the user is student, the instrument system shall allow the student user to update their difficulty to the next difficulty level. ie. beginner to intermediate to expert.*
    g. Select Song from Tutorials **(Event Driven)**
    *When the user selects the song tutorials from the song tutorial database, the song tutorial database shall return that specific tutorial song to be learned.*
    h. Students Play Song from Tutorials **(Complex: Event & State Driven)**
    *While not playing any song, if the student presses the play button, the song tutorial database shall begin to play that specifically selected song from our song database.*
    i. Students Pause/Exit Song from Tutorials **(State Driven)**
    *While the user student is playing, the song tutorial database shall pause the specific song tutorial that they are currently using.*
    j. Students Resume Song from Tutorials **(State Driven)**
    *While the user student is paused, the song tutorial database shall resume the specific song tutorial that they are currently using.*
    k. Tutorial Completion by Students **(Event Driven)**
    *When the user completes the entire song with the proper notes hit on time the song tutorial database shall return the analyzed data of the completed song tutorial.*

l. Users view Profile **(Event Driven)**
*When the user attempts to view another user profile our user database shall return that specific users profile.*
m. Signing Out **(State Driven)**
*While the user is currently signed in, the user data base shall log that specific user out of our instrument tutorial system.*
n. Turning System off **(State Driven)**
*While the system is in the on state, the instrument tutorial system shall turn instrument sensor, AR device and disconnect to our database.*

**2. Specifying Non-Functional Requirements not in EARS.**

**Look and Feel:**

a. The product shall have a customizable profile for each user.
b. The product shall have a user interface that is attractive to its user community.
c. The product shall have sound quality(.wav file) that is pleasing to its user community.

**Usability and Humanity:**

a. The product shall be easy for people ages 8-50 to use.
b. The product shall be used by people with no prior training.
c. The product shall make the users want to continue using it.
d. The product shall use words that are normally understandable by the user community.
e. Teachers will have the ability to assign as many songs as they feel necessary for the student to progress with their particular instrument.
f. System must not allow beginners to select difficulty levels above their skill set.
g. The product shall only show details that are understandable by the user (will simplify error messages, will simplify product info, etc).

**Performance:**

a. Boot system shall load all of the components of our product in under 30 seconds.
b. The response time for any user interface in our AR device shall be fast enough to avoid interrupting the user's flow of thought.
c. The time needed for input from the instrument prop to be sent to and displayed by our AR device shall be close enough to real time that any latency cannot be detected by the user.
d. The product shall check and update status of database connection every 10 seconds.
e. The product shall download selected songs from the database within 5 minutes.
f. Turning off the system and saving user data shall be completed in under 30 seconds.
g. The product shall not emit extremely bright light that could damage people's eyes.
h. Sensitive electronic components shall be shielded from human contact.
i. Accuracy of tutorial results shall be accurate to two decimal places (ex: 95.27% notes hit).
j. Accuracy of popularity of artist's songs shall be accurate to two decimal places (ex: 90.47% of users liked your song).
k. The product shall achieve 99% uptime.
l. The product shall notify users of any future non availability, such as system updates or database maintenance.

m. The product shall continue to operate in local mode with limited functionality whenever it loses connection to the database.
n. The product shall operate for at least 1 day before requiring a recharge.
o. The product shall be expected to operate for a minimum of 3 years before requiring replacement.
p. The product's database and server shall be capable of servicing 1000 users and processing their uploads and downloads without producing unacceptable latency.
q. User shall not be allowed to select more than one song at a time to prevent the system from crashing from too many requests.
r. Users shall only view one tutorial at a time to allow the student to better understand and complete the tutorial.

**Operational and Environmental:**

a. The product shall be used by someone indoors or outdoors, in dry conditions.
b. The product shall not be loud enough to disturb people other than the user.
c. New versions of the product shall be able to access data from at least two previous versions.
d. The product shall be able to be installed and used by an untrained user without the need for separately printed instructions.
e. Each maintenance release shall not cause previous releases and their features to malfunction.

**Maintainability and Support:**

a. The product shall remove songs that are duplicates of songs already in the database.
b. This product will be available in any free market society whose government approves our system.
c. This product is designed for our users to be able to use our system at home and a very intuitive setup process.
d. If our any of our products is in need of repair we will fix the product if it is under the 1 year warranty.

**Security:**

a. The password should be at least 8 characters in length and must have at least one upper, lower case character, number with a special character, if the user fails to input the properly specified password, then the user shall be prompted to enter the password that meet the requirements.
b. Only the user's student, teacher, and the system administrator shall be able to access the user's information.
c. Only the song artist and system administrator shall be able to access and change details of an uploaded song.
d. Only a teacher and the system administrator shall be able to modify the teacher's tutorials.
e. The product shall prevent corrupted or malicious data from being uploaded to the database.
f. The product shall notify users of changes in its information policy and what data is being collected.
g. The product shall reveal private information only in compliance with the information policy.
h. User must complete every single song associated with a particular tutorial.

**Culture and political requirement:**

a. The product shall not be offensive to religious or ethnic groups.
b. The product shall allow multiple versions of the same song in different languages to be uploaded so users can switch to their preferred language if it is available.

**Legal:**

a. Information of the song must be filled out when artist upload the song such as name of artist and album name to give credit to the original artist to comply with the Copyright Act of 1976.
b. Our instrument tutorial system shall comply with the Copyright Act of 1976 as amended and will safeguard us from any possible legal allegations of copyright being protected under this federal law. (from book)

**3. Modeling the Stored Data (Draw a class diagram).**