EMFAC Data Extraction-User Manual

Version: 1.0

Date: 18/5/2022

Written in Python 3.9.0

Library used:

- Python ==3.9.0
  - sqlite3
  - tkinter
  - itertools
- pandas==1.1.4
- numpy==1.19.4
- openpyxl==3.0.7
- XlsxWriter==3.0.1
- timebudget==0.7.1

Ensure all libraries are available to the script. GUI.exe would have included them already.

Written by: Wilson Pau

Report Bugs Encountered

Brief Description

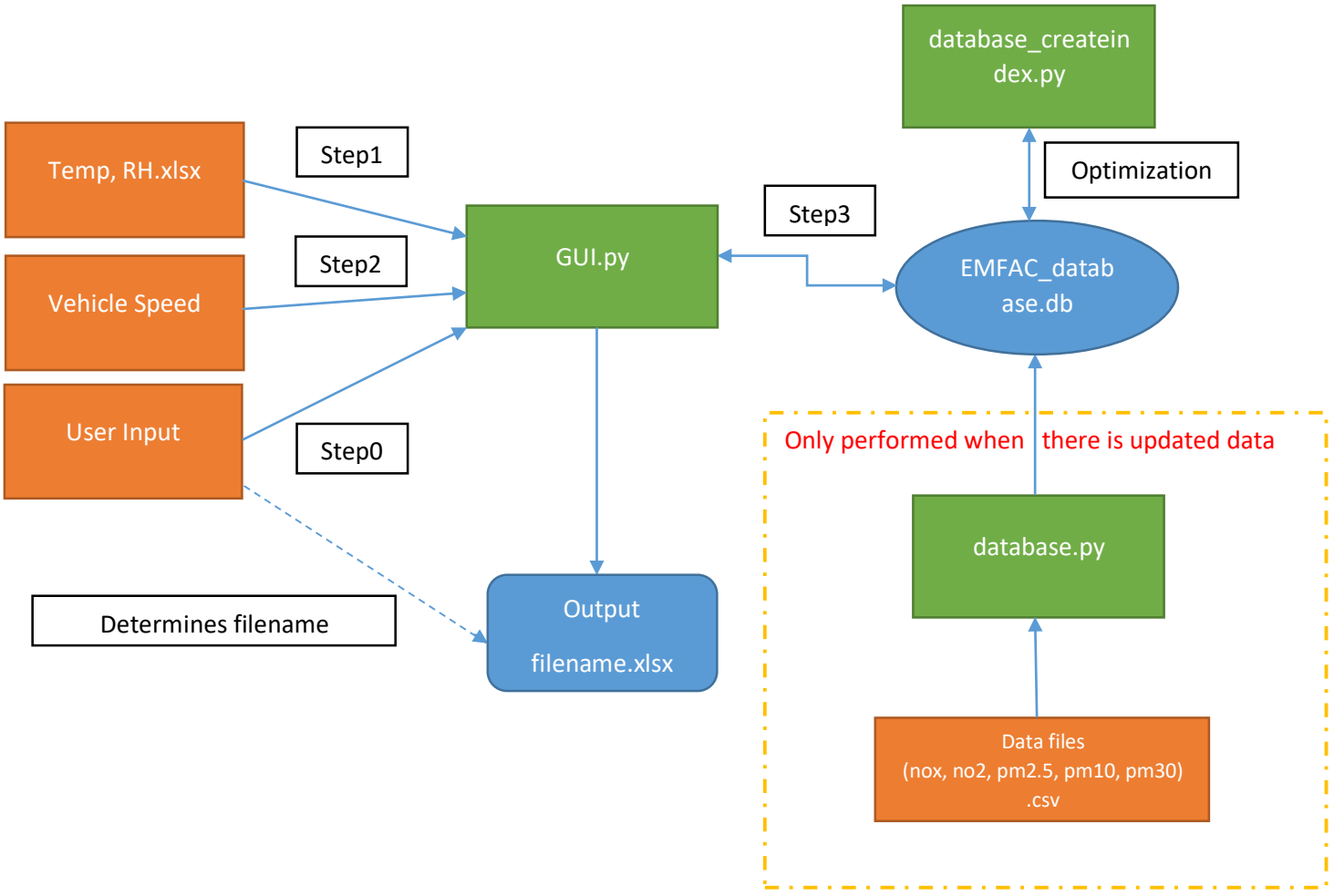
The script consists of the following parts:

Input: Where informations including temperature, Relative Humidity, Vehicle Speed, Year of Study, Emission mode, Run mode is fed into the script.

Scripts: GUI.py is where all of the codes executes in a normal operation and exports the desired excel output file. Database.py creates the database for GUI.py from csv data files. Database_createindex.py is an optional script to be run once to optimize database such that queries can be about 5 times faster.

Generated Files: EMFAC_database.db acts as the database for GUI.py to extract data from. The output file is exported in excel format. Naming of the file will be determined by user input (year, run mode, emission mode).

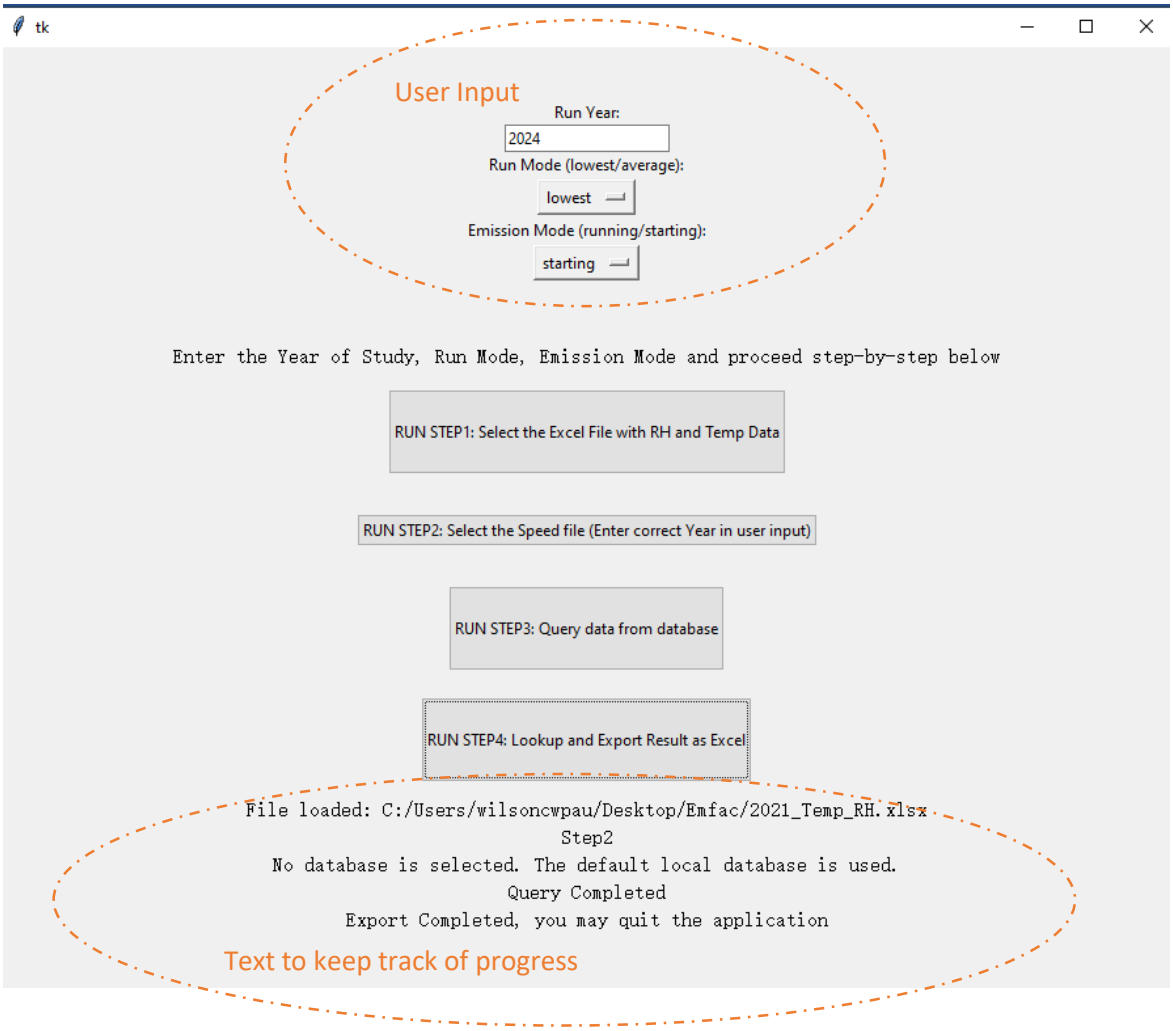
Graphical explanation of the script is shown below.



Procedure

Run the GUI.exe (for users without python)/GUI.py

Python can be installed from https://www.python.org/downloads/



Step0: Manual User Input

- Enter a 4-digit study year (e.g. 2024)
- Select the correct Run mode (Lowest, Average)
- Select the correct emission mode (Running, Starting)

Step1: Import Temperature and Relative Humidity

- Click the Step 1 Button
- A file selection window will prompt

- Select the excel file containing Temperature, Relative Humidity (2021_Temp_RH.xlsx)
- Step completed when text “File loaded: {file location/2021_Temp_RH.xlsx }” appeared

Step2: Depending on Emission Mode (running/starting), import the Vehicle Speed/Time and create a list of combinations (Month, Hour, Temperature, Relative Humidity, Vehicle Speed/Time)

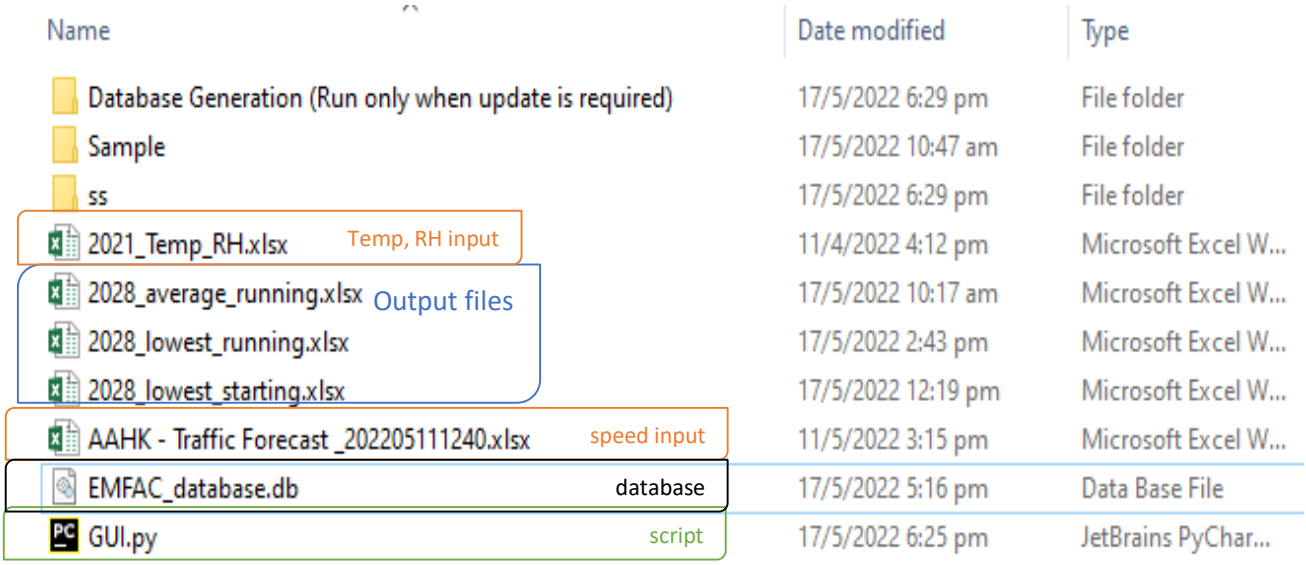
- Click the Step 2 Button
- If emission mode = running:
  - A file selection window will prompt
  - Select the excel file containing speed data; ensure worksheet naming as follows: Average speed ({yyyy}) where {yyyy} stands for study year inputted at step 0
- If emission mode = starting:
  - Step completed when text “Step2” appeared

Step3: The script “GUI.py” interacts with the database “EMFAC_database.db” to extract data

- Click the Step 3 Button
- A file selection window will prompt
- Select the target database (.db); if window is closed and no file is selected, the default database at local folder relative to GUI.py will be selected
- This step may take from 10s up to 5mins depending on PC performance and size of query
- Step completed when text “Query Completed” appeared

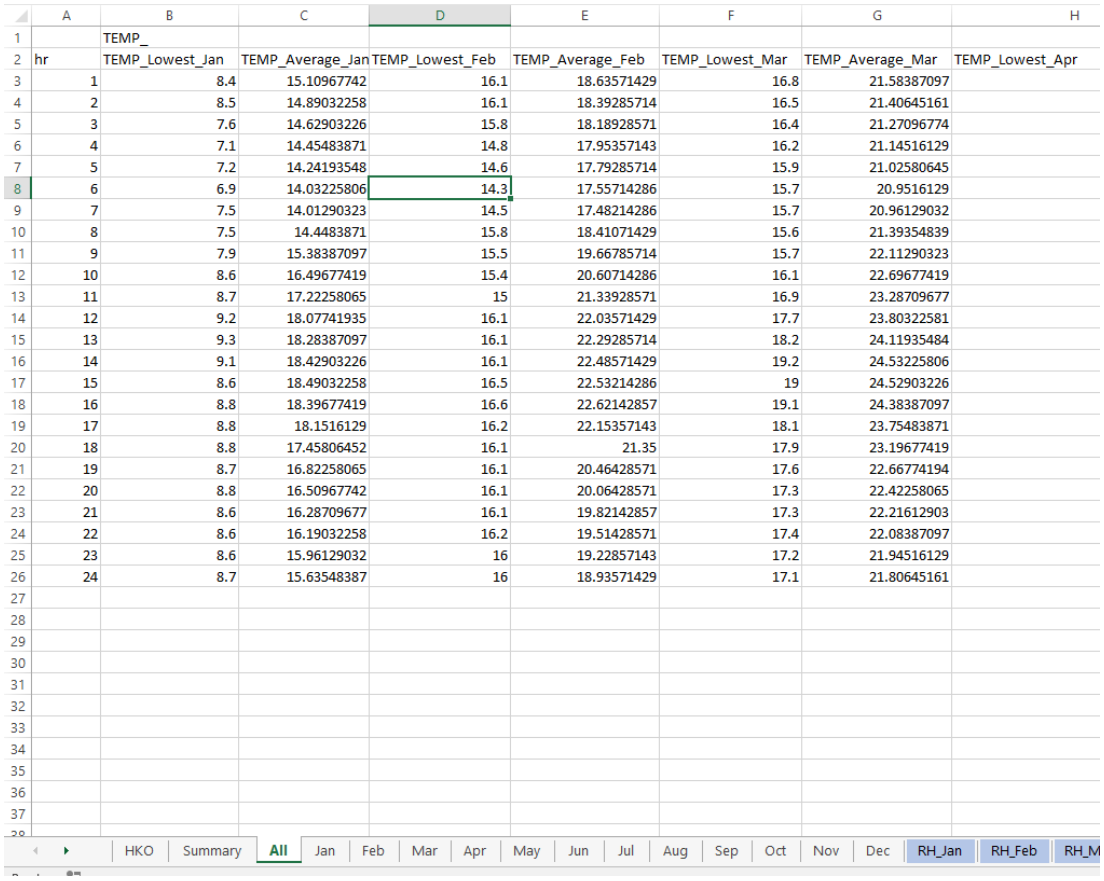
Step4: Process the extracted data and exports an excel file

- Click the Step 4 Button
- This step may take about 30s to 2min depending on data size
- Step completed when text “Export Completed, you may quit the application” appeared


Name
Date modified
Type
Database Generation (Run only when update is required)
17/5/2022 6:29 pm
File folder
Sample
17/5/2022 10:47 am
File folder
ss
17/5/2022 6:29 pm
File folder
2021_Temp_RH.xlsx
Temp, RH input
11/4/2022 4:12 pm
Microsoft Excel W...
2028_average_running.xlsx
Output files
17/5/2022 10:17 am
Microsoft Excel W...
2028_lowest_running.xlsx
17/5/2022 2:43 pm
Microsoft Excel W...
2028_lowest_starting.xlsx
17/5/2022 12:19 pm
Microsoft Excel W...
AAHK - Traffic Forecast _202205111240.xlsx
speed input
11/5/2022 3:15 pm
Microsoft Excel W...
EMFAC_database.db
database
17/5/2022 5:16 pm
Data Base File
GUI.py
script
17/5/2022 6:25 pm
JetBrains PyChar...

Points to Note to avoid program crash:

step1: ensure the sheet named ‘All’ is available and contains all the data with column name format is the same as shown in figure below.



	A	B	C	D	E	F	G	H
1		TEMP_						
2	hr	TEMP_Lowest_Jan	TEMP_Average_Jan	TEMP_Lowest_Feb	TEMP_Average_Feb	TEMP_Lowest_Mar	TEMP_Average_Mar	TEMP_Lowest_Apr
3	1	8.4	15.10967742	16.1	18.63571429	16.8	21.58387097	
4	2	8.5	14.89032258	16.1	18.39285714	16.5	21.40645161	
5	3	7.6	14.62903226	15.8	18.18928571	16.4	21.27096774	
6	4	7.1	14.45483871	14.8	17.95357143	16.2	21.14516129	
7	5	7.2	14.24193548	14.6	17.79285714	15.9	21.02580645	
8	6	6.9	14.03225806	14.3	17.55714286	15.7	20.9516129	
9	7	7.5	14.01290323	14.5	17.48214286	15.7	20.96129032	
10	8	7.5	14.4483871	15.8	18.41071429	15.6	21.39354839	
11	9	7.9	15.38387097	15.5	19.66785714	15.7	22.11290323	
12	10	8.6	16.49677419	15.4	20.60714286	16.1	22.69677419	
13	11	8.7	17.22258065	15	21.33928571	16.9	23.28709677	
14	12	9.2	18.07741935	16.1	22.03571429	17.7	23.80322581	
15	13	9.3	18.28387097	16.1	22.29285714	18.2	24.11935484	
16	14	9.1	18.42903226	16.1	22.48571429	19.2	24.53225806	
17	15	8.6	18.49032258	16.5	22.53214286	19	24.52903226	
18	16	8.8	18.39677419	16.6	22.62142857	19.1	24.38387097	
19	17	8.8	18.1516129	16.2	22.15357143	18.1	23.75483871	
20	18	8.8	17.45806452	16.1	21.35	17.9	23.19677419	
21	19	8.7	16.82258065	16.1	20.46428571	17.6	22.66774194	
22	20	8.8	16.50967742	16.1	20.06428571	17.3	22.42258065	
23	21	8.6	16.28709677	16.1	19.82142857	17.3	22.21612903	
24	22	8.6	16.19032258	16.2	19.51428571	17.4	22.08387097	
25	23	8.6	15.96129032	16	19.22857143	17.2	21.94516129	
26	24	8.7	15.63548387	16	18.93571429	17.1	21.80645161	
27								
28								
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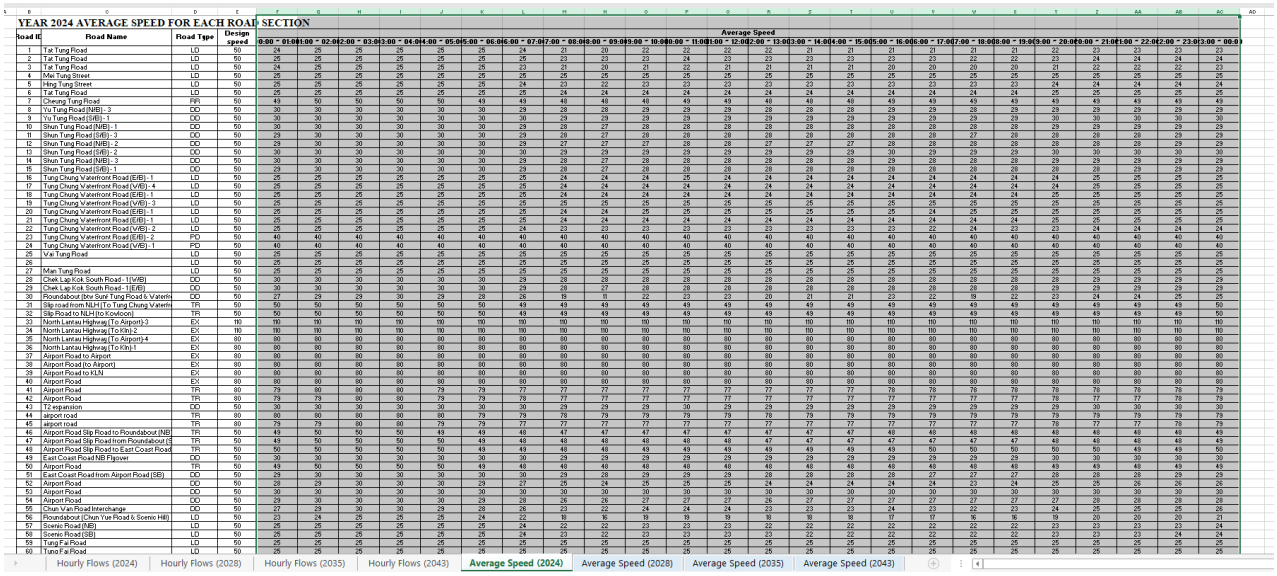
Step2: ensure the sheet named ‘Average Speed ({yyyy})’ is available and contains the speed data in columns F:AC in excel as shown in the figure below.



YEAR 2024 AVERAGE SPEED FOR EACH ROAD SECTION

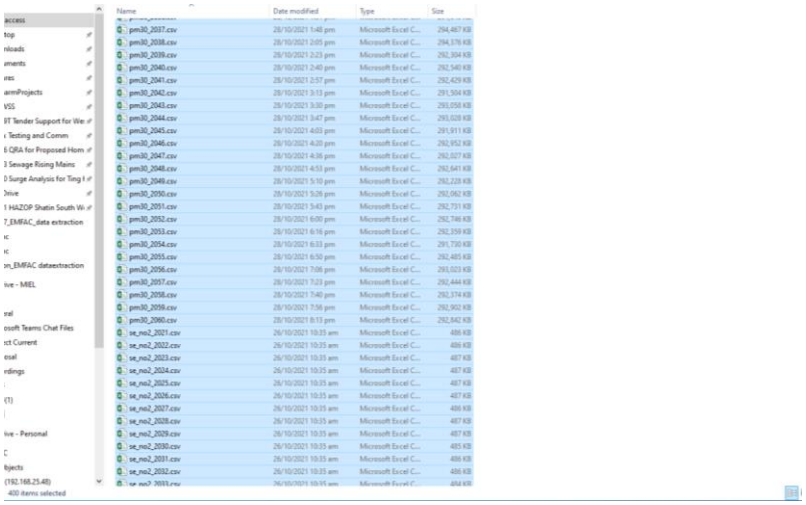
Road ID	Road Name	Road Type	Design speed	Average Speed																					
				0:00 ~ 01:00	1:00 ~ 02:00	2:00 ~ 03:00	3:00 ~ 04:00	4:00 ~ 05:00	5:00 ~ 06:00	6:00 ~ 07:00	7:00 ~ 08:00	8:00 ~ 09:00	9:00 ~ 10:00	10:00 ~ 11:00	11:00 ~ 12:00	12:00 ~ 13:00	13:00 ~ 14:00	14:00 ~ 15:00	15:00 ~ 16:00	16:00 ~ 17:00	17:00 ~ 18:00	18:00 ~ 19:00	19:00 ~ 20:00	20:00 ~ 21:00	21:00 ~ 22:00	22:00 ~ 23:00	23:00 ~ 00:00
1	Tai Tung Road	LD	50	24	25	25	25	25	25	25	24	21	20	22	22	22	22	21	21	21	21	21	21	22	23	23	23
2	Tai Tung Road	LD	50	25	25	25	25	25	25	25	25	23	23	23	24	23	23	23	23	23	23	22	22	23	24	24	24
3	Tai Tung Road	LD	50	24	25	25	25	25	25	25	23	21	20	21	22	21	21	21	21	20	20	20	20	21	22	22	22	23
4	Mei Tung Street	LD	50	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
5	Hing Tung Street	LD	50	25	25	25	25	25	25	24	23	22	23	23	23	23	23	23	23	23	23	23	23	24	24	24	24	24
6	Tai Tung Road	LD	50	25	25	25	25	25	25	25	24	24	24	24	24	24	24	24	24	24	24	24	24	25	25	25	25	25
7	Cheung Tung Road	FR	50	49	50	50	50	50	49	49	48	48	48	49	49	49	48	48	48	49	49	49	49	49	49	49	49	49
8	Yu Tung Road (NB)) - 3	DD	50	30	30	30	30	30	30	29	28	28	29	29	29	28	28	28	29	29	28	29	29	29	29	29	29	29
9	Yu Tung Road (SB)) - 1	DD	50	30	30	30	30	30	30	30	29	29	29	29	29	29	29	29	29	29	29	29	29	30	30	30	30	30
10	Shun Tung Road (NB)) - 1	DD	50	30	30	30	30	30	30	29	28	27	28	28	28	28	28	28	28	28	28	28	28	29	29	29	29	29
11	Shun Tung Road (SB)) - 3	DD	50	29	30	30	30	30	30	29	28	27	28	28	28	28	28	28	28	28	27	28	28	28	28	28	29	29
12	Shun Tung Road (NB)) - 2	DD	50	29	30	30	30	30	30	29	27	27	27	28	28	28	27	27	27	28	28	28	28	28	28	28	29	29
13	Shun Tung Road (SB)) - 2	DD	50	30	30	30	30	30	30	30	29	29	29	29	29	29	29	29	29	30	29	29	29	30	30	30	30	30
14	Shun Tung Road (NB)) - 3	DD	50	30	30	30	30	30	30	29	28	27	28	28	28	28	28	28	29	29	28	28	28	29	29	29	29	29
15	Shun Tung Road (SB)) - 1	DD	50	29	30	30	30	30	30	29	28	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28	29	29
16	Tung Chung Waterfront Road (EB)) - 1	LD	50	25	25	25	25	25	25	25	24	24	24	25	24	24	24	24	24	24	24	24	24	24	25	25	25	25
17	Tung Chung Waterfront Road (WB)) - 4	LD	50	25	25	25	25	25	25	25	24	24	24	24	24	24	24	24	24	24	24	24	24	24	25	25	25	25
18	Tung Chung Waterfront Road (EB)) - 1	LD	50	25	25	25	25	25	25	25	24	24	24	24	24	24	24	24	24	24	24	24	24	25	25	25	25	25
19	Tung Chung Waterfront Road (WB)) - 3	LD	50	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
20	Tung Chung Waterfront Road (EB)) - 1	LD	50	25	25	25	25	25	25	25	24	24	25	25	25	25	25	25	25	25	24	25	25	25	25	25	25	25
21	Tung Chung Waterfront Road (EB)) - 1	LD	50	25	25	25	25	25	25	25	24	24	24	24	24	24	24	24	24	24	24	24	24	25	25	25	25	25
22	Tung Chung Waterfront Road (WB) - 2	LD	50	25	25	25	25	25	25	24	23	23	23	23	23	23	23	23	23	23	22	24	23	23	24	24	24	24
23	Tung Chung Waterfront Road (EB)) - 2	PD	50	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
24	Tung Chung Waterfront Road (WB)) - 1	PD	50	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
25	Yat Tung Road	LD	50	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
26		LD	50	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
27	Man Tung Road	LD	50	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
28	Chek Lap Kok South Road - 1 (WB)	DD	50	30	30	30	30	30	30	29	28	28	28	28	29	28	28	28	28	28	28	28	28	28	29	29	29	29
29	Chek Lap Kok South Road - 1 (EB))	DD	50	30	30	30	30	30	30	29	28	27	28	28	28	28	28	28	28	28	28	28	28	29	29	29	29	29
30	Roundabout (link Sunt Tung Road & Waterfr	DD	50	27	29	29	30	29	28	26	19	11	22	23	23	20	21	21	23	22	19	22	23	24	24	25	25	
31	Slip road from NLH (To Tung Chung Waterfr	TR	50	50	50	50	50	50	50	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	50
32	Slip Road to NLH (to Cowloon)	TR	50	50	50	50	50	50	50	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	49	50
33	North Lantau Highway (To Airport)-3	EX	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
34	North Lantau Highway (To Kln)-2	EX	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
35	North Lantau Highway (To Airport)-4	EX	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
36	North Lantau Highway (To Kln)-1	EX	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
37	Airport Road to Airport	EX	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
38	Airport Road (to Airport)	EX	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
39	Airport Road to KLN	EX	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
40	Airport Road	EX	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
41	Airport Road	TR	80	79	80	80	80	79	79	77	77	77	77	77	77	77	77	77	78	78	78	78	78	78	78	78	78	79
42	Airport Road	TR	80	79	79	80	80	79	79	78	77	77	77	77	77	77	77	77	77	77	77	77	77	78	77	77	78	79
43	T2 expansion	DD	50	30	30	30	30	30	30	30	29	29	29	30	29	29	29	29	29	29	29	29	29	29	30	30	30	30
44	airport road	TR	80	80	80	80	80	80	79	79	78	79	79	79	79	78	79	79	79	79	79	79	79	79	79	79	79	79
45	airport road	TR	80	79	79	80	80	79	79	77	77	77	77	77	77	77	77	77	77	77	77	77	77	78	77	77	78	79
46	Airport Road Slip Road to Roundabout (NB)	TR	50	49	50	50	50	49	49	48	47	47	47	47	47	47	47	47	47	48	48	48	48	48	48	48	48	49
47	Airport Road Slip Road from Roundabout (S	TR	50	49	50	50	50	50	49	48	48	48	48	48	48	47	47	47	47	47	47	47	47	48	48	48	48	49
48	Airport Road Slip Road to East Coast Road	TR	50	50	50	50	50	50	49	49	48	48	48	49	49	49	49	49	49	49	50	50	50	50	50	49	49	50
49	East Coast Road NB Flyover	DD	50	30	30	30	30	30	30	30	29	29	29	29	29	29	29	29	29	29	29	29	29	30	30	30	30	30
50	Airport Road	TR	50	49	50	50	50	50	49	48	48	48	48	48	48	48	48	48	48	48	48	48	48	49	49	49	49	49
51	East Coast Road from Airport Road (SB)	DD	50	29	30	30	30	30	30	30	29	28	29	29	29	28	28	28	28	28	27	27	27	28	28	28	29	29
52	Airport Road	DD	50	28	29	30	30	30	30	29	27	25	24	25	25	25	24	24	24	24	24	23	24	25	25	26	26	26
53	Airport Road	DD	50	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
54	Airport Road	DD	50	29	30	30	30	30	29	28	26	26	26	27	27	27	26	27	27	27	27	27	27	27	28	28	28	28
55	Chun Yan Road Interchange	DD	50	27	29	30	30	30	29	28	26	23	22	24	24	24	24	23	23	23	24	23	22	23	24	25	25	26
56	Roundabout (Chun Yue Road & Scenic Hill)	LD	50	23	24	25	25	25	24	22	18	16	19	19	19	18	18	18	17	17	16	16	19	20	20	20	21	
57	Scenic Road (NB)	LD	50	25	25	25	25	25	25	24	22	22	23	23	23	22	22	22	22	22	22	22	22	23	23	23	23	24
58	Scenic Road (SB)	LD	50	25	25	25	25	25	25	24	23	22	23	23	23	23	22	22	22	22	22	22	22	23	23	23	24	24
59	Tung Fai Road	LD	50	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
60	Tung Fai Road	LD	50	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	26	26	26

Hourly Flows (2024) | Hourly Flows (2028) | Hourly Flows (2035) | Hourly Flows (2043) | Average Speed (2024) | Average Speed (2028) | Average Speed (2035) | Average Speed (2043)

Database

Create Database

1. Run database.py/database.exe
2. A file selection window will prompt
3. Select and open ALL files



4. The process takes a relatively long time (~30-60mins)
5. A database EMFAC_database.db will be generated

(Optional) Create Database Index

After creating database, the database can be optimized for faster query, resulting in significantly lower running time for each run in GUI.py/GUI.exe.

1. Run database_create.py/database_create.exe
2. A file selection window will prompt
3. Select the target database EMFAC_database.db
4. The process takes a relatively long time (~5-30mins)
5. database EMFAC_database.db will be updated