

RWR 4015

# Traffic Simulation for Planning Applications

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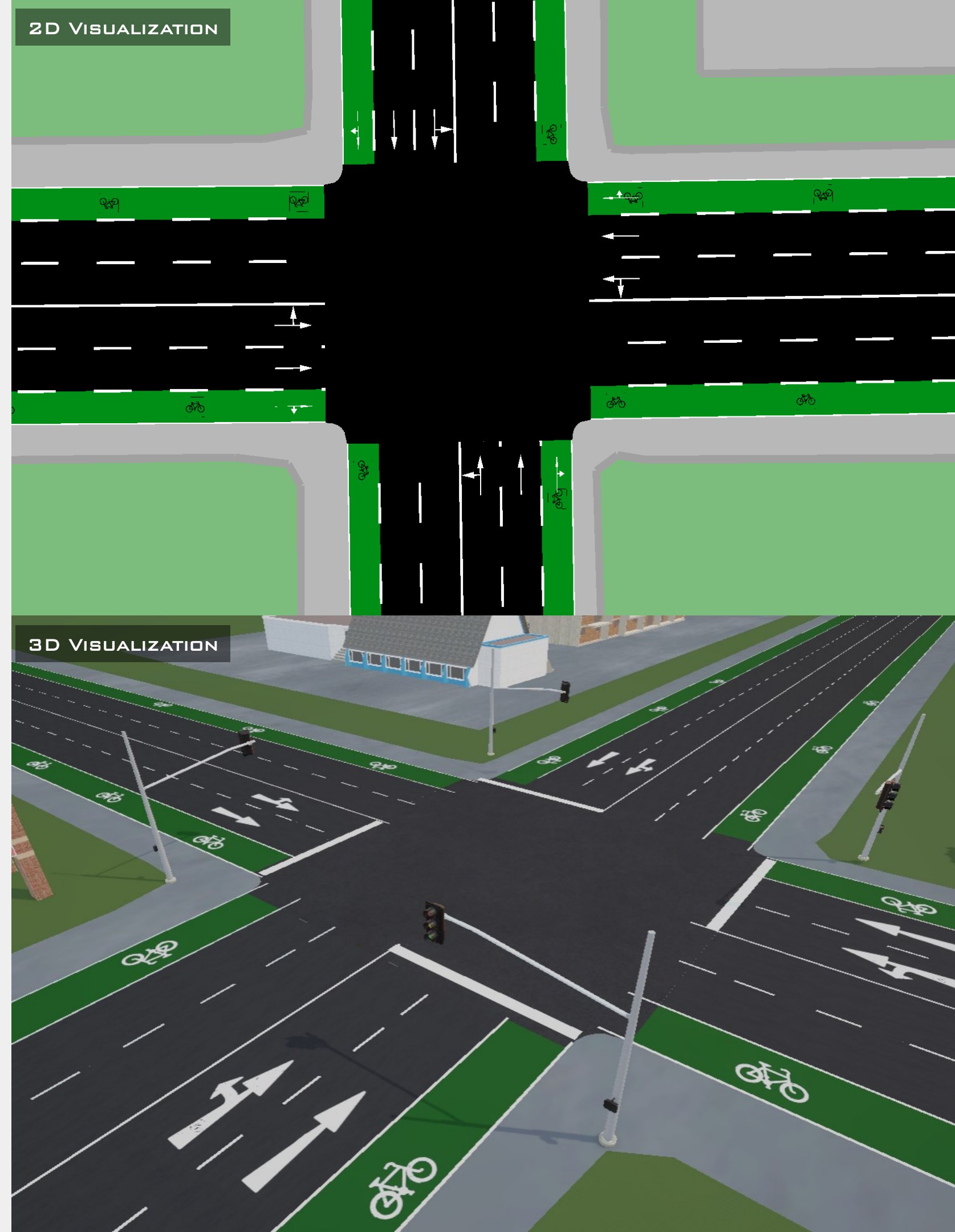
Week 5 | Hands-on:  
Demand Modelling and  
Route Assignment

Fall 2026

RoadwayVR



[roadwayvr.github.io/TrafficSimulationforPlanningApplications](https://roadwayvr.github.io/TrafficSimulationforPlanningApplications)



# Agenda

## ❑ Demand Modelling and Route Assignment

**1. Road Network Development**

**2. Traffic Signal Timing**

**Provided**

**3. Traffic Movement**

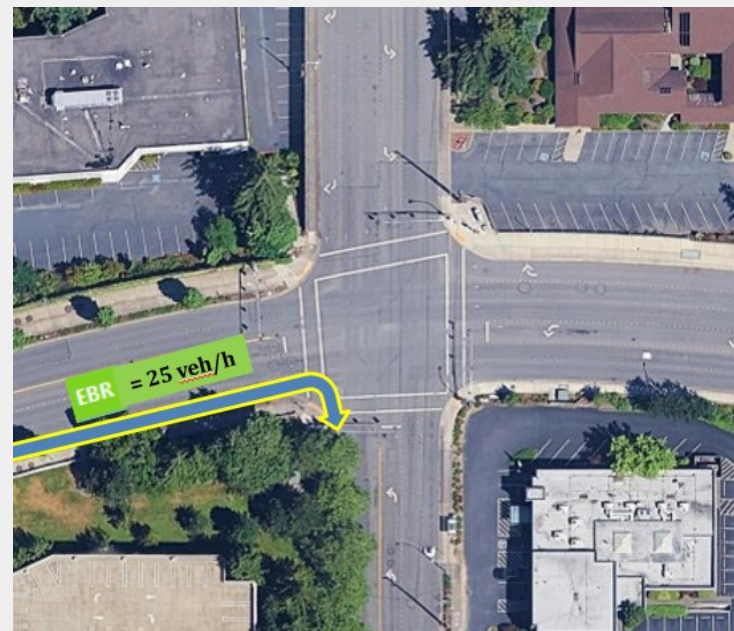
**4. Traffic Volume**

**5. Traffic Speed**

**This Session**

# Traffic Movement & Volume Calibration

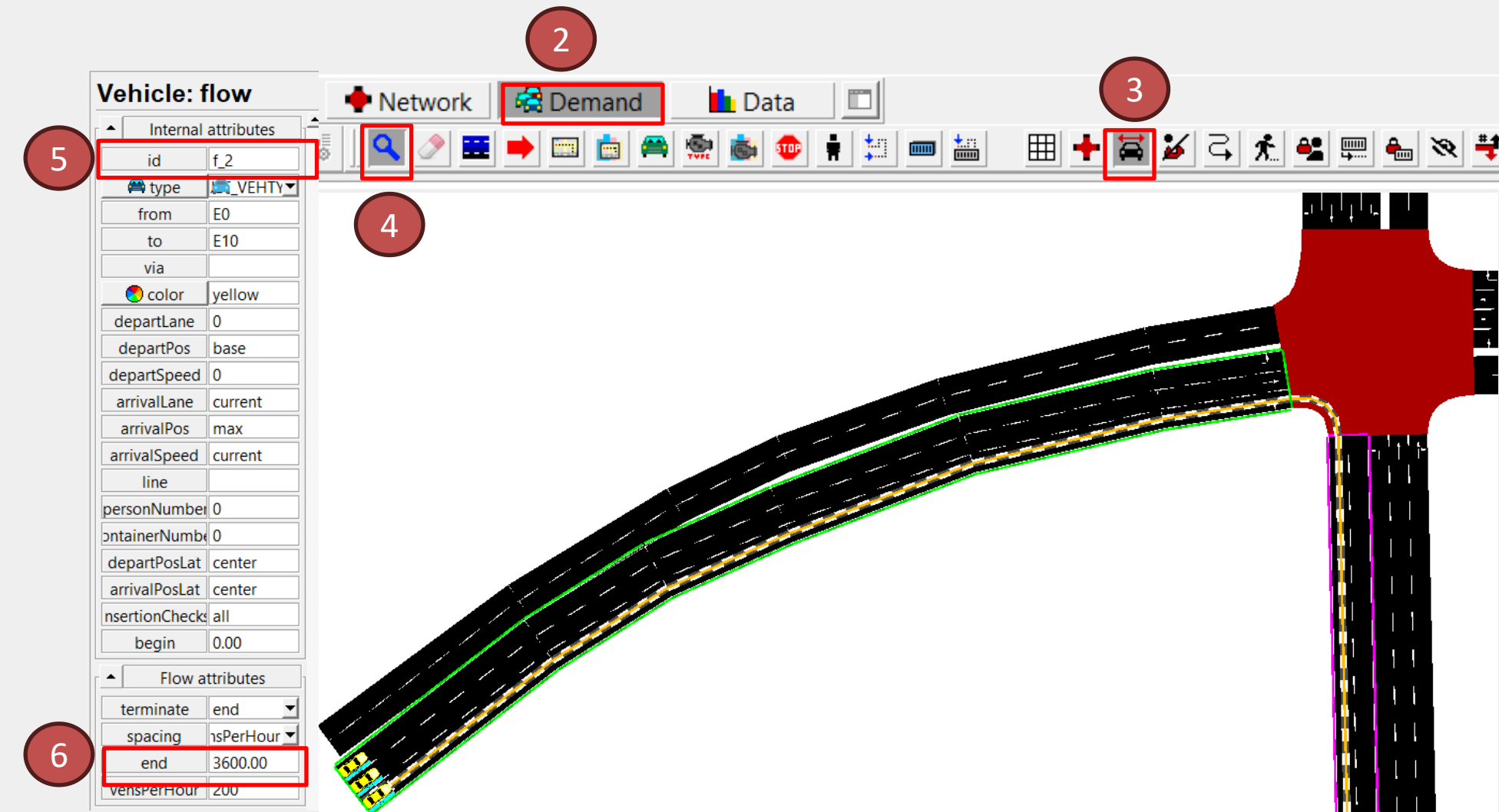
❏ [Download Exercise 1 Response](#)



# Traffic Movement & Volume Calibration

**Task:** We need to assign each observed traffic movement and volume to Simulation

1. Open SUMODT.netecfg
2. On top bar → Select Demand,
3. Select “Vehicles Spread ..”
4. Select Magnifier
5. Start from Eastbound → Select The right most lane Car
6. In the left side, read flow id and volume per hour





# Quiz

**Q:** *What is the traffic flow for  $f_2$ , if it is defined as **200 (veh/h)**? Select the most proper response.*

- A) It generates **exactly 200 vehicles every hour**, no more no less.
- B) It generates **200 vehicles randomly in each hour**, meaning the model tries to average 200 but the exact count can vary.
- C) It generates **200 vehicles each minute** (so 12,000 vehicles per hour).
- D) It generates **200 vehicles total for the whole simulation**, regardless of simulation duration.

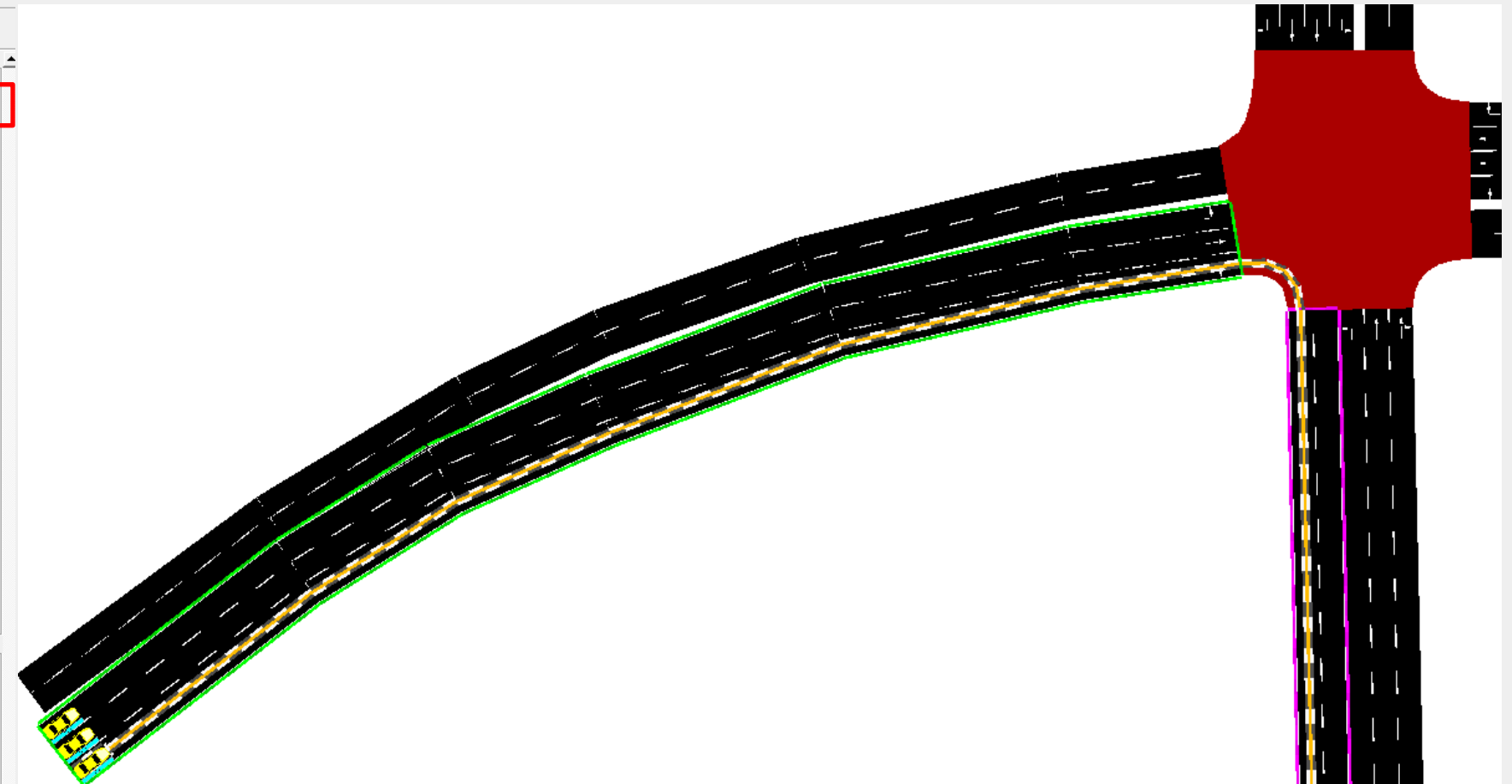
# Traffic Movement and Volume Calibration

7. Read from real-world image in slide and modify the traffic volume in NetEdit



Vehicle: flow	
Internal attributes	
id	f_2
type	VEHICLE
from	E0
to	E10
via	
color	yellow
departLane	0
departPos	base
departSpeed	0
arrivalLane	current
arrivalPos	max
arrivalSpeed	current
line	
personNumber	0
containerNumber	0
departPosLat	center
arrivalPosLat	center
insertionCheck	all
begin	0.00
Flow attributes	
terminate	end
spacing	1sPerHour
end	3600.00
vehsPerHour	???

???



# Traffic Movement and Volume Calibration

8. Make Sure you → Select Demand, → Select “Vehicles Spread ..” → Select Magnifier

The image shows a workflow for assigning traffic volume in a simulation. On the left, an aerial photograph of a street intersection has a yellow arrow pointing to a green box containing the text "WBR = 25 vehicles per 15Min". A blue arrow points from this box to a software interface. The interface has a "Vehicle: flow" panel on the left and a main workspace on the right. The "Vehicle: flow" panel has two sections: "Internal attributes" and "Flow attributes". In the "Internal attributes" section, the "id" field is set to "f\_11" and is highlighted with a red box. In the "Flow attributes" section, the "vehPerHour" field has a red question mark next to it. The main workspace shows a toolbar with icons for "Network", "Demand", and "Data". The "Demand" icon is highlighted with a red box. Below the toolbar is a 3D road network visualization with a red highlighted section and a yellow dashed line indicating a path.

WBR = 25 vehicles per 15Min

Vehicle: flow

Internal attributes

id	f_11
type	VEHTY
from	E1
to	E9
via	
color	yellow
departLane	first
departPos	base
departSpeed	0
arrivalLane	current
arrivalPos	max
arrivalSpeed	current
line	
personNumber	0
containerNumber	0
departPosLat	center
arrivalPosLat	center
insertionChecks	all
begin	0.00

Flow attributes

terminate	end
spacing	rsPerHour
end	3600.00
vehPerHour	?

Network Demand Data

???

9. Follow the same process for assigning real-world traffic volume to other simulated traffic volume

# Deliverables

- ☐ Follow the same process for assigning real-world traffic volume to other simulated traffic volume
- ☐ Submit the file



# Traffic Volume Calibration using GEH

☐ Download Exercise 3 Response

☐ Download Required Materials

# Traffic Volume Calibration using GEH

**Question:** Can we calculate GEH using traffic volume and movement in real-world images and simulation in previous slides?

**GEH Formula:**

$$GEH = \sqrt{\frac{2(M - C)^2}{M + C}}$$

$M$  = Simulated Traffic Volume (veh/h)

$C$  = Observed Traffic Volume (veh/h)

**Interpretation:**

$GEH < 5$     *Good match*

$5 \leq GEH < 10$     *Needs investigation*

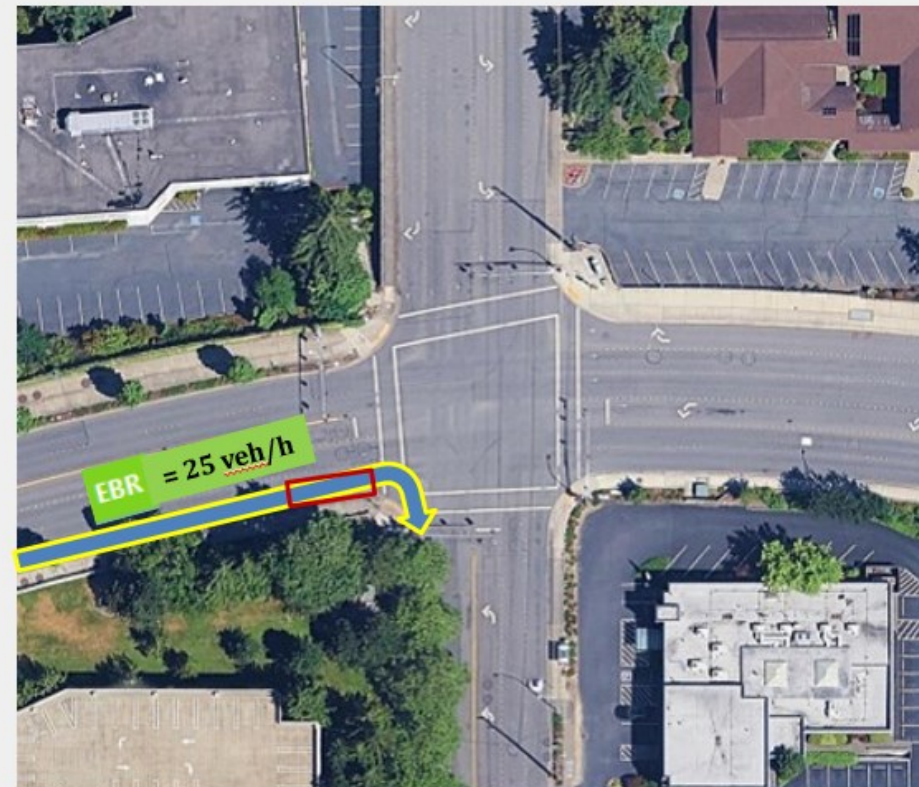
$10 \leq GEH$     *Likely mismatch (check data, mapping, or model settings)*

❑ Compute GEH for each traffic movement separately.

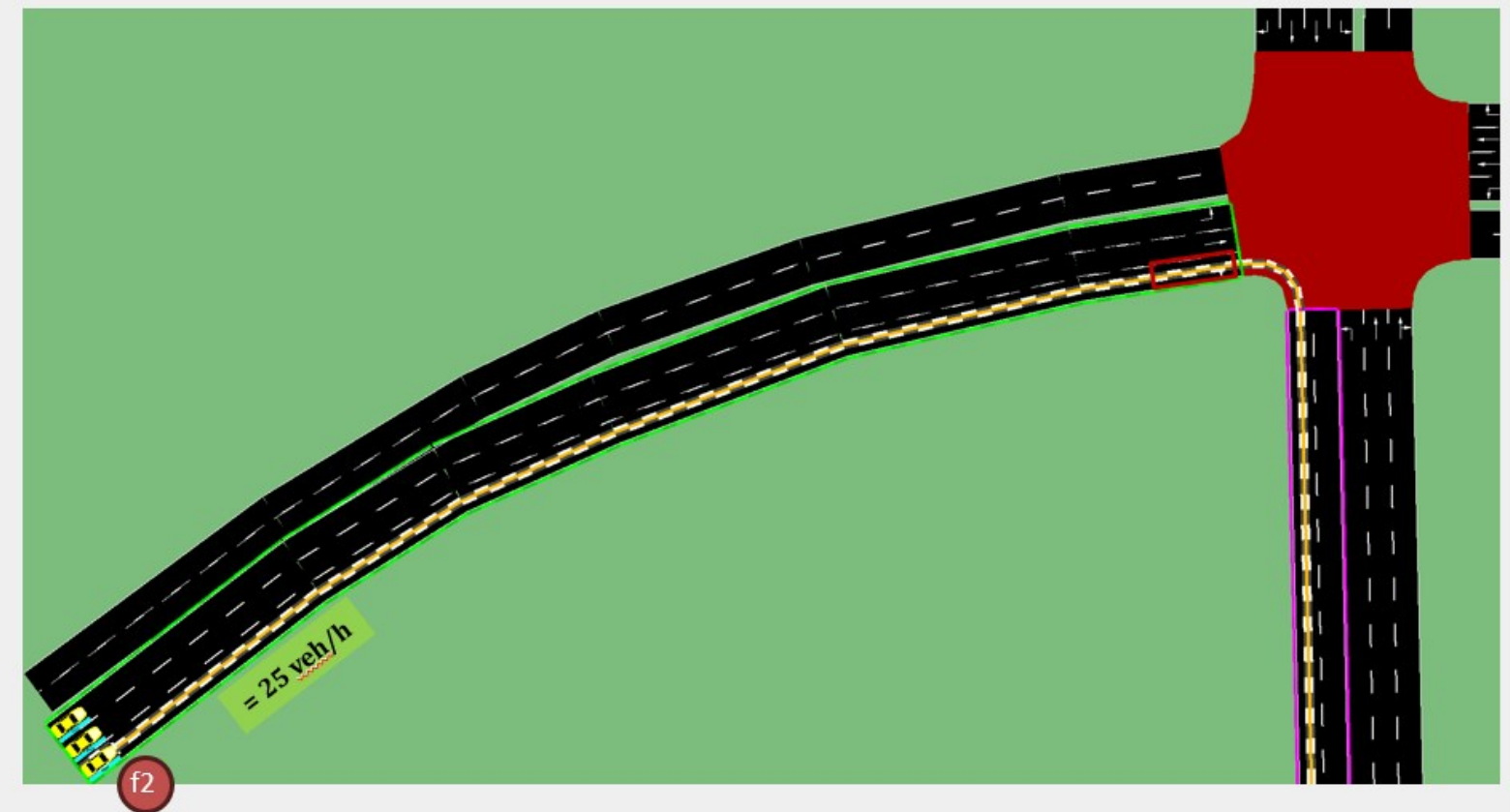
❑ Aim for  $GEH < 5$  for at least  $\sim 85\%$  of traffic movements

# Traffic Volume Calibration using GEH

1. We cannot calculate GEH using information in previous Slides.
2. Read Slide 9 again
3. We need to run simulation and then collect traffic volume in red box from SUMO
4. Then, calculate GEH



EBR (25 veh/h) = f2 (25 veh/h)



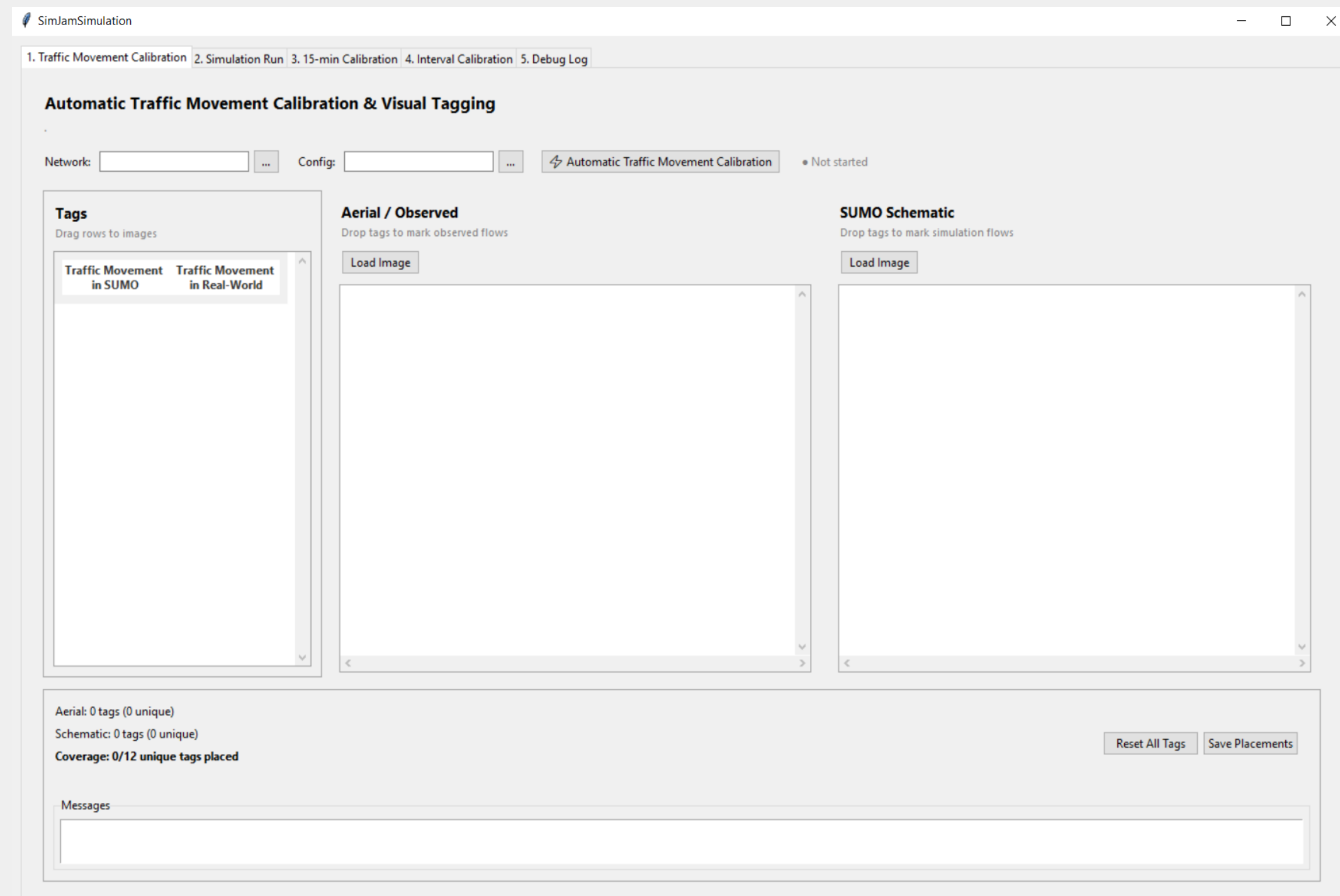
# Traffic Volume Calibration using GEH

5. For this course, we created an application so it can automatically collect traffic volume from red boxes from SUMO and calculate GEH

6. Download Required Materials

7. Open Folder “SUMODT”

8. Run SimJamSimulation application

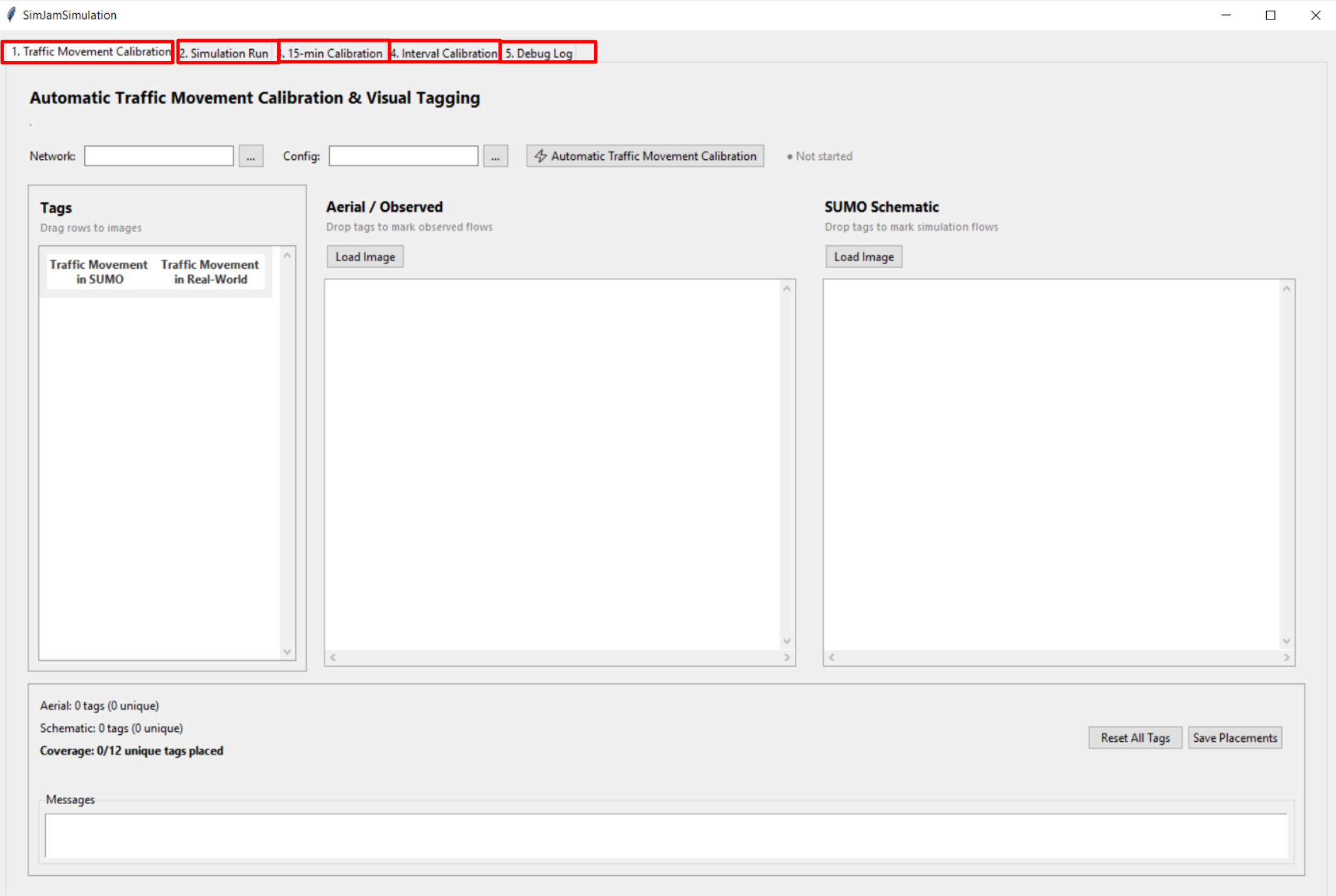




# SimJamSimulation App

# SimJamSimulation App

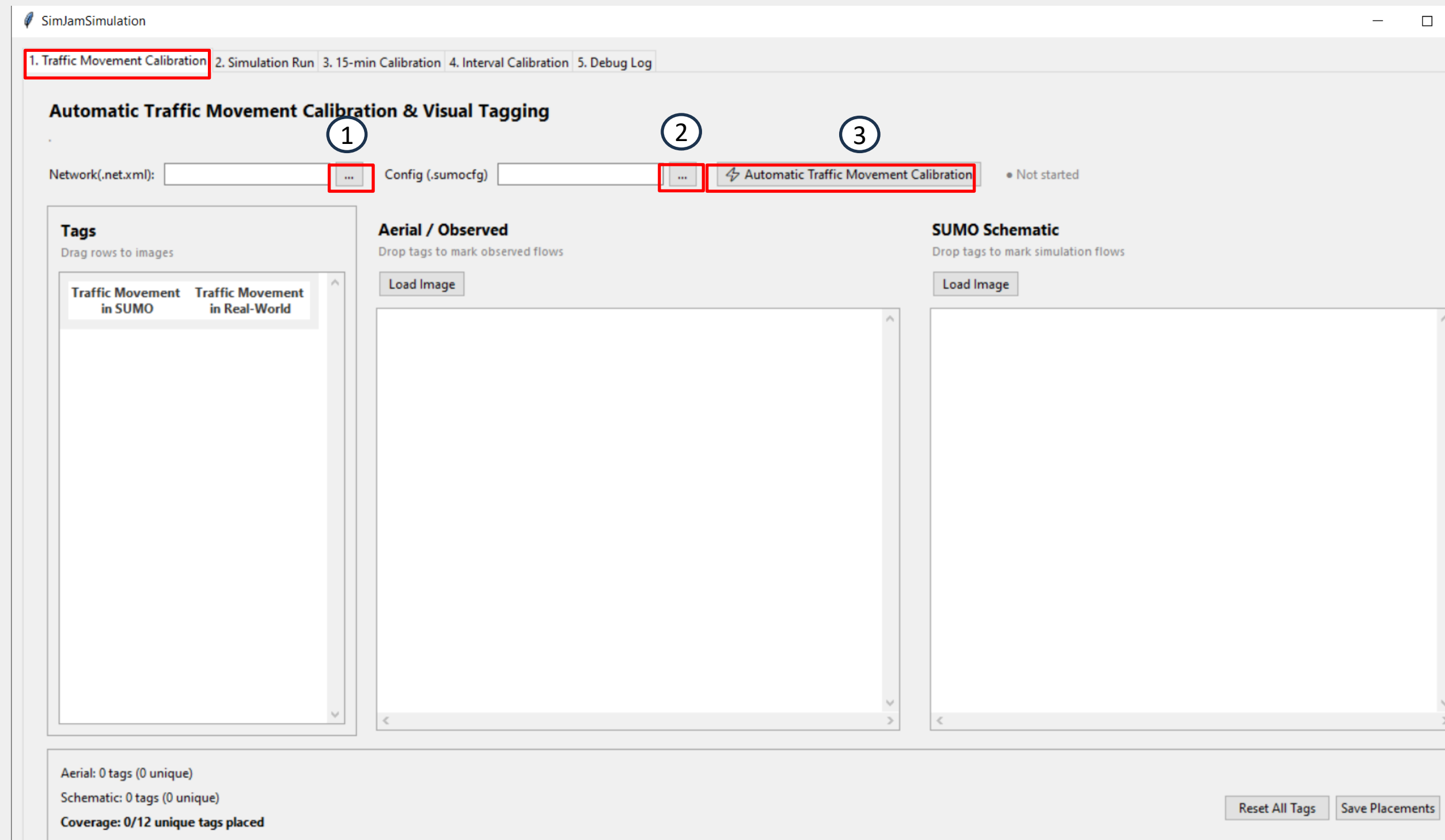
1. The SimJamSimulation app automatically perform Traffic Movement & Volume Calibration using GEH



# Traffic Movement Calibration

2. In Traffic Movement Calibration Tab → Select Sumo Network → Select Sumo Visualization Interface (.sumocfg)

→ Click Automatic “Traffic Movement Calibration”





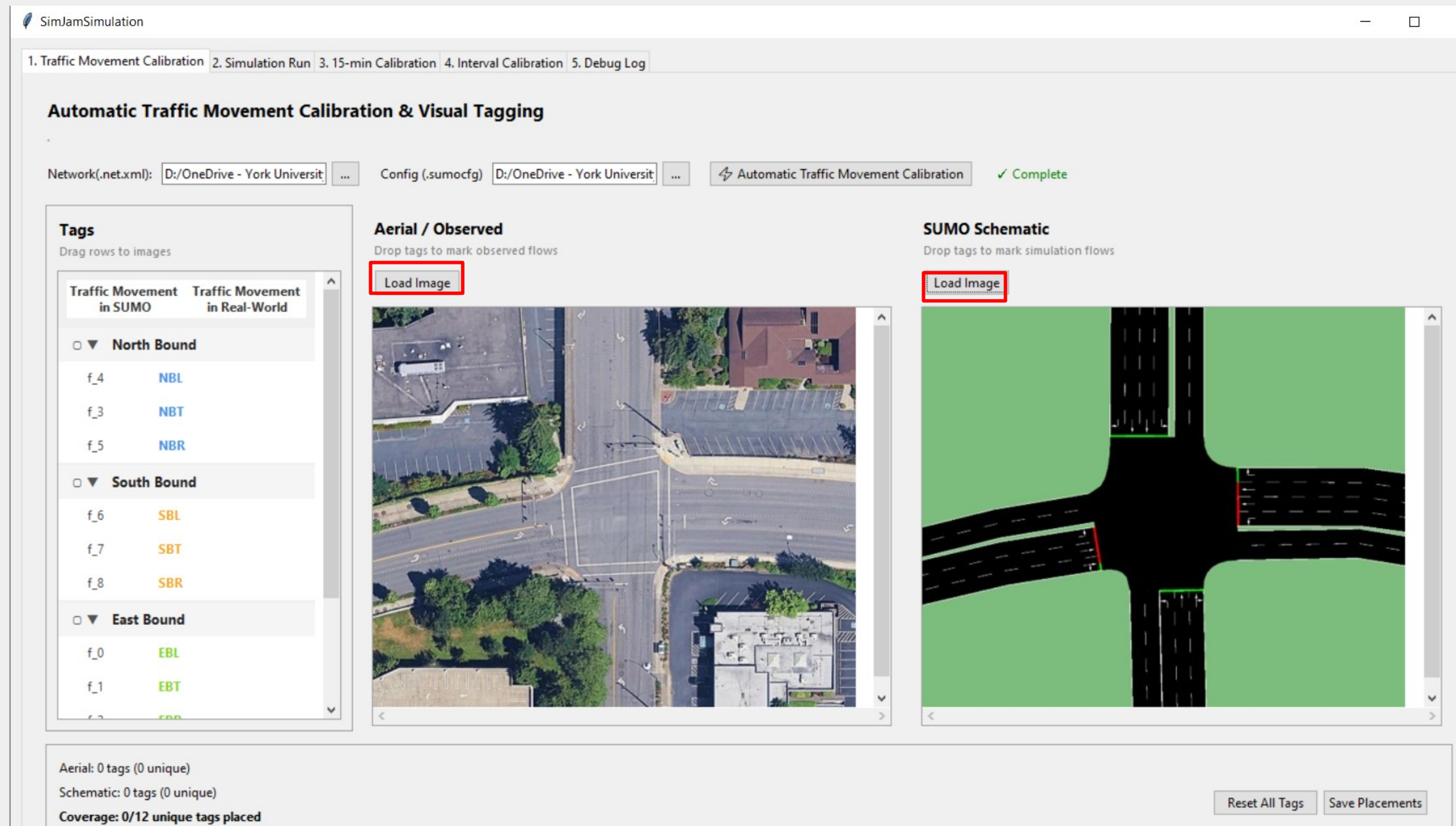


# Traffic Movement Calibration

4. Open SUMODT.cfg and zoom in → Change to real-world → take Screenshot → Save

5. Open QGISToSUMO.tif → Zoom in and take Screenshot → Save

6. Load Images of SUMO and Real-world in the App



# Deliverables

7. Drag and Drop tags to each image

8. Assing all the directions

9. After completing it, take a screenshot similar to below and submit (make sure you assigned all the tags)

**Tags**  
Drag rows to images

Flow	Movement
○ ▼ North Bound	
f_4	NBL
f_3	NBT
f_5	NBR
○ ▼ South Bound	
f_6	SBL
f_7	SBT
f_8	SBR
○ ▼ East Bound	
f_0	EBL
f_1	EBT
f_2	EBR

**SUMO Schematic**  
Drop tags to mark simulation flows

Load Image

**Aerial / Observed**  
Drop tags to mark observed flows

Load Image

# Traffic Volume Calibration using GEH

1. Click browse and Assign 15-Min Observed Data (The format is csv, download the data in material)
2. Click browse and Assign SUMO Network (.net.xml)
3. Click browse and Assign SUMO Config (.sumocfg)
4. Click browse and Assign Route File (.rou.xml)
5. Click browse and Assign Output Directory (Create an output folder first)
6. Traffic Light ID : J1
7. Run Calibration → you should see “Calibration complete”

Traffic Digital Twin Synchronization

1. Flow Mapping

2. Baseline Run

3. 15-min Calibration

4. Interval Calibration

5. Debug Log

Input Files

15-Min Observed Data:

D:/OneDrive - York University/Bussiness2/CodingPractical/Tutorials/

Browse

SUMO Network:

D:/OneDrive - York University/Bussiness2/CodingPractical/Tutorials/

Browse

SUMO Config:

D:/OneDrive - York University/Bussiness2/CodingPractical/Tutorials/

Browse

Existing Route File:

D:/OneDrive - York University/Bussiness2/CodingPractical/Tutorials/

Browse

Output Directory:

D:/OneDrive - York University/Bussiness2/CodingPractical/Tutorials/

Browse

Traffic Light ID:

J1

☐ Generate output files (calibrated\_routes\_final.rou.xml, calibration\_summary.csv, etc.)

Run Calibration

Stop

Calibration complete



# Traffic Volume Calibration using GEH

1. Open the “15-Min Calibration” tab.
2. The app automatically copies the observed 15-minute volumes into the simulation inputs for each movement.
3. The first two columns list the traffic movements (e.g., NBL, EBT).
4. The third column shows the observed 15-minute volume (collected from video).
5. The fourth column shows the simulated 15-minute volume for each movement.
6. The next column shows the hourly volumes (Observed and Simulated), converted from the 15-minute values.
7. The final column shows the GEH for each movement.

Traffic Digital Twin Synchronization

1. Flow Mapping 2. Baseline Run 3. 15-min Calibration 4. Interval Calibration 5. Debug Log

Adjust scale factors (0-50) and click Recalibrate to improve GEH

GEH Quality Assessment

Total movements (non-N/A): 12

GEH < 5: 12/12 (100.0%) | Target: ≥85% Status: ✓ EXCELLENT

GEH < 10: 12/12 (100.0%) | Target: 100%

Direction	Movement	15-Min Obs	15-Min Sim	Hourly Obs	Hourly Sim	GEH	Status	Scale Factor
North								
	LEFT	30	28	120	112	0.74	GOOD	<input type="text" value="1.0"/>
	THROUGH	143	129	572	516	2.40	GOOD	<input type="text" value="1.0"/>
	RIGHT	19	18	76	72	0.46	GOOD	<input type="text" value="1.0"/>
South								
	LEFT	22	21	88	84	0.43	GOOD	<input type="text" value="1.0"/>
	THROUGH	154	140	616	560	2.31	GOOD	<input type="text" value="1.0"/>
	RIGHT	24	24	96	96	0.00	GOOD	<input type="text" value="1.0"/>
East								
	LEFT	20	20	80	80	0.00	GOOD	<input type="text" value="1.0"/>
	THROUGH	100	98	400	392	0.40	GOOD	<input type="text" value="1.0"/>
	RIGHT	21	21	84	84	0.00	GOOD	<input type="text" value="1.0"/>
West								
	LEFT	24	24	96	96	0.00	GOOD	<input type="text" value="1.0"/>
	THROUGH	129	127	516	508	0.35	GOOD	<input type="text" value="1.0"/>
	RIGHT	25	25	100	100	0.00	GOOD	<input type="text" value="1.0"/>

Recalibrate Export 15-Min Calibrated Observed Data



# Traffic Volume Calibration using GEH

**8. Status column:** shows the GEH result for each movement. A movement is Good when  $GEH < 5$ .

**9. GEH Quality Assessment:** summarizes overall calibration quality. The target is at least 85% of movements with  $GEH < 5$ .

**10. If any movement has  $GEH \geq 5$ , do this:**

- I. Compare Hourly Observed vs Hourly Simulated volume for that movement.
- II. If Simulated > Observed, reduce the Scale Factor (set < 1) and click Recalibrate.
- III. If Simulated < Observed, increase the Scale Factor (set > 1) and click Recalibrate.
- IV. Repeat steps I–III until the movement reaches Acceptable or Excellent GEH.

Traffic Digital Twin Synchronization

1. Flow Mapping 2. Baseline Run 3. 15-min Calibration 4. Interval Calibration 5. Debug Log

Adjust scale factors (0-50) and click Recalibrate to improve GEH

GEH Quality Assessment

Total movements (non-N/A): 12

GEH < 5: 12/12 (100.0%) | Target: ≥85%      Status: ✓ EXCELLENT

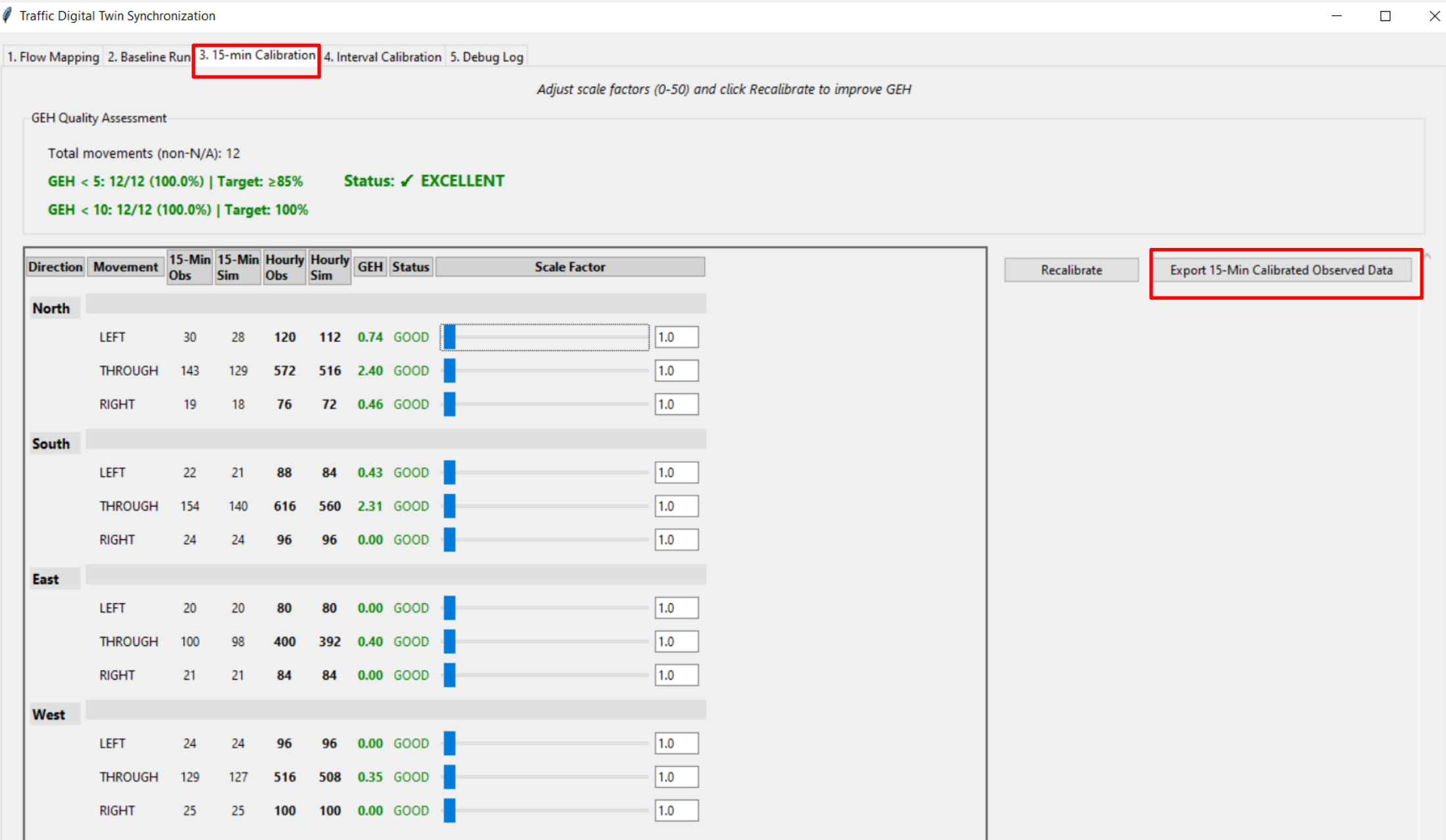
GEH < 10: 12/12 (100.0%) | Target: 100%

Direction	Movement	15-Min Obs	15-Min Sim	Hourly Obs	Hourly Sim	GEH	Status	Scale Factor
North								
North	LEFT	30	28	120	112	0.74	GOOD	1.0
	THROUGH	143	129	572	516	2.40	GOOD	1.0
	RIGHT	19	18	76	72	0.46	GOOD	1.0
South								
South	LEFT	22	21	88	84	0.43	GOOD	1.0
	THROUGH	154	140	616	560	2.31	GOOD	1.0
	RIGHT	24	24	96	96	0.00	GOOD	1.0
East								
East	LEFT	20	20	80	80	0.00	GOOD	1.0
	THROUGH	100	98	400	392	0.40	GOOD	1.0
	RIGHT	21	21	84	84	0.00	GOOD	1.0
West								
West	LEFT	24	24	96	96	0.00	GOOD	1.0
	THROUGH	129	127	516	508	0.39	GOOD	1.0
	RIGHT	25	25	100	100	0.00	GOOD	1.0

Recalibrate      Export 15-Min Calibrated Observed Data

# Traffic Volume Calibration using GEH

- 11. Once you are satisfied with the results, click “**Export 15-Min Calibrated Observed Data.**”
- 12. This creates a CSV file containing **the calibrated 15-minute traffic volumes** (by movement) for use in the simulation.
- 13. See the next slide for how to use/import the exported file



# Traffic Volume Calibration using GEH

## 14. Compare the two files

- **Left:** 15-Min Observed Data.csv (raw counts from video)
- **Right:** 15-Min Calibrated Data.csv (exported after GEH calibration)

## “15-Min Observed Data.csv”

[illegible]

## Exported “15-Min Calibrated Data.csv”

[illegible]