1. Design of Database

(1) Relational Schema

User (username, password, uname, uemail, ucity)
Artist (artistID, arname, ardesc)
Album (albumID, altitle, aldate)
Track (trackID, ttitle, duration, arname, albumID)
Playlist (playID, ptitle, pdate, visible, username)
Playlist_Track (playID, trackID, lsequence)

Like_Artist (username, artistID, ltimestamp)
Rate_Song (username, trackID, score, rtimestamp)
Follow_User (follow, followed, ftimestamp)
Play_Track (username, trackID, ptimestamp)

(2) Keys and Foreign key constraints

All the primary keys are underlined above.

Track.arname is a foreign key referencing to Artist.arname
Track.albumID is a foreign key referencing to Album.albumID
Playlist.username is a foreign key referencing to User.username
Playlist_Track.playID is a foreign key referencing to Playlist.playID
Playlist_Track.trackID is a foreign key referencing to Track.trackID
Like_Artist.username is a foreign key referencing to User.username
Like_Artist.artistID is a foreign key referencing to Artist.artistID
Rate_Song.username is a foreign key referencing to User.username
Rate_Song.trackID is a foreign key referencing to Track.trackID
Follow_User.follow is a foreign key referencing to User.username
Follow_User.followed is a foreign key referencing to User.username
Play_Track.username is a foreign key referencing to User.username
Play_Track.trackID is a foreign key referencing to Track.trackID

(3) Explanation of the schema

User, Artist, Track, Album and Playlist are exactly as what is described in the requirement. The visible in Playlist can be 'Public' or 'Private' to decide if it's available to other users. We use Playlist_Track to store the tracks in playlists, the attribute lsequence is the integer to indicate the track order in the lists since they are ordered. Like_Artist holds data when a user likes an artist, when they don't like the artist, we can simply delete that record, so the timestamp is not included in PK. Follow_User and Rate_Song are the same, timestamp is not in PK because users cannot follow the same person or rate the same song before the record is deleted. But since a user can play a track as much as they want, we have to include the timestamp in PK.

(4) Create the schema using MySQL

```
CREATE DATABASE MusicOnline;
USE MusicOnline;

CREATE TABLE `User` (
	`username` VARCHAR(20) NOT NULL,
	`password` VARCHAR(45) NOT NULL,
	`uname` VARCHAR(45) NOT NULL,
	`uemail` VARCHAR(45),
	`ucity` VARCHAR(20),
	PRIMARY KEY (`username`),
	UNIQUE INDEX `uemail_Index` (`uemail` ASC));

CREATE TABLE `Artist` (
	`artistID` VARCHAR(45) NOT NULL ,
	`arname` VARCHAR(200) NOT NULL,
	`ardesc` TEXT,
	PRIMARY KEY (`artistID`),
	UNIQUE INDEX `arname_Index` (`arname` ASC)
);

CREATE TABLE `Album` (
	`albumID` VARCHAR(45) NOT NULL,
	`altitle` TEXT,
	`aldate` VARCHAR(45),
	PRIMARY KEY (`albumID`));

CREATE TABLE `Track` (
	`trackID` VARCHAR(45) NOT NULL,
	`ttitle` TEXT,
	`duration` INT NOT NULL,
	`arname` VARCHAR(200) ,
	`albumID` VARCHAR(45),
	PRIMARY KEY (`trackID`),
	FOREIGN KEY (`arname`) REFERENCES `Artist`(`arname`) ON DELETE NO
ACTION ON UPDATE CASCADE,
	FOREIGN KEY (`albumID`) REFERENCES `Album`(`albumID`) ON DELETE NO
ACTION ON UPDATE CASCADE
);

CREATE TABLE `Playlist` (
		`playID` INT NOT NULL AUTO_INCREMENT,
	`ptitle` VARCHAR(20) NOT NULL,
```

```
    `pdate` DATE NOT NULL,
        `visible` VARCHAR(20) NOT NULL,
        `username` VARCHAR(20) NOT NULL,
    PRIMARY KEY (`playID`),
    INDEX `username_Index` (`username` ASC),
    CONSTRAINT `username`
    FOREIGN KEY (`username`) REFERENCES `User` (`username`) ON DELETE
CASCADE ON UPDATE CASCADE);

CREATE TABLE `Playlist_Track` (
    `playID` INT NOT NULL,
    `trackID` VARCHAR(45)  NOT NULL,
    `lsequence` INT,
    PRIMARY KEY (`playID`, `trackID`),
    FOREIGN KEY (`playID`) REFERENCES `Playlist` (`playID`) ON DELETE
CASCADE ON UPDATE CASCADE,
    FOREIGN KEY (`trackID`) REFERENCES `Track` (`trackID`) ON DELETE
CASCADE ON UPDATE CASCADE);

CREATE TABLE `Like_Artist` (
    `username` VARCHAR(20) NOT NULL,
    `artistID` VARCHAR(45)  NOT NULL,
    `ltimestamp` DATETIME NOT NULL,
    PRIMARY KEY (`username`, `artistID`),
    INDEX `artistID_Index` (`artistID` ASC),
    FOREIGN KEY (`username`) REFERENCES `User` (`username`) ON DELETE
CASCADE ON UPDATE CASCADE,
    FOREIGN KEY (`artistID`) REFERENCES `Artist` (`artistID`) ON DELETE
CASCADE ON UPDATE CASCADE);

CREATE TABLE `Rate_Song` (
    `username` VARCHAR(20) NOT NULL,
    `trackID` VARCHAR(45)  NOT NULL,
    `score` INT NOT NULL,
    `rtimestamp` DATETIME NOT NULL,
    PRIMARY KEY (`username`, `trackID`),
    INDEX `trackID_Index` (`trackID` ASC),
    FOREIGN KEY (`username`) REFERENCES `User` (`username`) ON DELETE
CASCADE ON UPDATE CASCADE,
    FOREIGN KEY (`trackID`) REFERENCES `Track` (`trackID`) ON DELETE
CASCADE ON UPDATE CASCADE);

CREATE TABLE `Follow_User` (
    `follow` VARCHAR(20) NOT NULL,
    `followed` VARCHAR(20) NOT NULL,
```

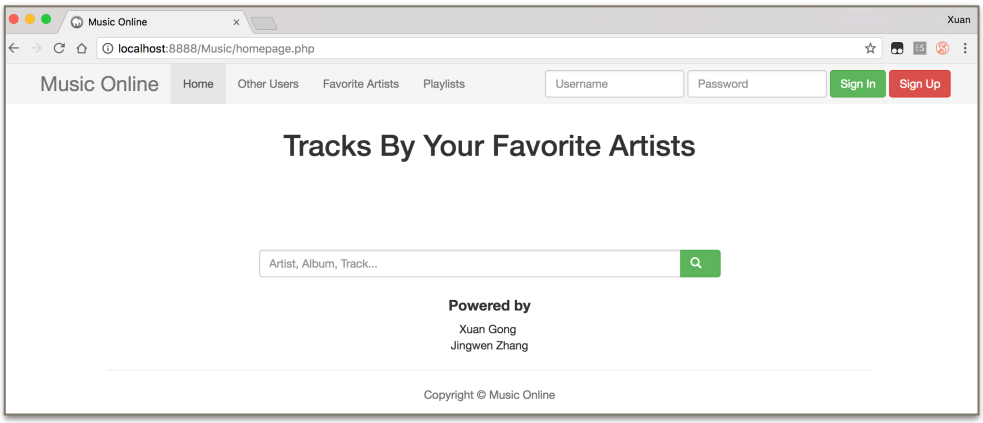
```
    `ftimestamp` DATETIME NOT NULL,
    PRIMARY KEY (`follow`, `followed`),
    INDEX `follow_Index` (`follow` ASC),
    FOREIGN KEY (`follow`) REFERENCES `User` (`username`) ON DELETE CASCADE ON UPDATE CASCADE,
    FOREIGN KEY (`followed`) REFERENCES `User` (`username`) ON DELETE CASCADE ON UPDATE CASCADE);

CREATE TABLE `Play_Track` (
    `username` VARCHAR(20) NOT NULL,
    `trackID` VARCHAR(45)  NOT NULL,
    `ptimestamp` DATETIME NOT NULL,
    PRIMARY KEY (`username`, `trackID`, `ptimestamp`),
    INDEX `trackID_Index` (`trackID` ASC),
    FOREIGN KEY (`username`) REFERENCES `User` (`username`) ON DELETE CASCADE ON UPDATE CASCADE,
    FOREIGN KEY (`trackID`) REFERENCES `Track` (`trackID`) ON DELETE CASCADE ON UPDATE CASCADE);
```

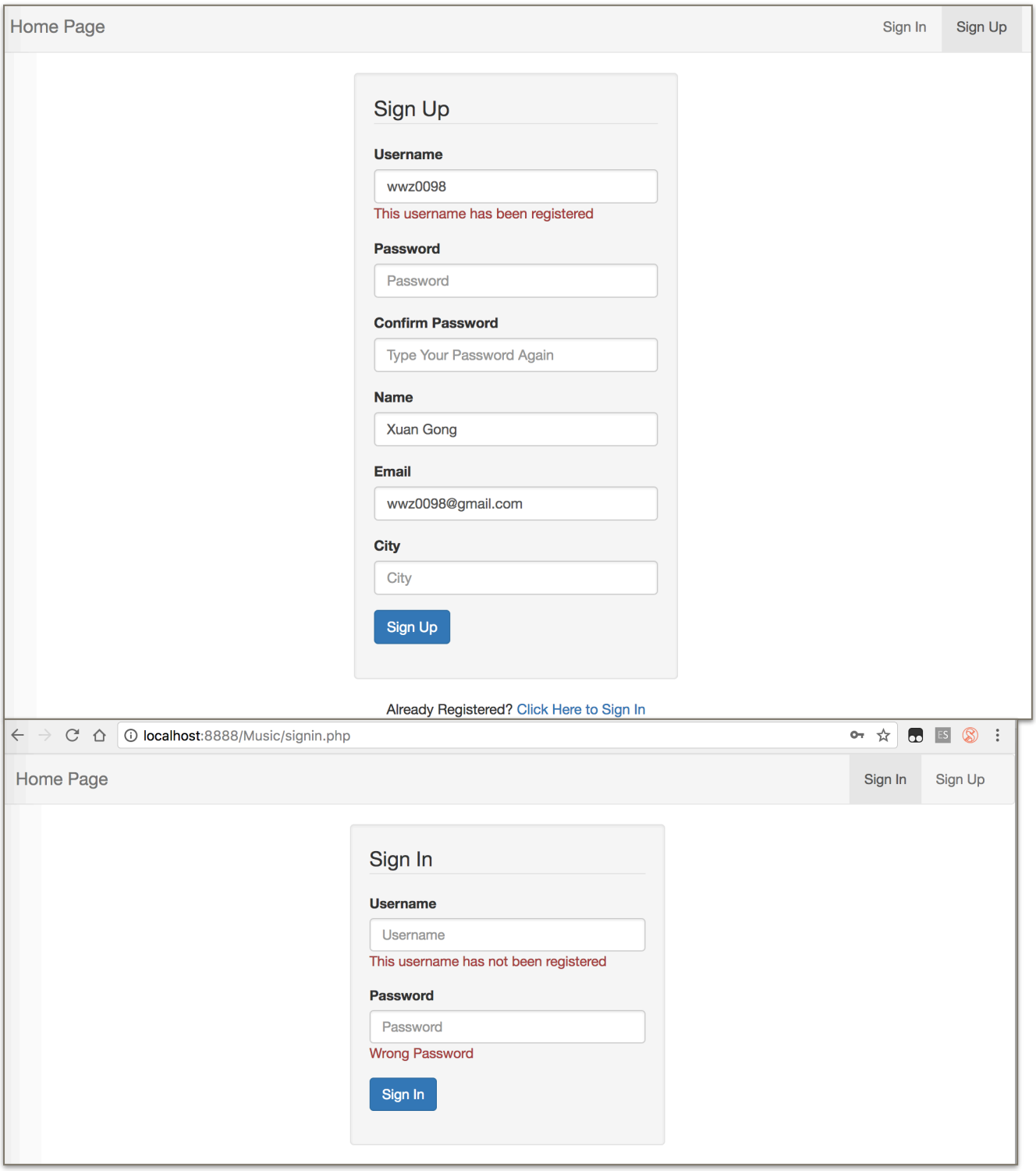
2. User Guide

(1) Sign Up and Sign In

The homepage is as follows:

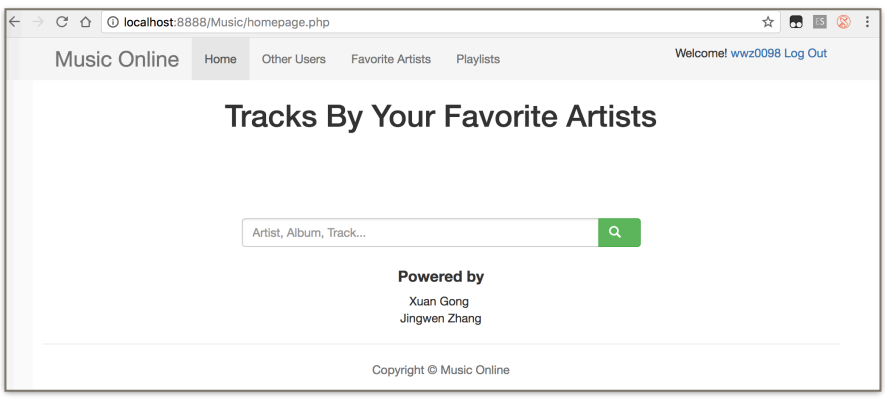


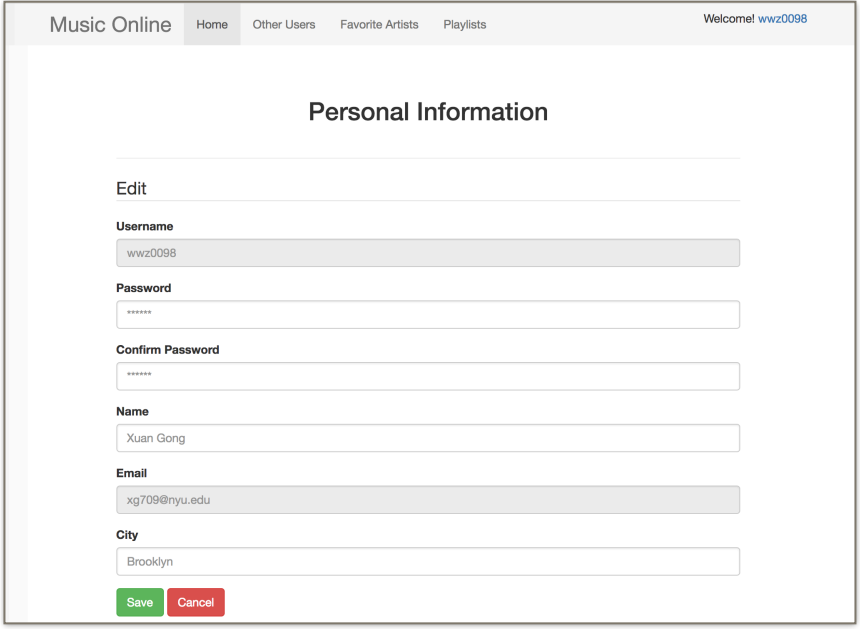
Users can sign up and sign in using the buttons in the up-right corner. If the username or the email has been already registered, the system will tell the user and the input data will not be passed to database, also we verify the validation of user's input such as email to make sure the database is maintained properly. If the username or the password is incorrect, the system will prevent user from login:



(2) Edit personal information and log out

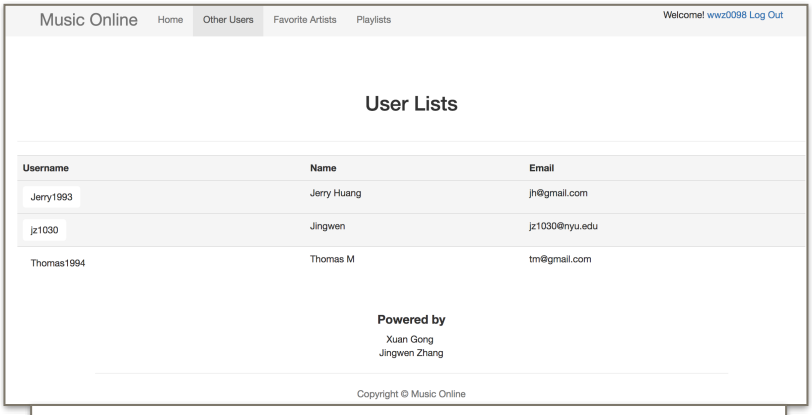
After the user signs in, the sign-in area will change, system will show username, and that is the place to check out the user's information. Click 'Save' to make a change, and click 'Cancel' to close the page. If you click 'Log Out', the sign-in area will change back:

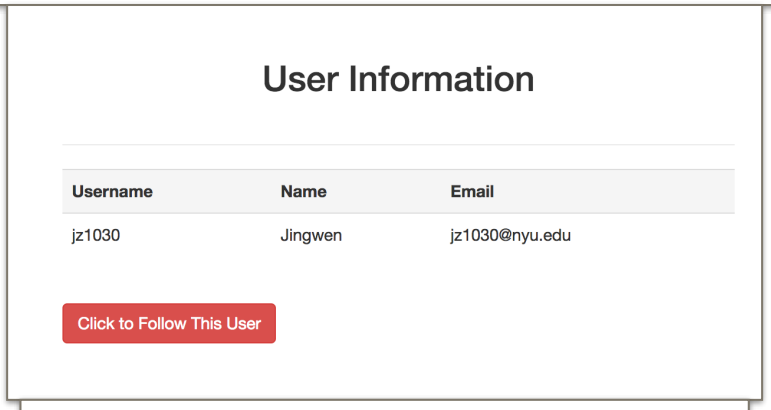


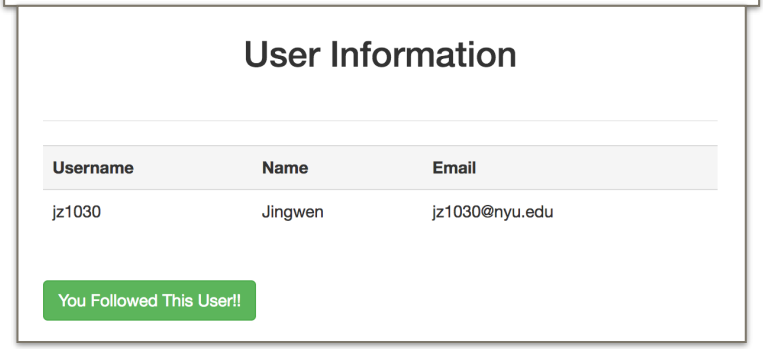


(3) Follow other users

Click the second tab on the top, so that you can see other users in a list. And you can click their name to enter their information page, there you can follow a user:

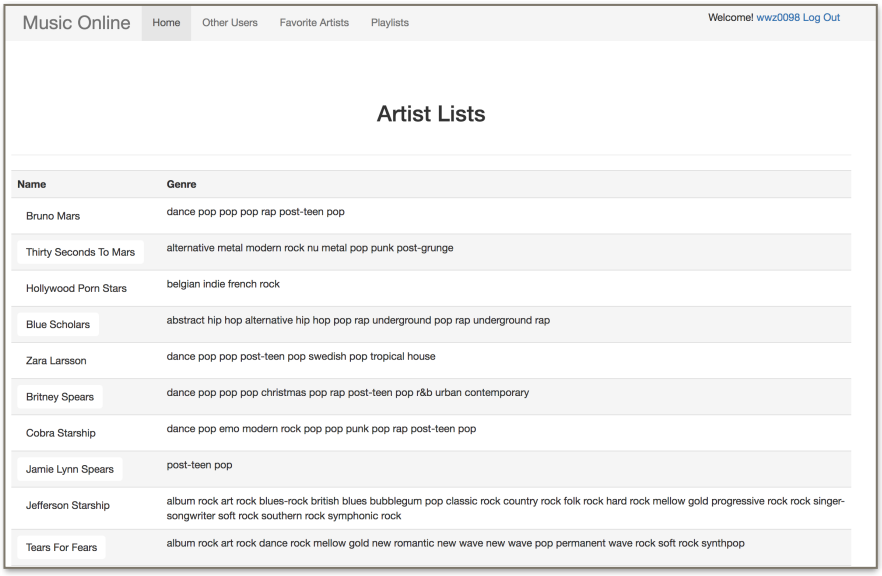


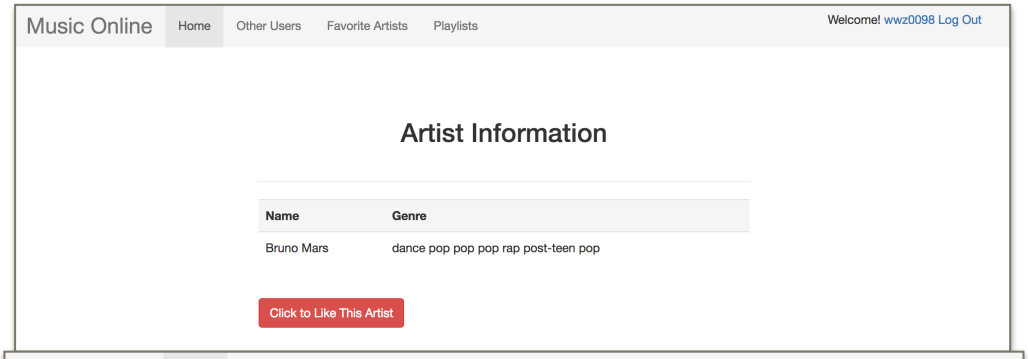


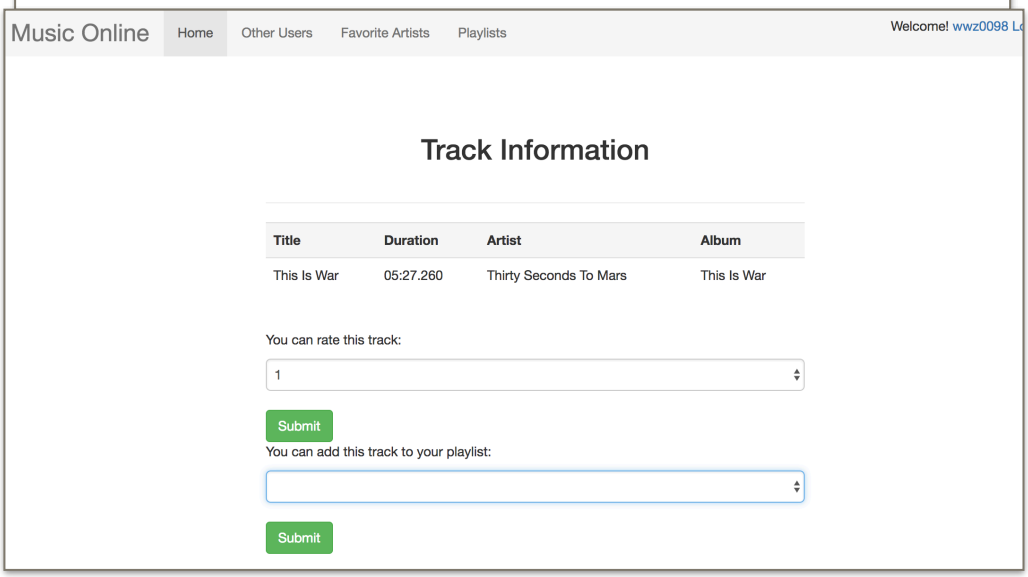


(4) Search artists and tracks

On the homepage, you can input keyword to search artists and tracks, so the system will present the user two lists, artist list and track list respectively. The user can click the name of the artist to enter an artist info page or click the name of the track to enter a track info page. On an artist info page, you can like the artist (and their songs may be recommended on your homepage). On the track info page, you can rate this track or add this track to one of your playlists, if you have rated this track, the system will show you the score:

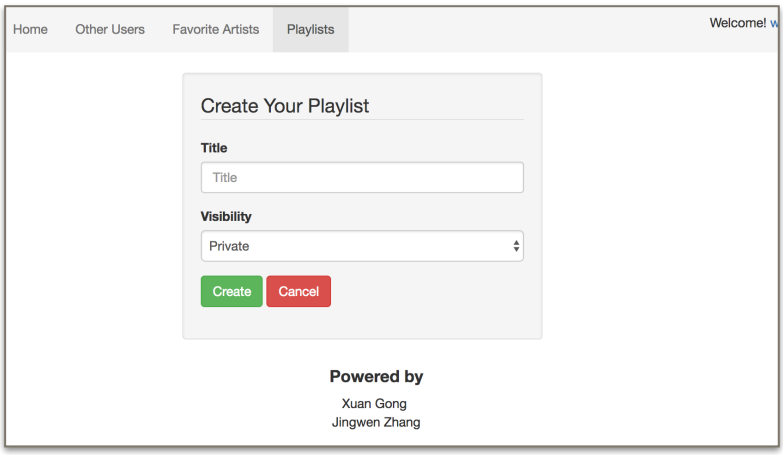


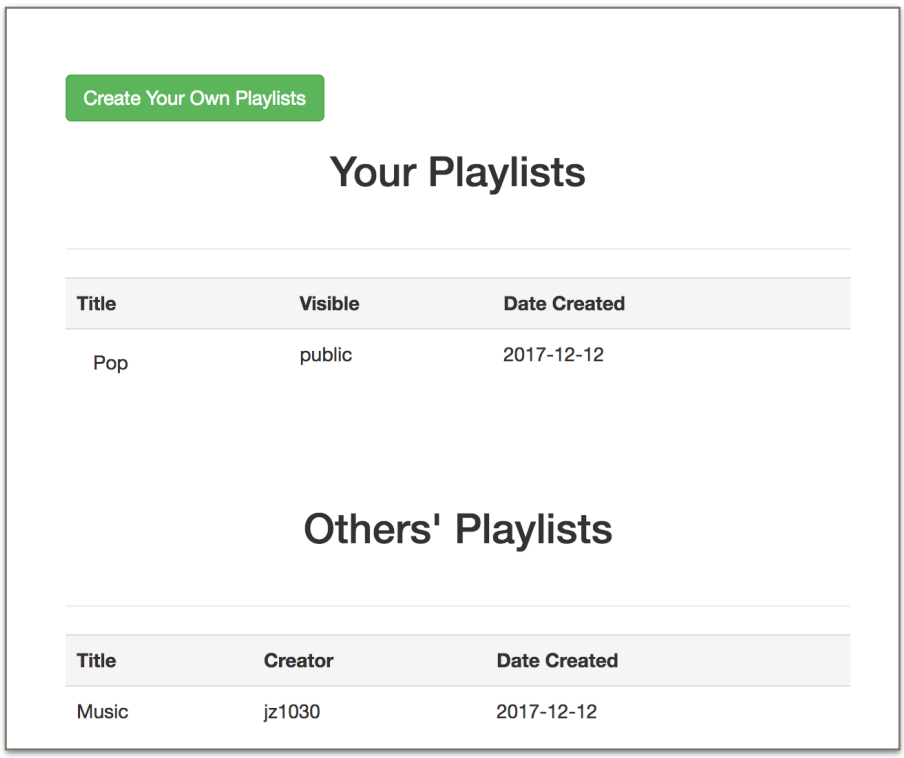


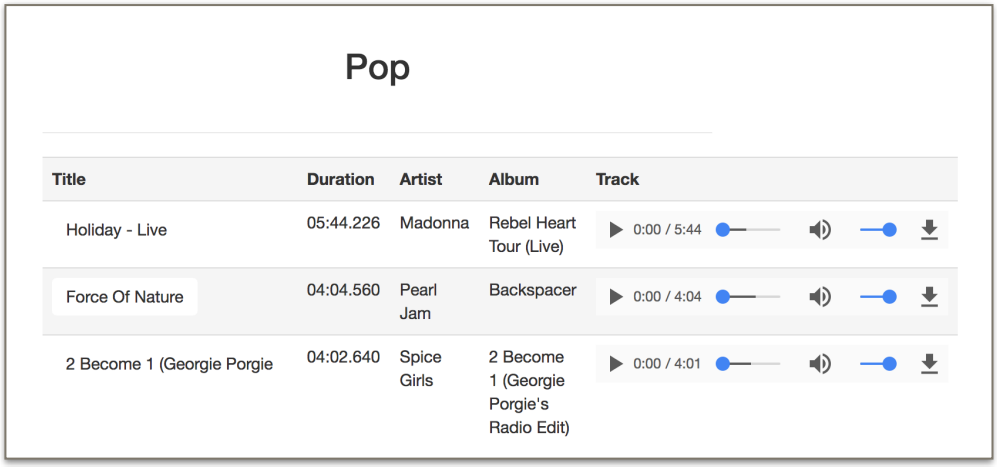


(5) Create your own playlists and play music online

On the homepage, click the last tap on the top, you can see your playlists and the playlists from those whom you follow. Click on the name of the playlist, you can enter the page of that playlist and play the song in that playlist. You can also create a new playlist, input a name and choose the visibility, if the visibility is 'Private', the playlist can only be seen by yourself:

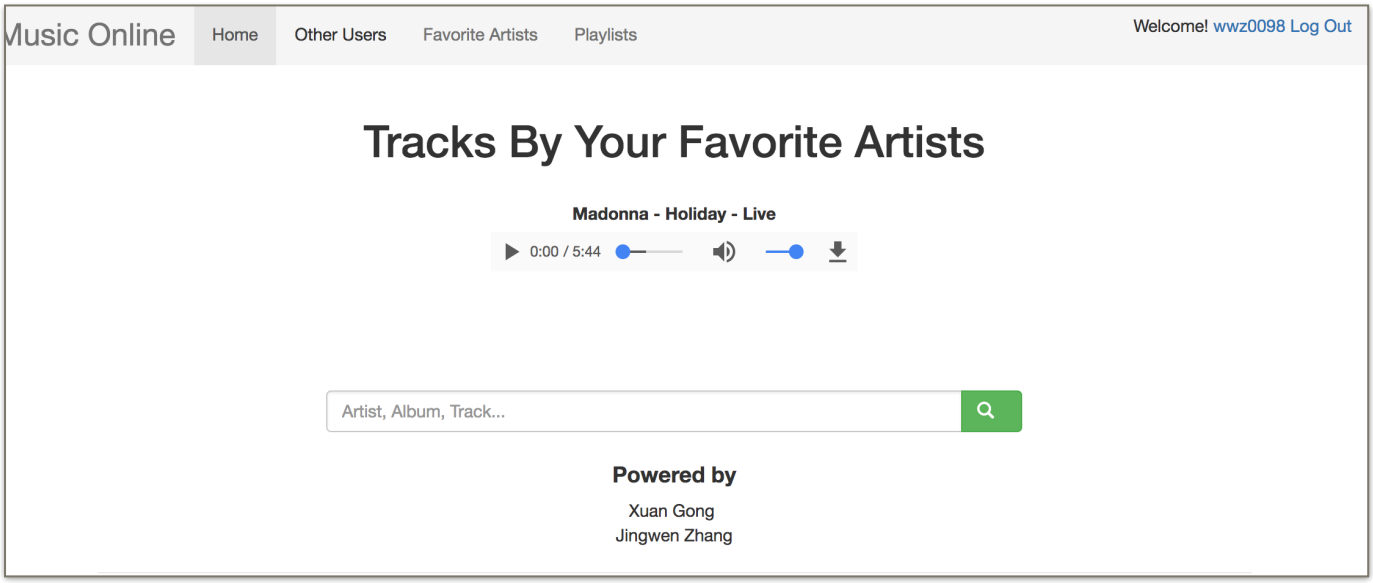






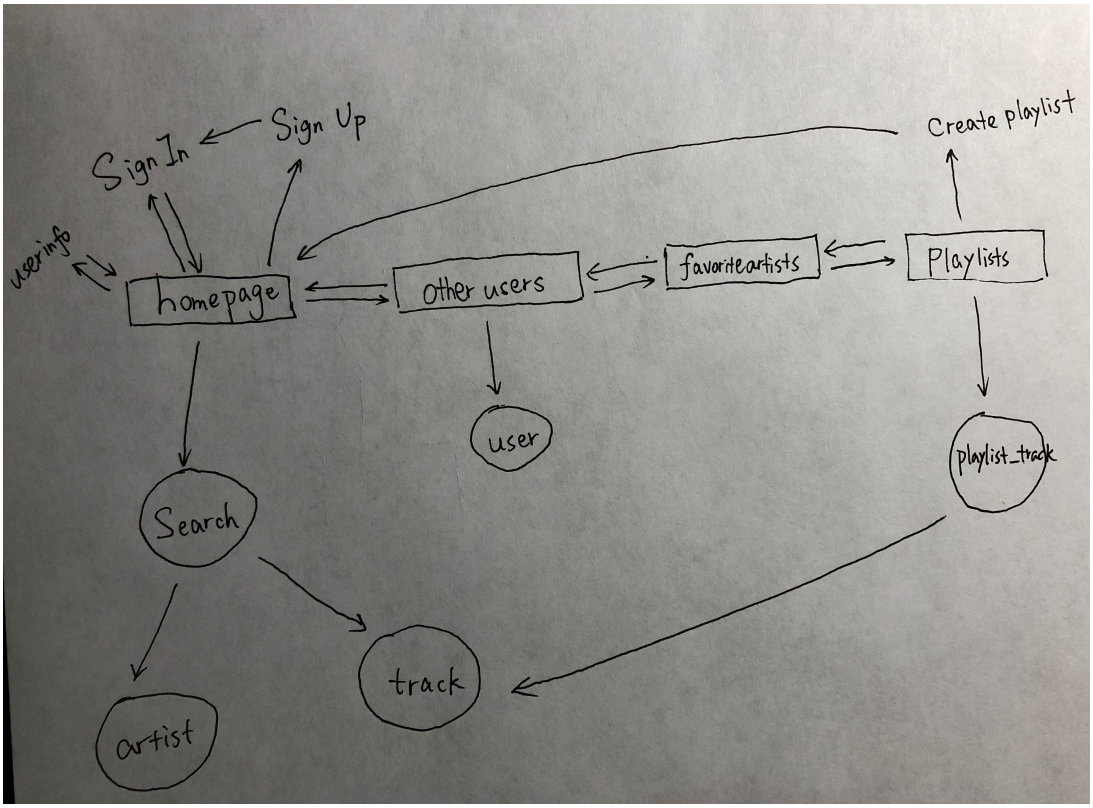
(6) Recommendation on the homepage

The system will keep the record if a user plays a track online. And the homepage should be like this if you play a track performed by an artist you like:



3. Code Structure

The relationship between the pages is as follows, and all these .php files can be found in the server root: (Two .php files are not in the graph, connection.php is used to connect database and logout.php is used to destroy the session so the user can log out)



The music which is used for playing online is in the music file, since we don't use Spotify API, so the source has to be in the server (in music file), and there are some .php files in the server file. We use AJAX in this project, so these server files are used to deal with the request from the front end. Just as the name of these files, we post a request to the server when the user likes an artist, so a new record need to be inserted into database, the code in likeArtist.php deals with it. And the code in followUser.php, playTrack.php etc., all of them are used to insert a new record into the database.