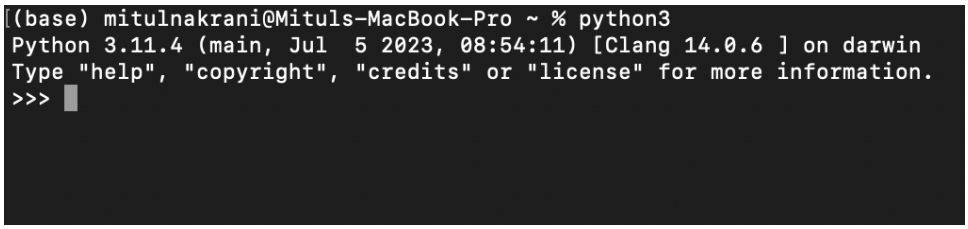
Project Title: MBTA Transit Tracker

Group Name: ShahANakraniM

Project By: Aneri Shah and Mitul Nakrani

Project Technical Specifications and Environment

- User Requires Python 3.0.0 or Higher Environment to Run this Project.
- To Install Python: You Can Click On THIS.
- To Check Your Python Environment:
  - Open Terminal (For MAC Users) or Command Prompt (Windows Powershell)
  - Type "python3" and Press Enter
  - If Such Screen Is Visible: You Are Good to Go.



Softwares Used:

- MySQL WorkBench
- Visual Studio Code

Python Prerequisite Libraries to Be Installed:

- PyMySQL (Click Open Installation Documentation)
  - To Install, Open Terminal or Command Prompt.
  - Type "*pip install pymysql*" and Press Enter.
  - The Library Will be Successfully Installed.
- PwInput (Click Open Installation Documentation)
  - To Install, Open Terminal or Command Prompt.
  - Type "*pip install pwinput*" and Press Enter.
  - The Library Will be Successfully Installed.
- MatplotLib (Click Open Installation Documentation)
  - To Install, Open Terminal or Command Prompt.
  - Type "*pip install matplotlib*" and Press Enter.
  - The Library Will be Successfully Installed.
- Numpy (Click Open Installation Documentation)
  - To Install, Open Terminal or Command Prompt.
  - Type "*pip install numpy*" and Press Enter.
  - The Library Will be Successfully Installed.

How to Setup Database:

- Open the submitted "*Transit_Tracker_Project_Dump.sql*" File in Your MySQL WorkBench.
- Execute the Entire File to Create the Database and Insert Data in Tables.

How to Run the Project:

After Installing the Python Environment and all the Prerequisite Libraries, Follow the given Steps:

1) Navigate to the Folder in which the submitted "project.py" file is situated in your terminal or command prompt.
2) To run project, Type "*python project.py*" and Press Enter, This will Execute the Project.

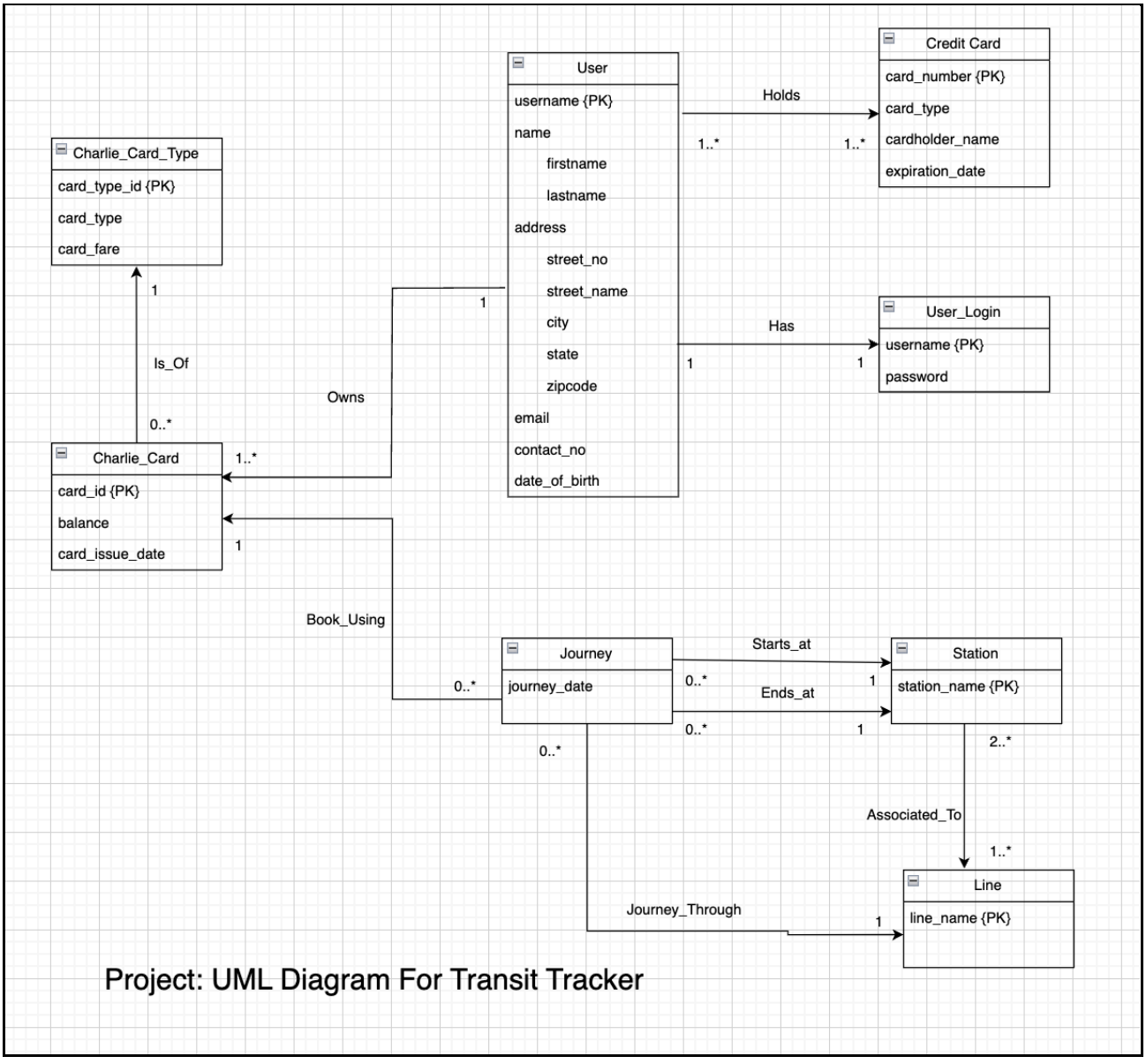
3) It will First Ask Your Database Username and Database Password to connect to the database. Once Connected You will be able to perform operation

Username Password of The Program Existing User (With Existing Data):

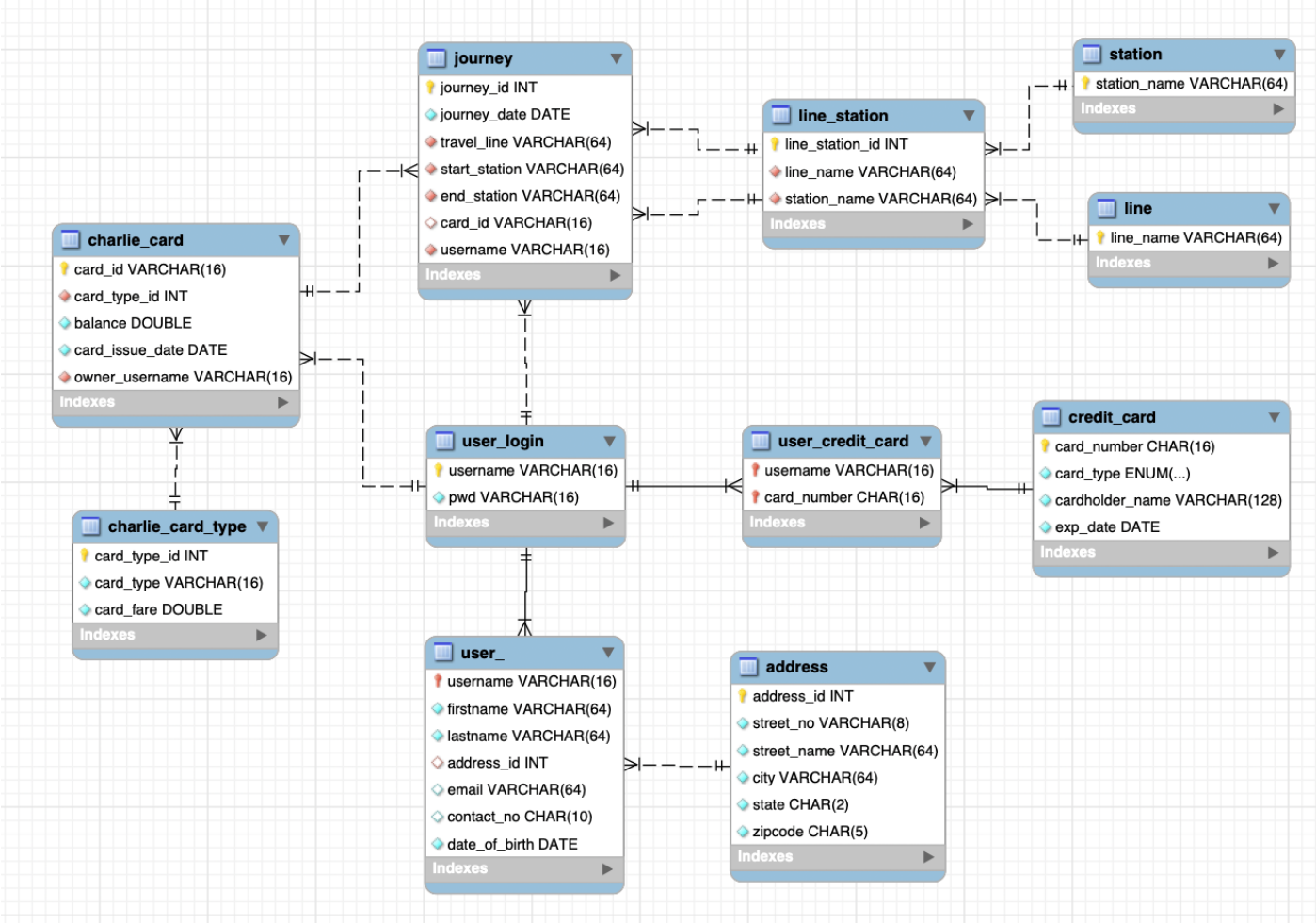
```
############################################################
######## -- Welcome to the MBTA Transit Tracker -- ########
############################################################

------------------------------------------------------------
Please select one of the following options
1. EXISTING USER
2. CREATE ACCOUNT
3. QUIT
Enter your choice: 1


Enter Username: nakrani_m
Enter Password: *****
```

Username: nakrani_m
Password: mitul

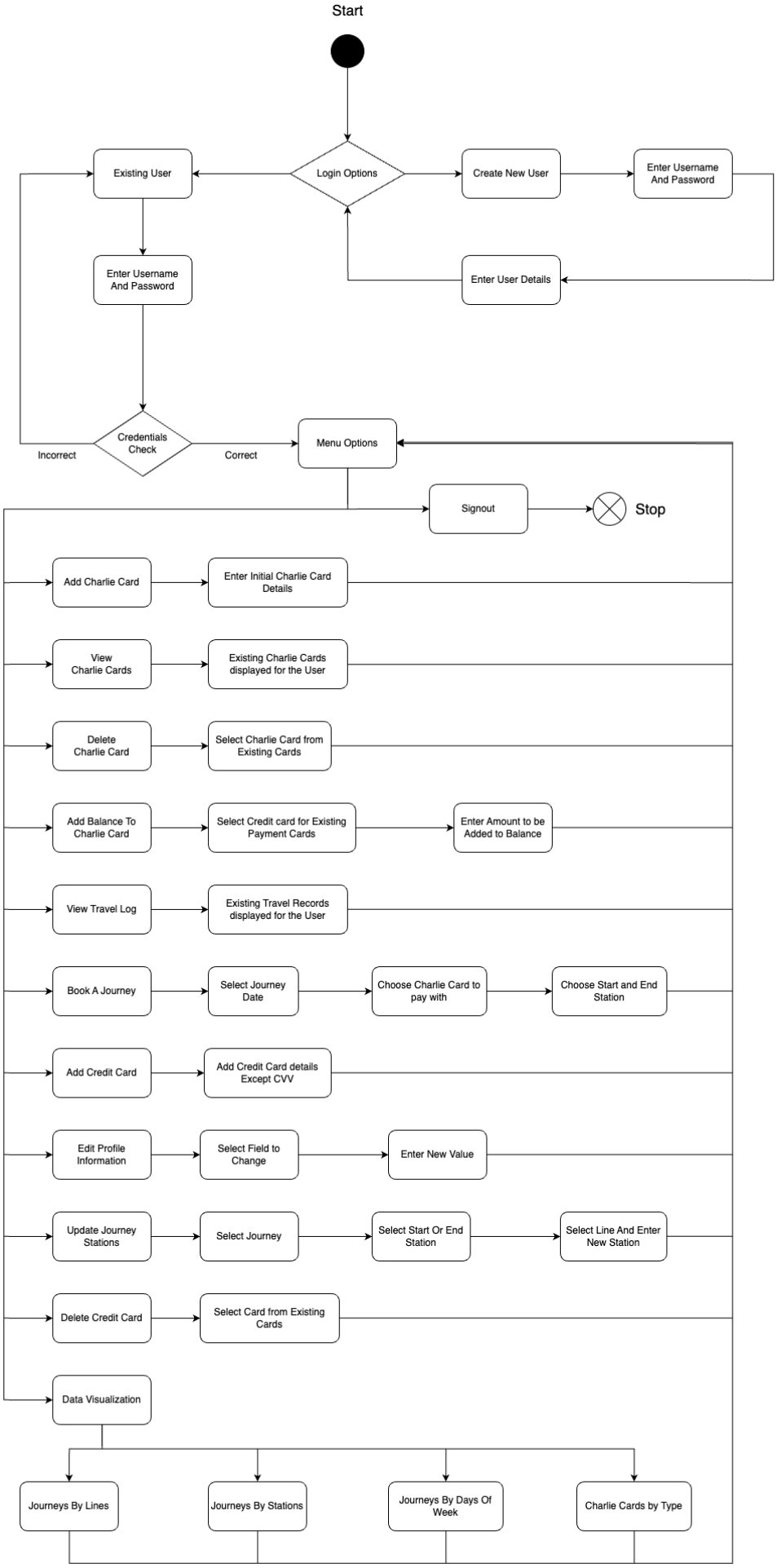
Current Conceptual Design UML



Logical Design for the Submitted Database Schema (Reverse Engineered Schema)



Final user flow of the system.

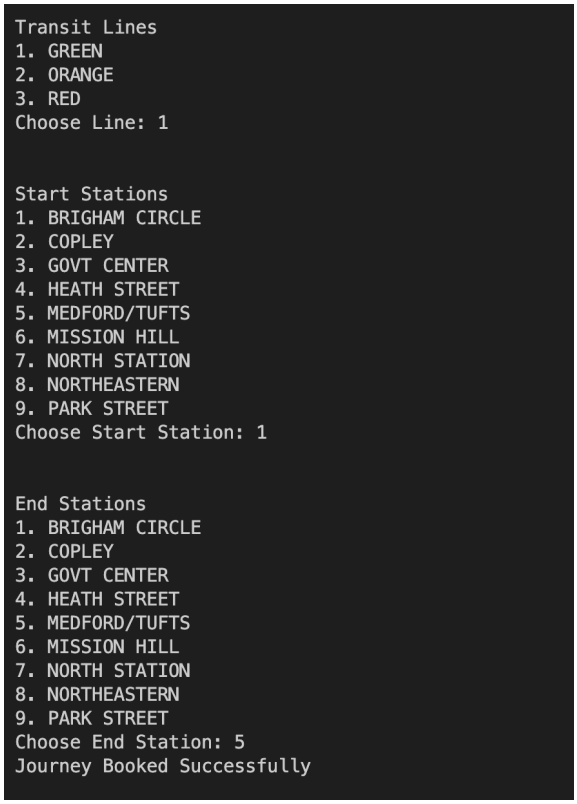


List the commands or methods the user performs to interact with the system.

```
############################################################
######## -- Welcome to the MBTA Transit Tracker -- #########
############################################################

------------------------------------------------------------
Please select one of the following options
1. EXISTING USER
2. CREATE ACCOUNT
3. QUIT
Enter your choice: 1


Enter Username:
```

```
Enter Username: nakrani_m
Enter Password: *****

------------------------------------------------------------
Please select one of the following options (If Clicked Wrong Operation, Type quit when prompted to go to Main Menu)
1. ADD CHARLIE CARD
2. VIEW CHARLIE CARDS
3. DELETE CHARLIE CARD
4. ADD BALANCE TO CHARLIE CARD
5. VIEW TRAVEL LOG
6. BOOK A JOURNEY
7. ADD CREDIT CARD
8. EDIT PROFILE INFORMATION
9. UPDATE JOURNEY STATIONS
10. DELETE CREDIT CARD
11. DATA VISUALIZATIONS
12. SIGN OUT
Enter your choice: 1
```

```
10. DELETE CREDIT CARD
11. DATA VISUALIZATIONS
12. SIGN OUT
Enter your choice: 6


Enter Journey Date (YYYY-MM-DD): 2023-12-10


Available Charlie Cards
1. 0000111 - Available balance: $10.0
2. 1111111 - Available balance: $20.200000000000003
3. 2222222 - Available balance: $44.809999999999995
4. 2223334 - Available balance: $50.0
5. 7777777 - Available balance: $7.799999999999999
6. 9999999 - Available balance: $3.9
Choose Charlie Card: 1


Transit Lines
1. GREEN
2. ORANGE
3. RED
Choose Line: 1
```



Provide a "Lessons Learned" section that contains report sections for the following:

- **Technical expertise gained**
- The opportunity to work on 'Transit Tracker' includes proficiency in designing and implementing database structures with appropriate constraints, optimizing SQL queries for performance, utilizing error handling techniques from database objects, and leveraging Python for seamless integration and data manipulation. This experience encompasses database modeling, normalization techniques and the development of efficient and scalable solutions for data storage and retrieval.
- Additionally, the project has provided valuable insights into the effective utilization of SQL and Python for data analysis using visualization.
- **Insights, time management insights, data domain insights etc.**
- **Time Management Techniques used during our project implementation:**
  1. Defining Clear Objectives and Scope in the beginning
  2. Breaking Down the Project in small parts and individually working on them
  3. Prioritizing Tasks in case the whole definition could not be implemented
  4. Creating Timelines for small tasks and sticking to it
  5. Allocating Adequate Time for Error Testing – This has effectively helped us as we completed project development earlier enough to work on error handling
  6. Communication and Collaboration
- **Data Domain Insights:**
- For Transit Tracker project the following data would be required:
  1. Users: The people travelling on public trains using Charlie Cards
  2. Lines: In Boston, there are different 'lines' depicting the routes of public transport
  3. Stations: These are start and end points of public transport throughout the route of 'lines'
  4. Charlie Card: The card using which users can book their journey from one station to another on specific route. Users can load money in Charlie card and later use it to book their journey.

5. Credit Card: System stores the credit cards belonging to users so that they can load money from it to their Charlie cards.
6. Journey: This is a weak entity as users book their 'journey' using Charlie cards along stations of specific line.

- **Realized or contemplated alternative design / approaches to the project**
- We can implement this project in Document-Based Database like MongoDB where each journey can be represented as a document including details of user that booked the journey, the route of the journey, the Charlie card used to book a journey, etc
- **Document any code not working in this section**
- All the SQL and Python code and functionalities are working as described in UML, Activity Diagram, and database description.

Provide a "Future work" section containing:

- **Planned uses of the database**
- This Database can be used by MBTA Authorities to use for its current Train system. It can be also used by other Cities where there is a City Train network to manage its online ticketing. Also the Authorities can expand this database for every type of public transport including Buses and ferries.
- **Potential areas for added functionality**
- 1) Ticket Booking Across Multiple Train Lines – Feature to book tickets for journeys including multiple lines and Multiple Stations.
- 2) Adding An Easy to Use User Interface – A Robust and Easy to Use User Interface can be provided using Django or Flask.
- 3) Adding Other Payment Method to add Balance In Charlie Card – Other payment Method options Can be added as PayPal, Bank Transfer, Etc.
- 4) Variable Fare System As Per the Journey Distance. – An Enhancement in the current ticked face counting system here the fares are calculated by the distance between start station and end station.
- 5) Expansion to add Ticketing for Bus as Well as Long Route Trains – Bus Routes And Its Fares can be also added and also long commuter rail stops and fares can be added.

Video Link of the Project Presentation:

- **https://drive.google.com/file/d/1XlxixBSCobyhH1VZqIyxGOSplkIpxLHe/view?usp=sharing**