NPS2001B

Matrix Unplugged: Using Computer for Real-World Problems

AY2023/24 Semester 1

Group Milestone 2
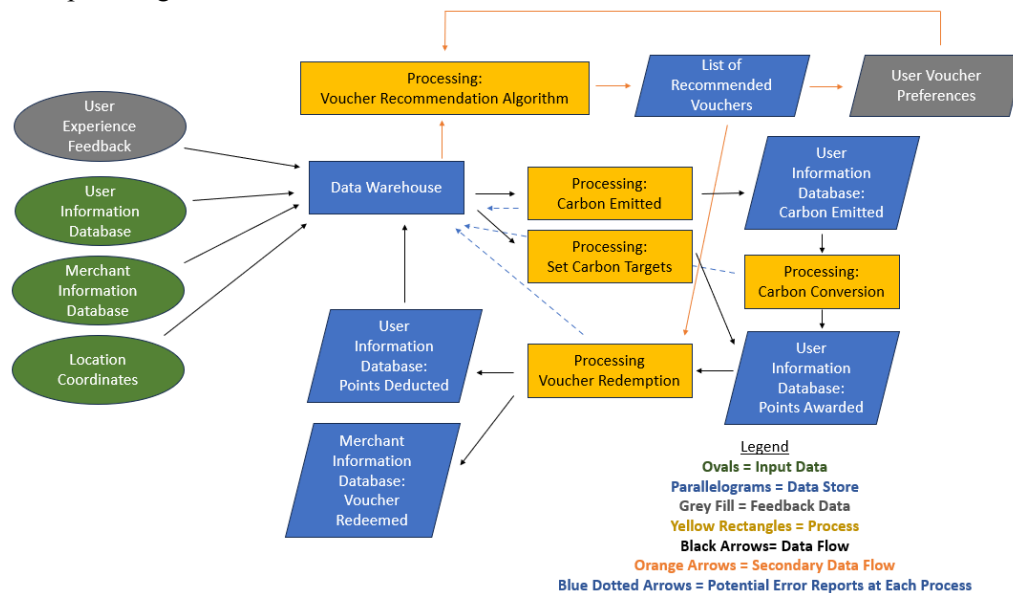
By Group 2

Name	Matriculation Number
Carina Teh	A0257530H
Donna Sneha Choy	A0254505J
Lee Xin Yi	A0259267N

1. The carbon converter requires input data and feedback data to function and achieve its goals. All data points go through the data warehouse and run through various algorithms when processing to create an output. The map's location coordinates (e.g. Singapore's map and coordinates of all points), user and merchant information database are fundamental input data required so that users can interact with the app functions using their personal accounts. Other input data includes user information (e.g. name, age, gender, contact number, email) as well as their specific tracked location coordinates and mode of transportation used during travels.

The users' personal information will be processed in a mathematical algorithm to generate a weekly carbon emissions target specific to their lifestyle. The tracked location coordinates of each user's travel activity would be processed into output of total distance travelled. Following which, the app would calculate users' total emissions equivalent produced based on a set of formulae. Points are then allocated to users according to whether they achieved the carbon emissions target initially set for them by our algorithm. Finally, these points allocated to users interact with the merchant information database when users exchange their points for vouchers.

Feedback data will also be gathered through monthly prompts sent to users regarding their user experience feedback (e.g. app ratings, feedback on the desirability of vouchers available). In case of errors or crashes in the processing stages, the app will also send error reports upon detecting such issues. The voucher redemption algorithm and feedback runs after the initial flow of data in the black arrows.

Legend
Ovals = Input Data
Parallelograms = Data Store
Grey Fill = Feedback Data
Yellow Rectangles = Process
Black Arrows= Data Flow
Orange Arrows = Secondary Data Flow
Blue Dotted Arrows = Potential Error Reports at Each Process

2. Our app collects personal details of users in order to attribute their input data to their respective accounts, such as their name and date of birth. This is crucial in measuring their carbon emission and rewarding them accurately for their environmentally-conscious travel efforts. The users' collective data may also be released as public information anonymously, with permission, to report the effectiveness of the app in reducing carbon emissions. The collection of information and activities will be uploaded into the cloud for storage.

Here are some examples of how the data privacy policy may look like to users when they agree to the terms and conditions of the application:

Firstly, this app requires users to create an account using an email address and password. This information is used solely for authentication and to provide personalized services. We use encryption

protocols to secure user credentials and do not share this information with third parties. Passwords are stored using industry-standard hashing techniques (e.g. SHA-256) for cryptographic purposes.

Secondly, this app utilises third-party services (e.g. cloud storage) for enhanced functionality. We ensure that third-party integrations comply with data protection regulations. Users are informed about the data shared with these services. The prompt may state: 'By accepting the terms and conditions, you agree to your name, contact number, and travel history being shared on our Google cloud database'.

Lastly, the app will request access to the user's location for location coordinates for calculation of carbon emissions. Location data is anonymized and used solely for the specified features, with permission.

Given the usage of users' app activities and data, data privacy and security may be compromised. The following table includes the app's risk matrix and the various possible factors involved with the loss of confidentiality, integrity, and availability of data.

SYSTEM: The Carbon Converter Risk Matrix			
Threat Event	**Likelihood** Unlikely - 1 Likely - 2 Near certain - 3	**Impact** Mild - 1 Moderate - 2 Severe - 3	**Risk Level**
Loss of Confidentiality			Average: 5
Public release of personal information without prior approval	2	2	4
Travel and location compromised by hackers	2	3	6
Loss of Integrity			Average: 4
Incorrect data collection (e.g. GPS tracking issue) - carbon emission efficacy evaluation reports and points and voucher reward system	2	2	4
Loss of Availability			Average: 2
Loss of data in cloud system	1	2	2
		OVERALL RISK	11/27

To reduce potential confidentiality breaches, only relevant personal information will be stored and users would be required to use a 8 character password containing numbers, uppercase and lowercase letters, and symbols for authentication purposes. Users can also use biometrics for basic data privacy. VPN will also be used when data is being transferred to cloud storage to ensure encryption. This prevents data interception as they do not have access to the encryption key due to data hashing techniques (e.g. SHA-256).

Link to dataset:
https://github.com/ryukiko/NPS-Group-Project/blob/bb9edd49d67c8c128d2fd69dad939715b5196430/The%20Carbon%20Converter%20Dataset.xlsx