CS 411 – Database System Spring 2024 PT1 Final Report

1. **Please list out changes in the directions of your project if the final project is different from your original proposal (based on your stage 1 proposal submission).**
   This project is pretty much what we expected in stage 1. All the functions we listed in stage 1 have been implemented in the final project. And we have also added some additional functions such as the ability to record User login information, change avatars, and change passwords. The purpose is to make our project closer to reality and consistent with daily use. And we have also distinguished Users into two roles: users and administrators. Maintained the security and stability of this project.
2. **Discuss what you think your application achieved or failed to achieve regarding its usefulness.**
   Our team successfully developed this used car trading website. New users can obtain an account by registering, and they need to enter address information when registering an account. Users can also personalize their nickname and avatar. User login requires user ID and password. After the login is completed, the user can change the password and avatar. Each car contains an address information, through which the distance to the user can be calculated to provide convenient filtering for the user's selection. We have also added an additional administrator mechanism to maintain this website and imposed some functional restrictions on users. For example, user cannot add recall or view user log information. These features protect the security of the website. We also have some unfinished achievements, such as buyers and sellers not being able to discuss prices through communication and there is no auction mechanism. So, I'm thinking we can ensure communication by adding a phone number to the user's database. The auction mechanism is too complex, and I don't think canceling it will have a big impact on our website.
   All in all, we successfully completed the construction of the website.
3. **Discuss if you changed the schema or source of the data for your application.**
   In our application we have not made any changes to the schema or data sources. Thanks to our TA's prompt feedback on our issues, we changed the Phase 2 architecture to make it perfect, so the final website fully conforms to the Phase 2 architecture. The data comes from Kaggle, and we made some changes to the data so that each database can be perfectly related to each other.
4. **Discuss what you change to your ER diagram and/or your table implementations. What are some differences between the original design and the final design? Why? What do you think is a more suitable design?**
   Due to significant issues that arose, we had to redo stage 2 of our project. The initial design was completely flawed. Firstly, it lacked sufficient entities, as there were fewer than five, and the relationships between them were incorrect. As a result, we made several changes. First, we removed the attribute 'Carteam,' which we initially mistook for an entity, making it unnecessary. To improve the

architecture, we also downloaded more datasets from Kaggle. The final version comprises five entities: car models, company, recall, location, and user. Clearly, the revised version is more appropriate as it perfectly meets the rubric and the logic is correct and realistic.

5. **Discuss what functionalities you added or removed. Why?**
   We added a feature to calculate the distance between users and cars using the existing addresses of both users and cars. To facilitate user interaction, since many users do not know their coordinates, we linked city names with coordinates, allowing users to input their city names instead of complex coordinates. This step simplified operations and enhanced convenience. We also added a feature allowing users to change their avatars for more personalization.

   Conversely, we removed some features: We eliminated the function of comparing two cars, as we deemed it meaningless. Users can effectively compare by searching for the car model and sorting by price, distance, and mileage. Hence, we directly removed this feature. We also removed the display of car company addresses since users are more concerned with the cars themselves rather than the addresses of the car companies. Therefore, we streamlined our website to focus on the transactional functionality.
6. **Explain how you think your advanced database programs complement your application.**
   We use Join multiple relations, SET Operators, Aggregation via GROUP BY and Subqueries to complete the advanced query. Some advanced query could compute the distance between cars and users. Also the query could filter out the preference which user likes(such as distance, price, color,etc.)

7. **Each team member should describe one technical challenge that the team encountered. This should be sufficiently detailed such that another future team could use this as helpful advice if they were to start a similar project or where to maintain your project.**

   Hao Liu: As a team member, I found the biggest technical challenge was deploying our database to Google Cloud Platform (GCP). Lacking previous experience with GCP, I had to learn through trial and error. Creating a database on GCP was straightforward, but connecting our project to GCP was complex. It required setting up firewall rules and configuring the instance to be public to obtain a public IP address. I used MySQL Bench to connect to GCP, and then I had to update the host, password, and port in our website's database file. The most frustrating part was that the IP address changes periodically, leading to connection issues with the database. Consequently, it was necessary to repeatedly establish new firewall rules. Thus, I recommend setting a reasonable IP range to ensure connectivity to GCP even when IP addresses change.

Yuxuan Nan: As for me, I think challenge for me is to write advanced query, since it needs to use at least two of operation, also even though you write the query out, it still needs a lot of time to debug in order to match the result from database.

Zixin Mao: AS for me, my challenge is that when I try to write routes and restful API to connect the sql into some useful API, there is some grammar mistakes and implementation errors, for example for adding active user, it need to require the correct Advanced SQL of procedure and thise function should be called properly in the Frontend, especially when debugging the SQL and test to see if it worked properly. What is more, it also took some time to connect the backend to the frontend when some API may not be properly connected. When using Express.JS, it is also challenge that when we try to set up the environment and framework.

8. **Are there other things that changed comparing the final application with the original proposal?**

   No, there are no additional changes. All these changes are talked previously.

9. **Describe future work that you think, other than the interface, that the application can improve on**

   Maybe we would add more features in to our app, so that it would not only a Auto trading platform,but also introduces the platform of the car.

10. **Describe the final division of labor and how well you managed teamwork.**

    The most frustrating event during stage 3 was when a team member left our group. Faced with this unexpected situation, we didn't panic; instead, we calmly reassessed and redistributed the tasks. After reassigning the roles, the workload was approximately equal for each remaining member.

    Hao Liu: Design the database and connect it to the local environment using Google Cloud Platform (GCP). Design the user interface (UI) and develop APIs on the frontend using JavaScript.

    Yuxuan Nan: Working together with Zixin Mao to the backend, sql, and some advanced database feature.

    Zixin Mao: Working together with Yuxuan Nan on Express.JS, implementation of RESTFUL API, and Advanced SQL writing such as Procedure, Trigger, Set transaction. Writing javascript of routes.

    Through this project, every team member collaborated effectively with clear role divisions. We communicated regularly to ensure smooth progress on the project. Our success would not have been possible without the guidance of our teaching assistant, Hongtai Cao. He provided us with the right direction for our work, and his timely responses to our questions were immensely helpful.