# RWR 4015

# Traffic Simulation for Planning Applications

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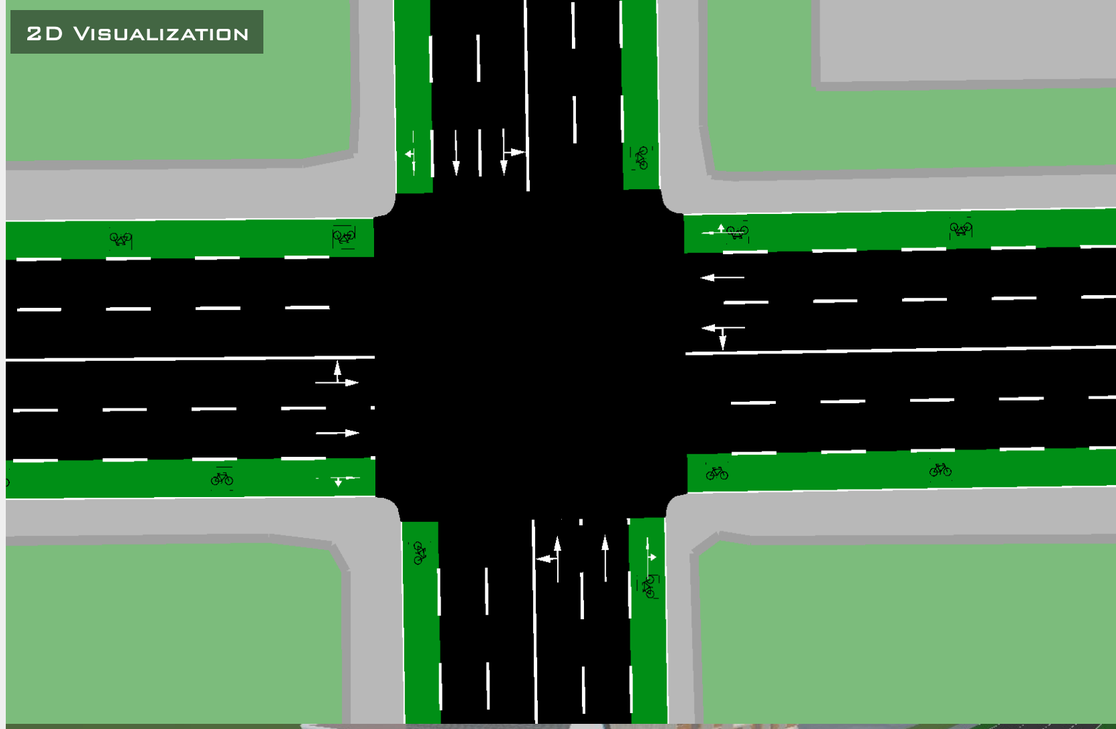
## Week 5 | Hands-on: Demand Modelling and Route Assignment

Fall 2026

RoadwayVR

roadwayvr.github.io/TrafficSimulationforPlanningApplications



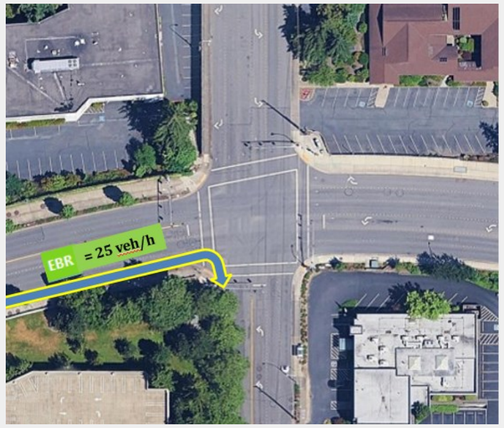

# Agenda

❑ Demand Modelling and Route Assignment

| | |
|---|---|
| 1. Road Network Development<br>2. Traffic Signal Timing | Provided |
| 3. Traffic Movement<br>4. Traffic Volume<br>5. Traffic Speed | This Session |

# Traffic Movement & Volume Calibration

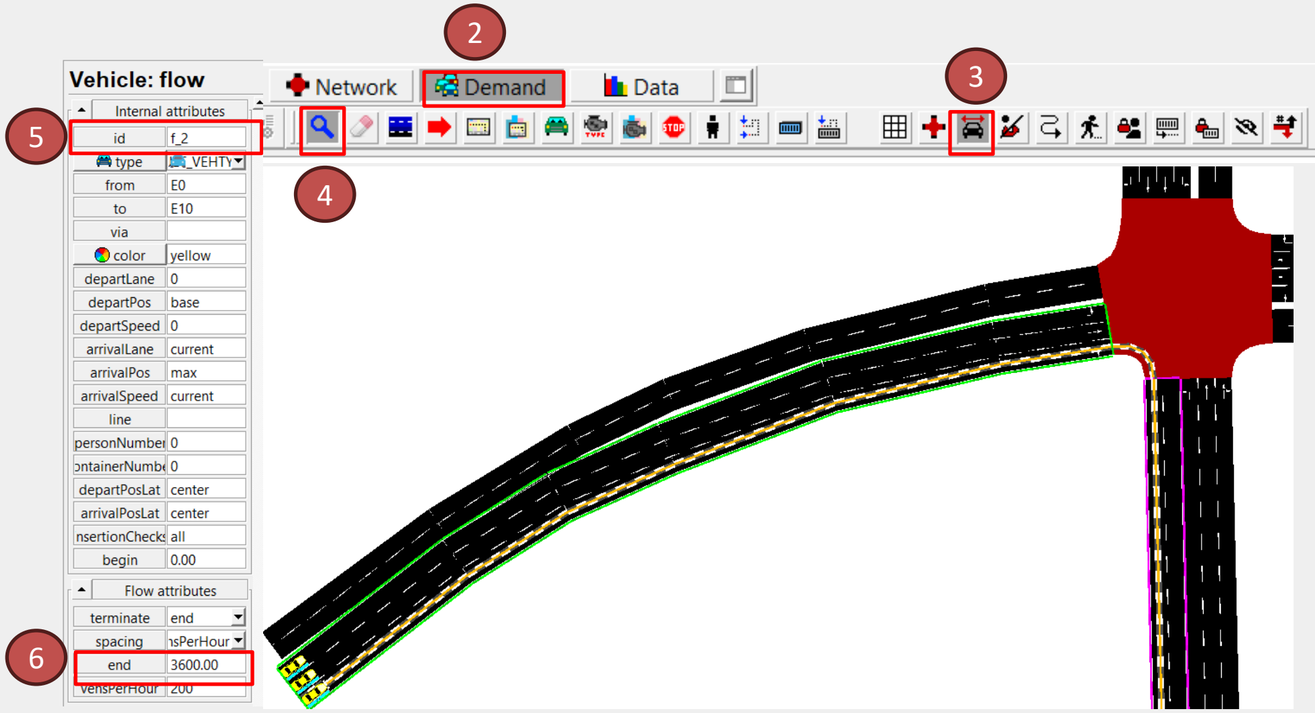
- ❑ Download Exercise 1 Response




# 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 f2, 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.

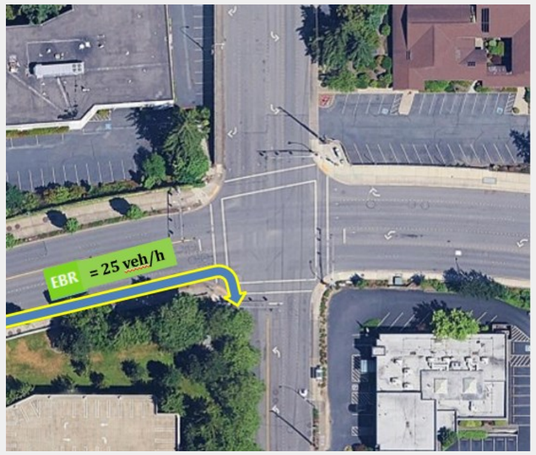
B) It generates **200 vehicles randomly in each hour**, meaning the model tries to average 200 but the exact count can vary.

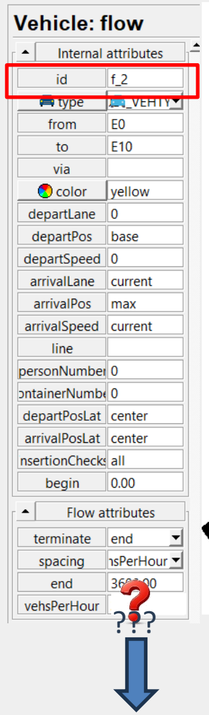
C) It generates **200 vehicles each minute** (so 12,000 vehicles per hour).

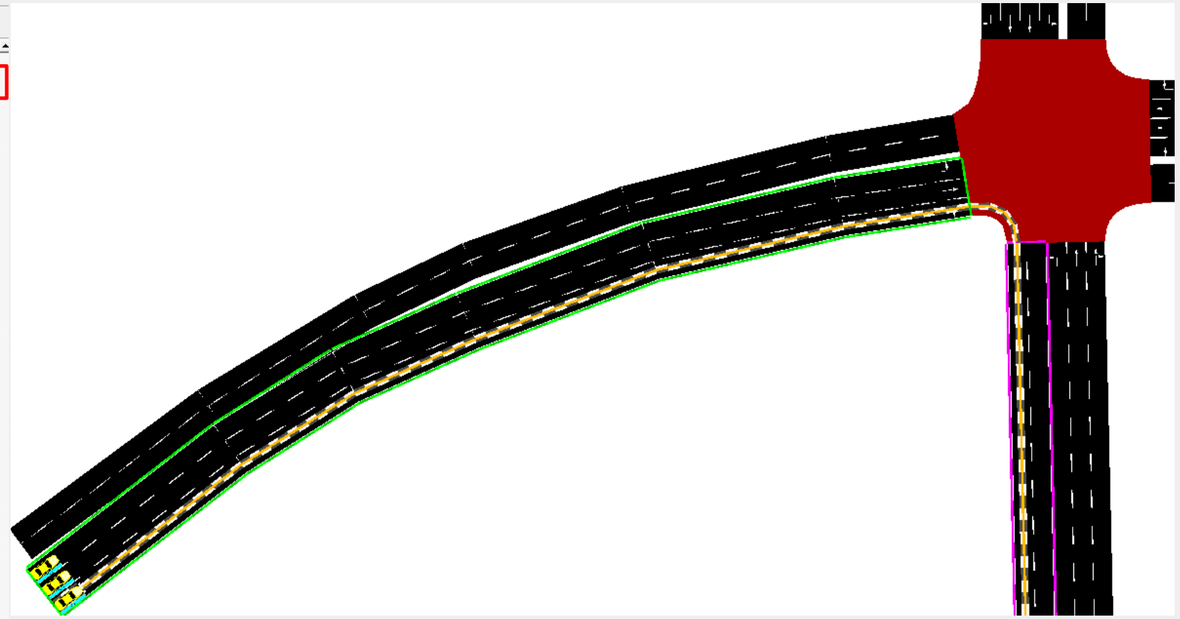
D) It generates **200 vehicles total for the whole simulation**, regardless of simulation duration.

# Traffic Movement and Volume Calibration

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

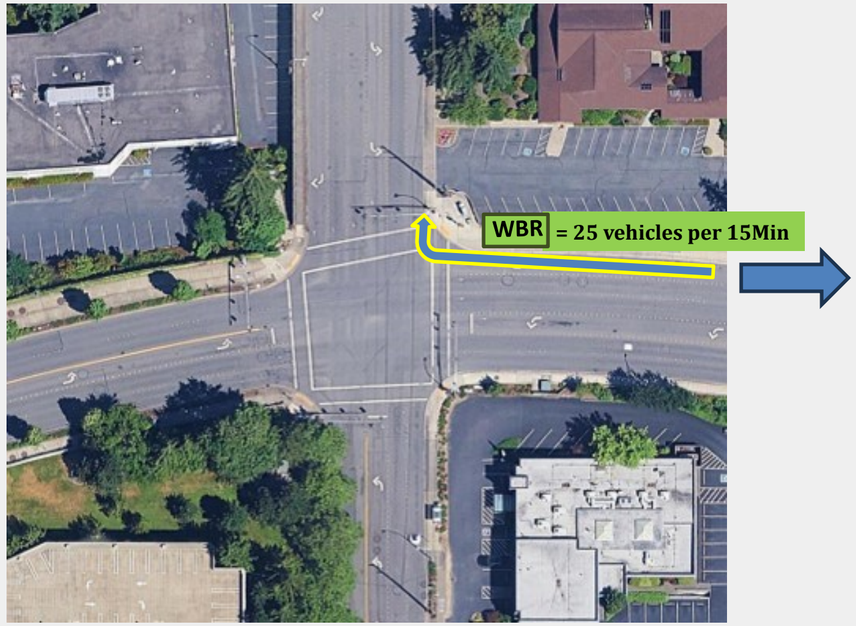


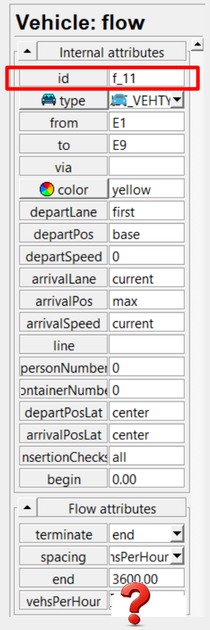



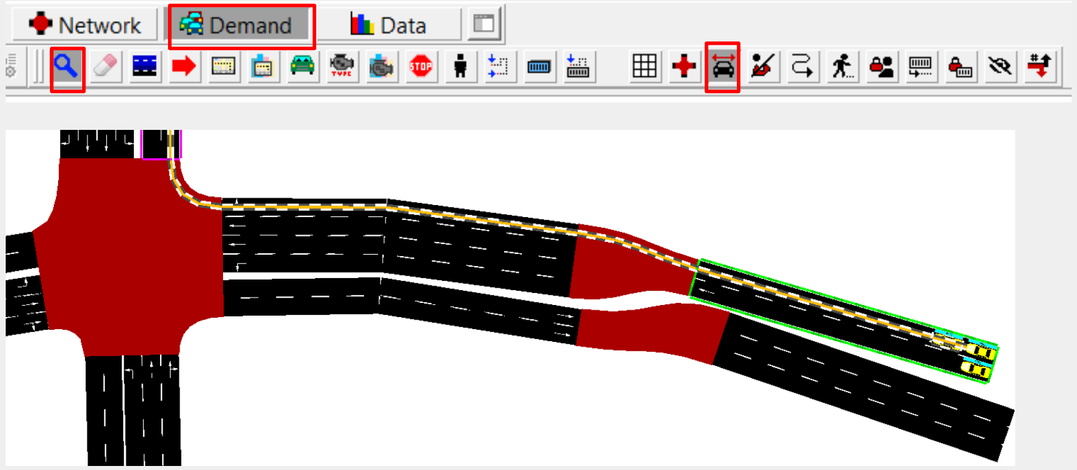



# Traffic Movement and Volume Calibration

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




???

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:**

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

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

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

**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 ~ 85% of traffic movements

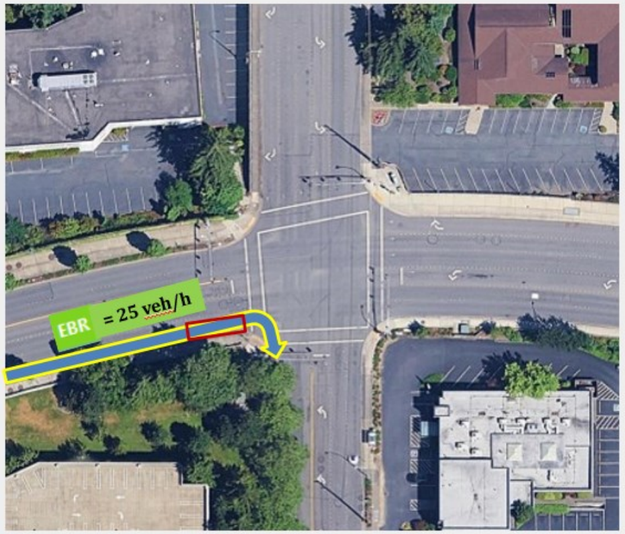
# Traffic Volume Calibration using GEH

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)

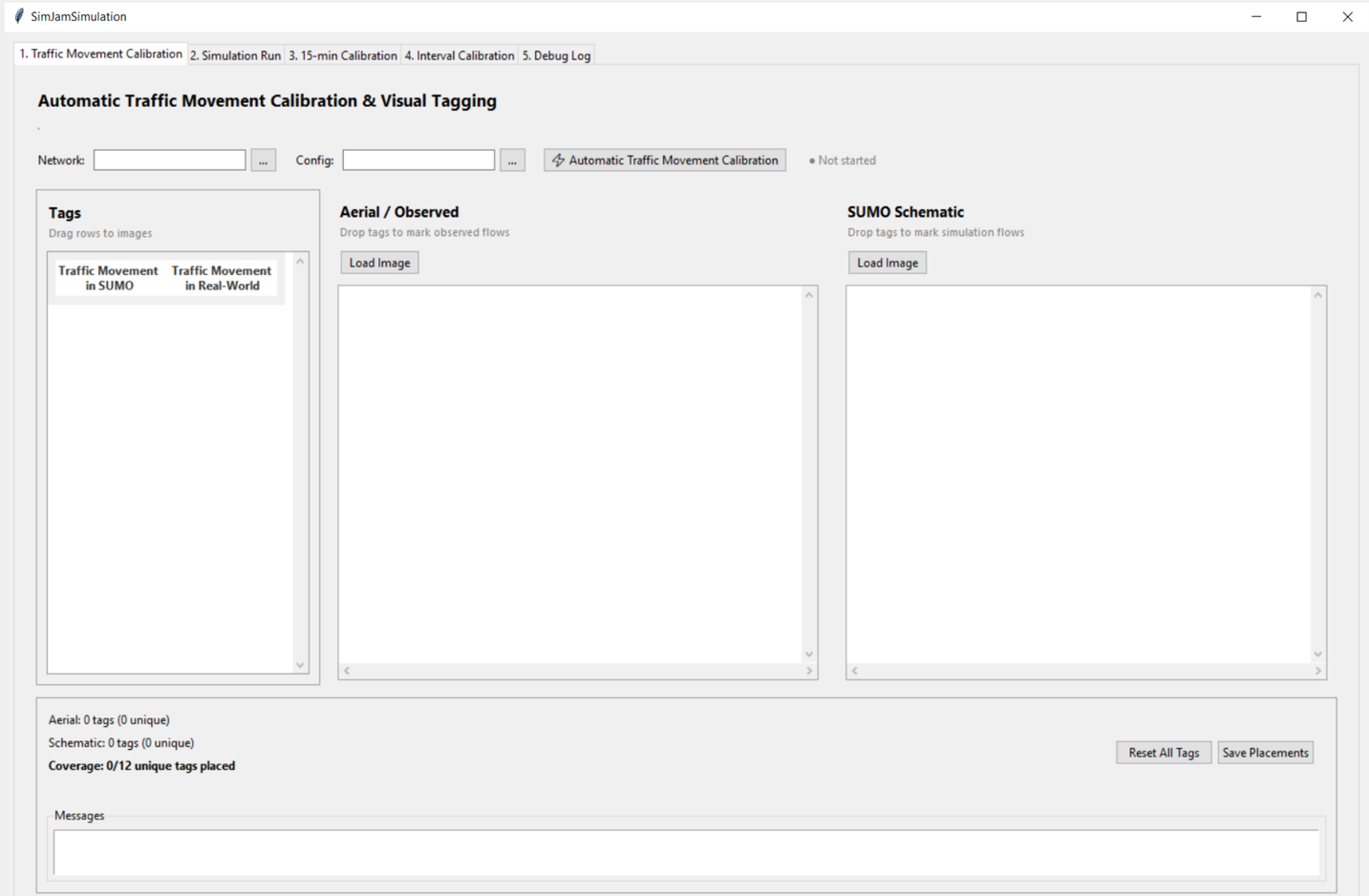
# Traffic Volume Calibration using GEH

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

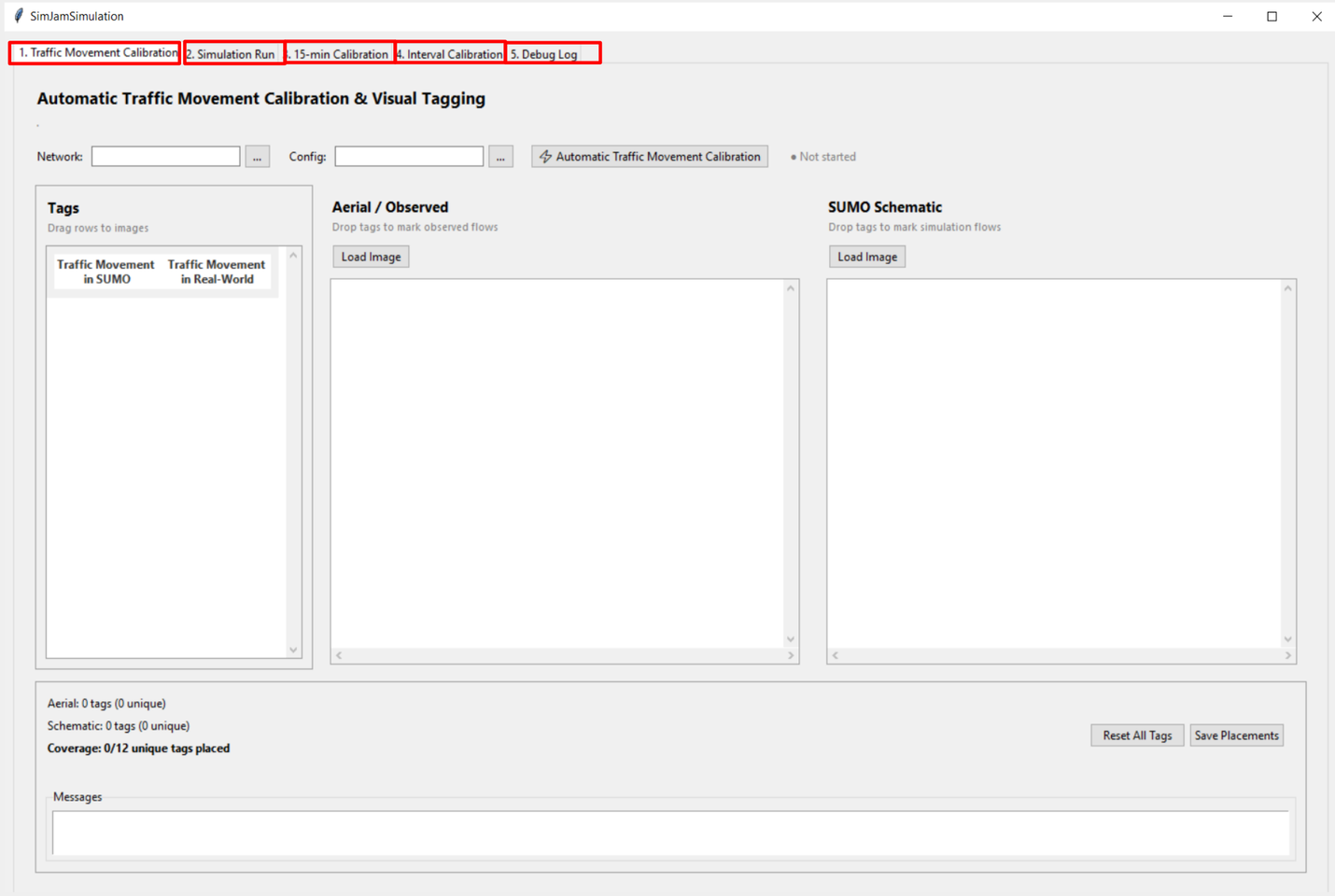


# SimJamSimulation App

# SimJamSimulation App

1. The SimJamSimulation app automatically perform

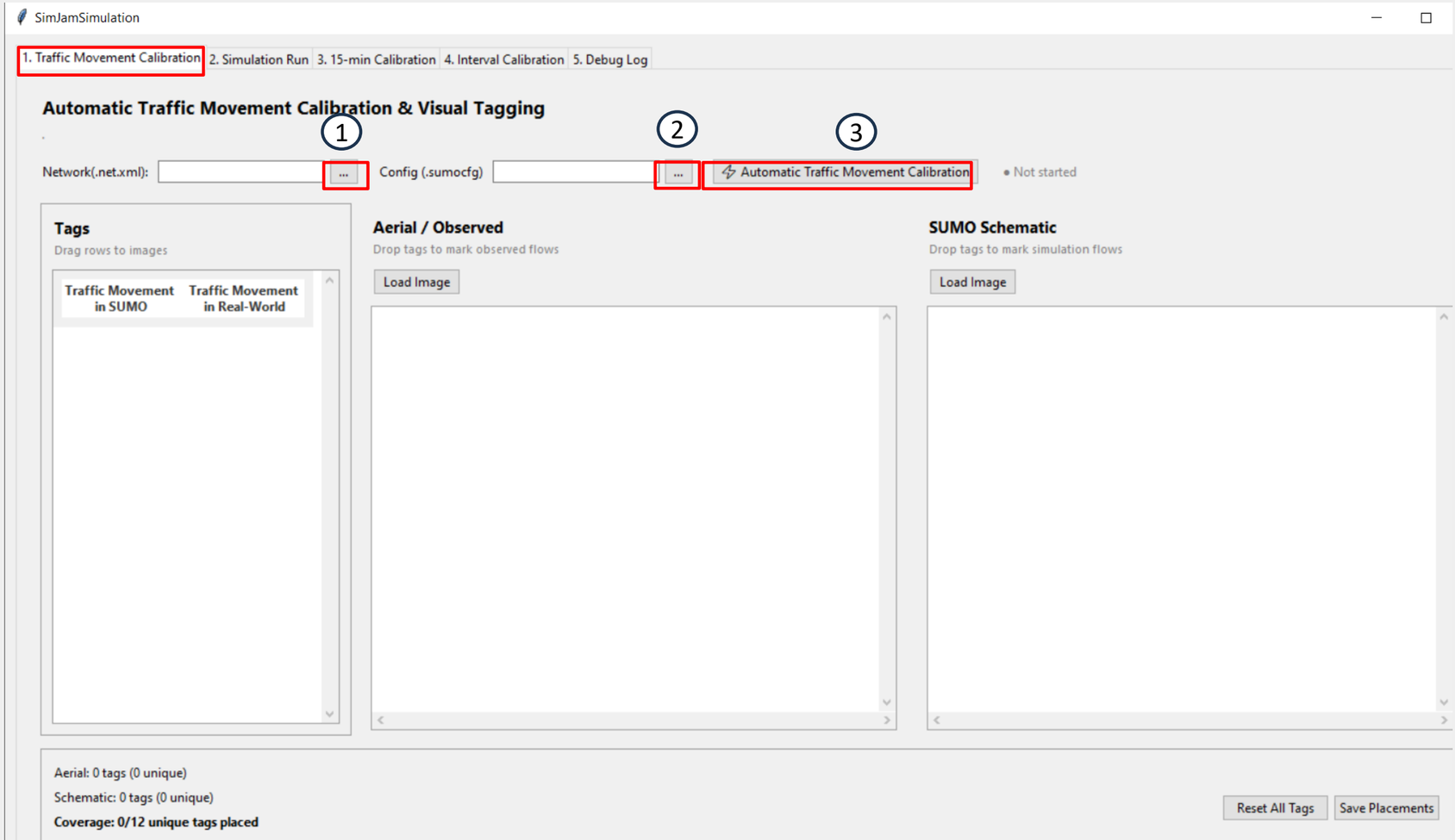
Traffic Movement & Volume Calibration using GEH



# Traffic Movement Calibration

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

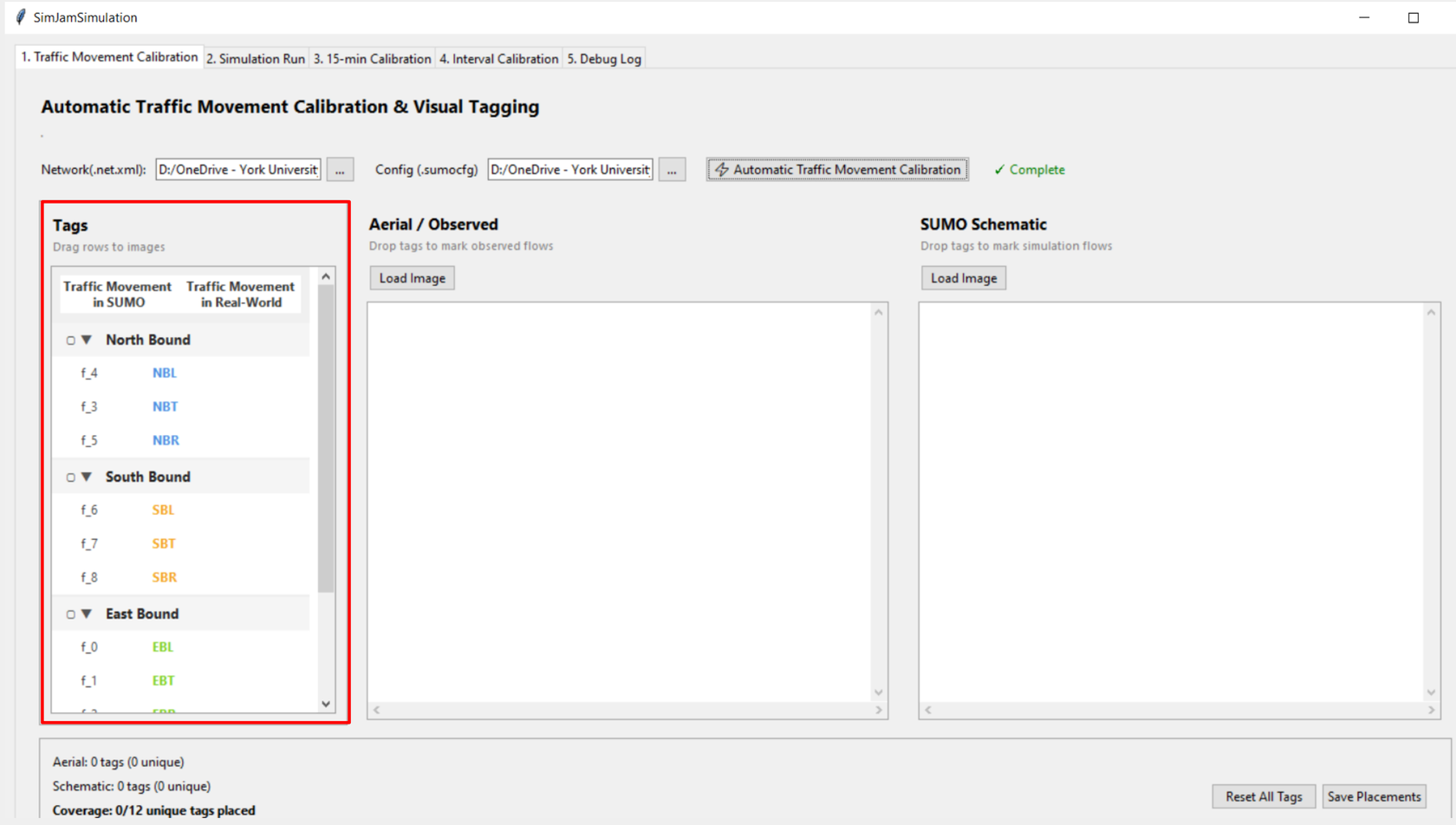
→ Click Automatic “Traffic Movement Calibration”



# Traffic Movement Calibration

3. Traffic Movement Calibration is automatically done

See the information in Red box.

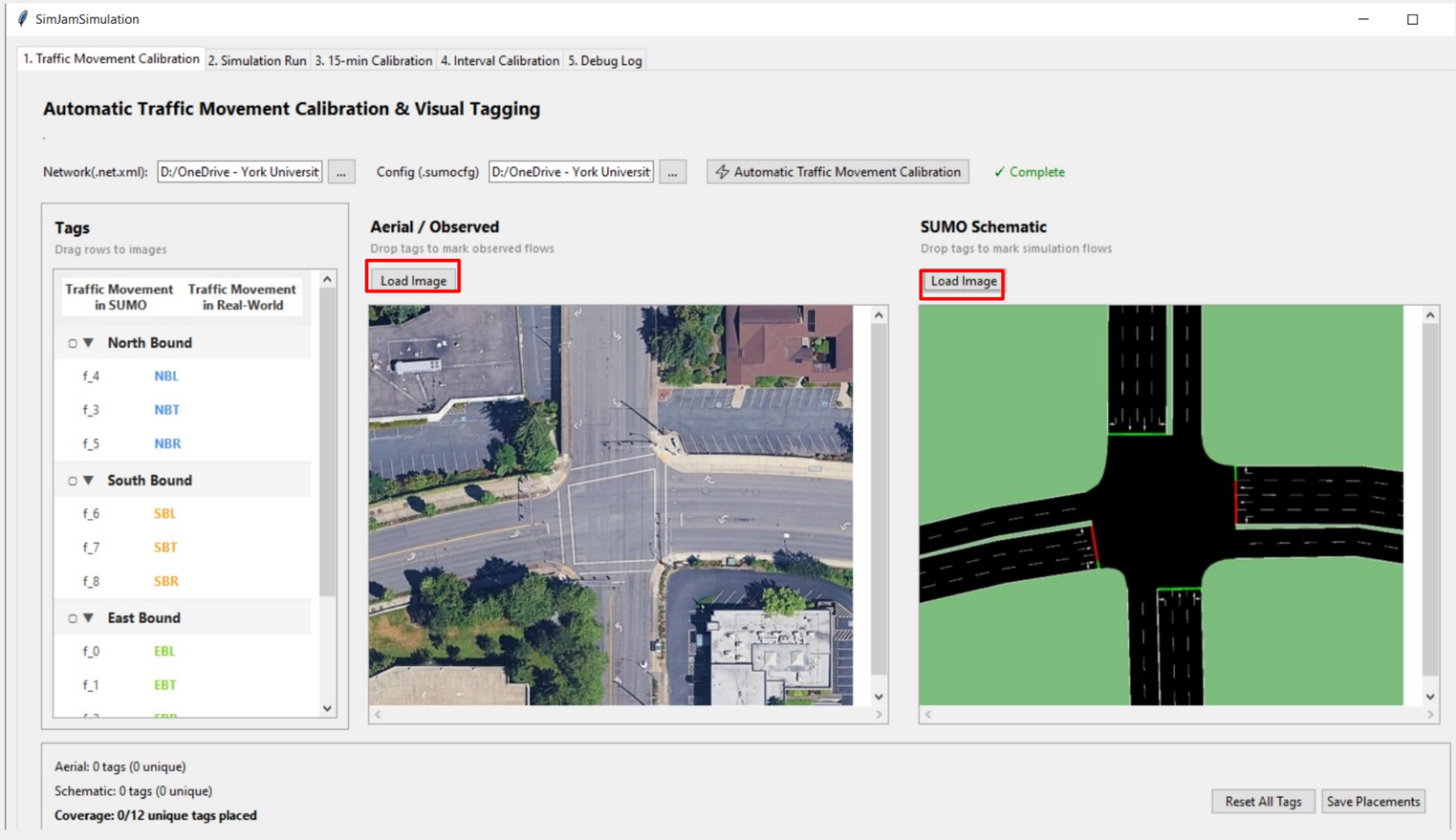


# Traffic Movement Calibration

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

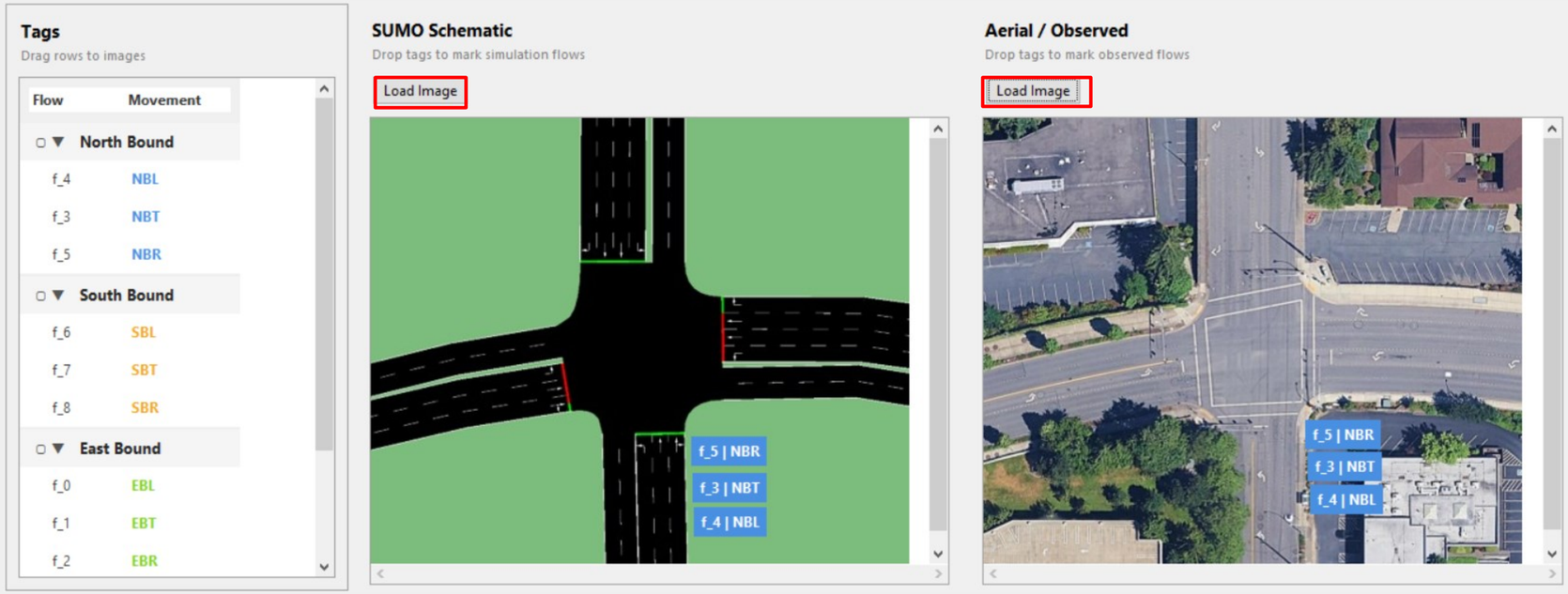


# Deliverables

7. Drag and Drop tags to each image

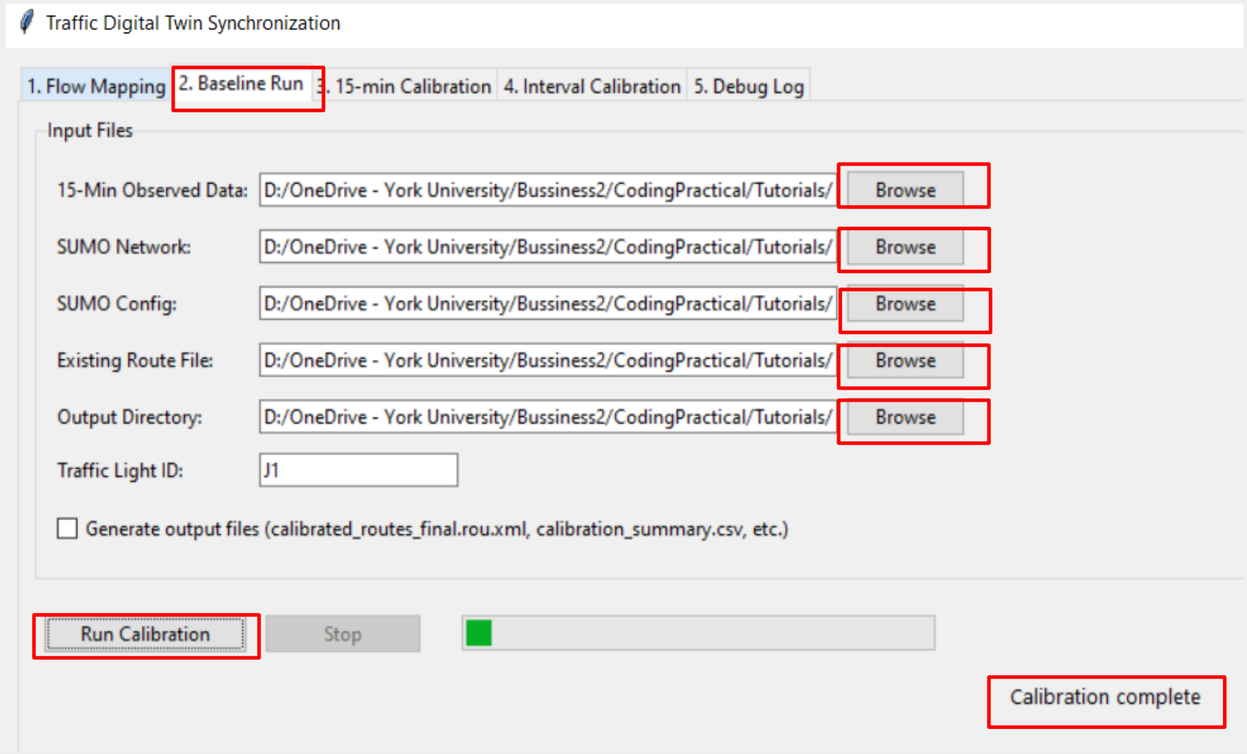
8. Assing all the directions

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



# 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 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.

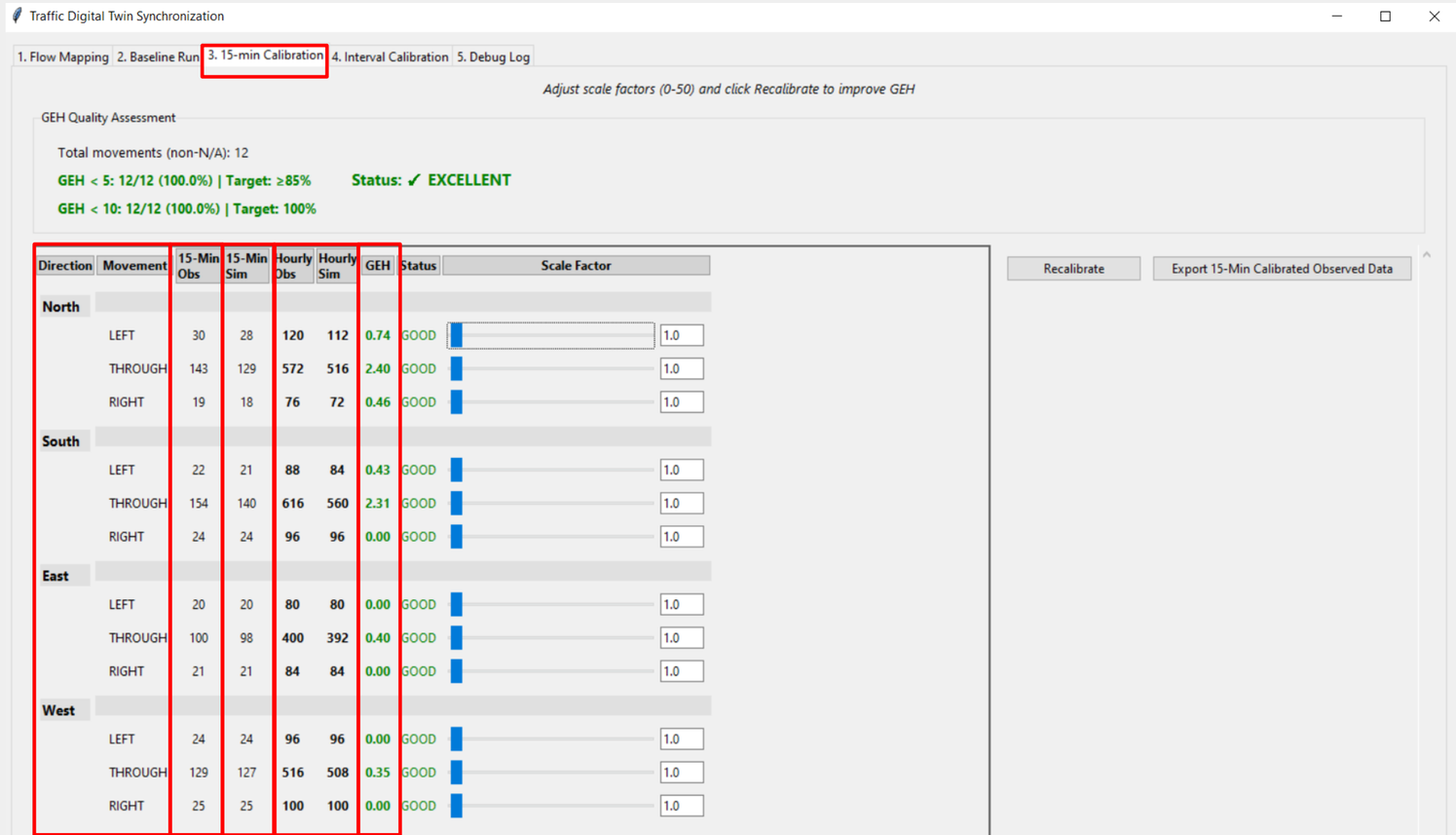
3. The first two columns list the traffic movements (e.g., NBL, EBT).

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.




| 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 | 1.0 |
| | THROUGH | 143 | 129 | 572 | 516 | 2.40 | GOOD | 1.0 |
| | RIGHT | 19 | 18 | 76 | 72 | 0.46 | GOOD | 1.0 |
| 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 | | | | | | | | |
| | 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 | | | | | | | | |
| | LEFT | 24 | 24 | 96 | 96 | 0.00 | GOOD | 1.0 |
| | THROUGH | 129 | 127 | 516 | 508 | 0.35 | GOOD | 1.0 |
| | RIGHT | 25 | 25 | 100 | 100 | 0.00 | GOOD | 1.0 |

# 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.

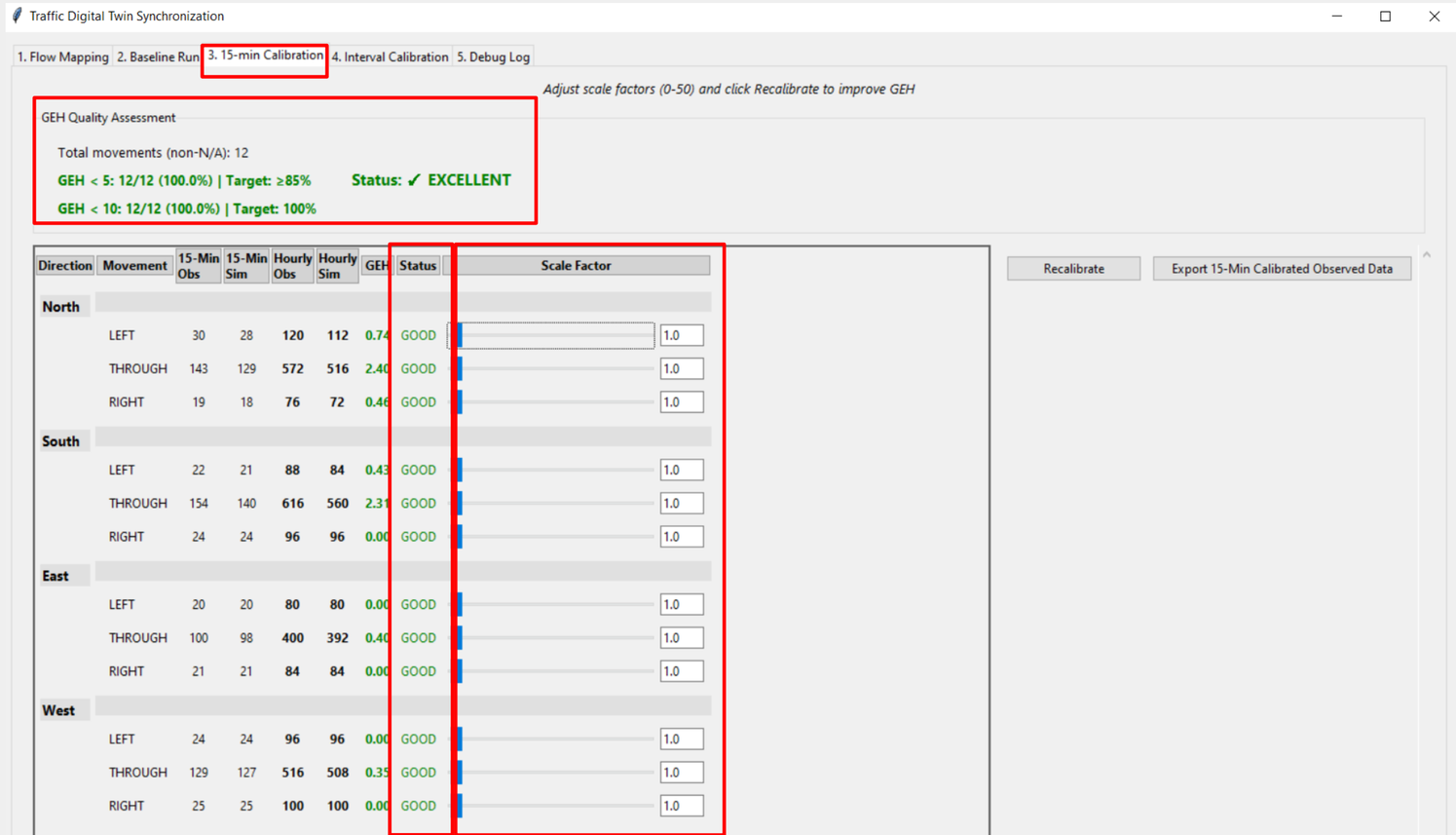
**10. If any movement has GEH ≥ 5, do this:**

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.

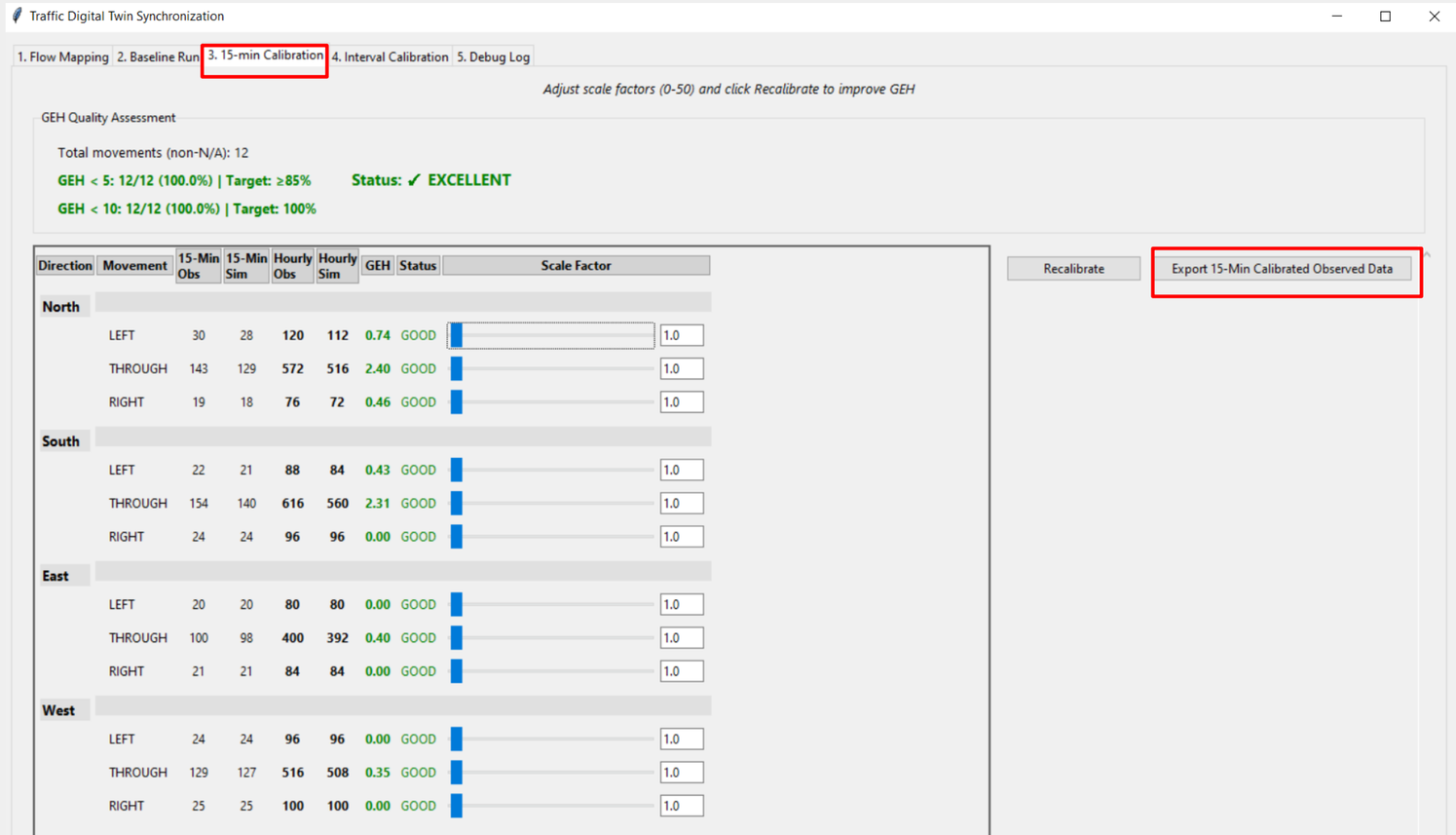


# Traffic Volume Calibration using GEH

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




| 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 | 1.0 |
| | THROUGH | 143 | 129 | 572 | 516 | 2.40 | GOOD | 1.0 |
| | RIGHT | 19 | 18 | 76 | 72 | 0.46 | GOOD | 1.0 |
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| | LEFT | 20 | 20 | 80 | 80 | 0.00 | GOOD | 1.0 |
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| West | | | | | | | | |
| | LEFT | 24 | 24 | 96 | 96 | 0.00 | GOOD | 1.0 |
| | THROUGH | 129 | 127 | 516 | 508 | 0.35 | GOOD | 1.0 |
| | RIGHT | 25 | 25 | 100 | 100 | 0.00 | GOOD | 1.0 |

# 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"

| | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Minute | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR |
| 2 | All | 30 | 143 | 19 | 22 | 154 | 24 | 20 | 100 | 21 | 24 | 129 | 25 |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |

Exported "15-Min Calibrated Data.csv"

| | A | B | C | D | E | F | G | H | I | J | K | L | M |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Minute | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR |
| 2 | All | 30 | 143 | 19 | 22 | 154 | 24 | 20 | 100 | 21 | 24 | 129 | 25 |
| 3 | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | | |
| 15 | | | | | | | | | | | | | |
| 16 | | | | | | | | | | | | | |