Identification of evasive action in traffic conflicts

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Why bother?

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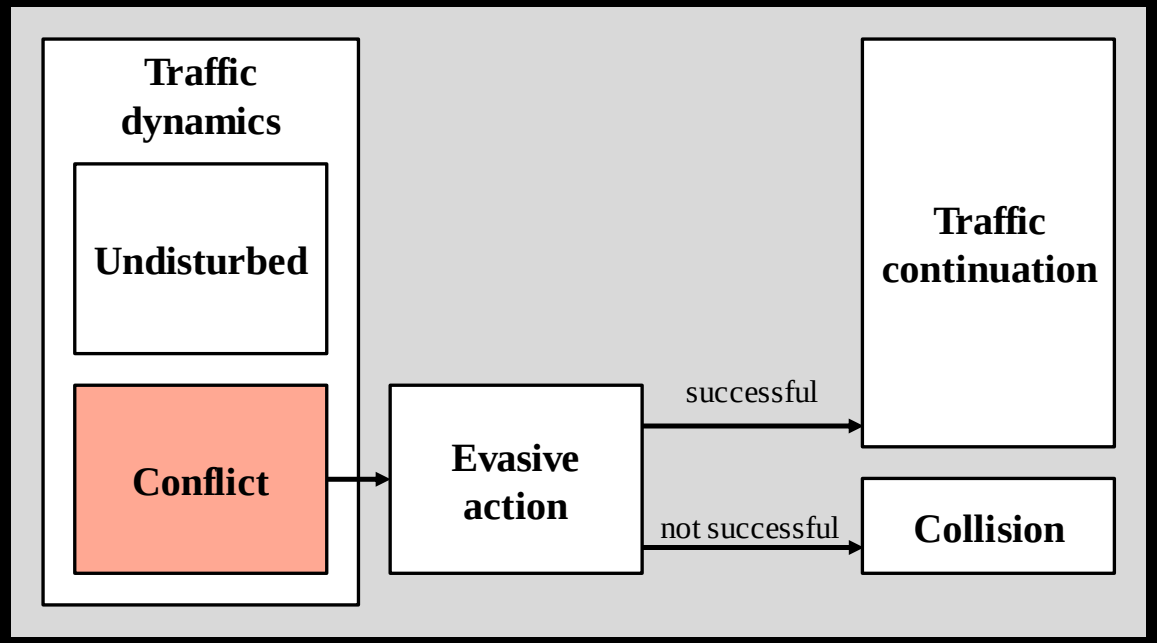
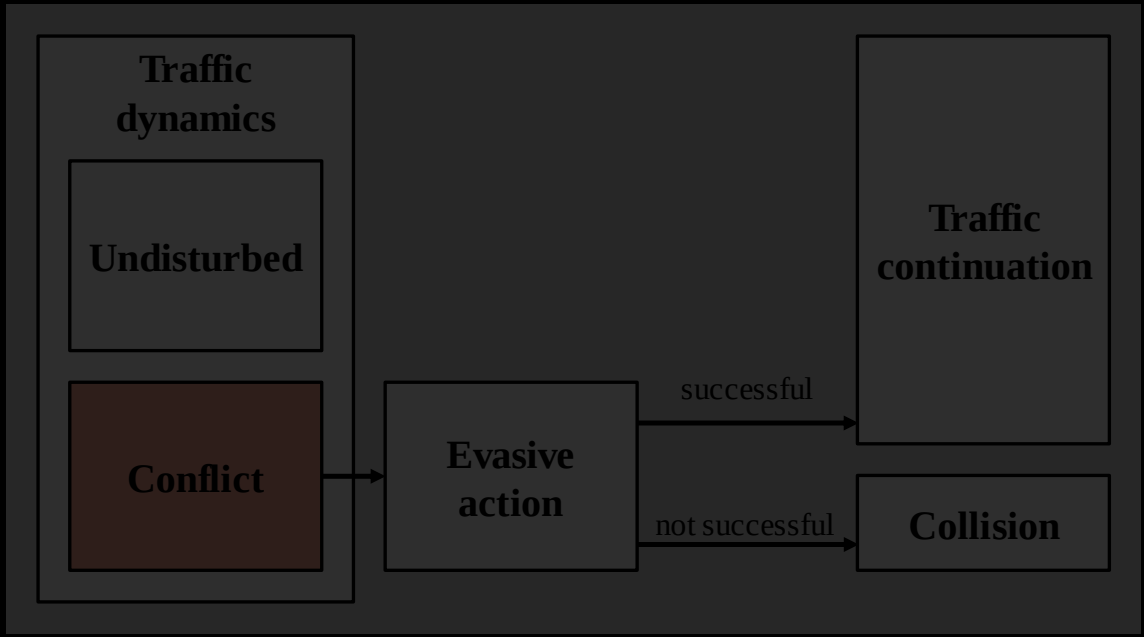
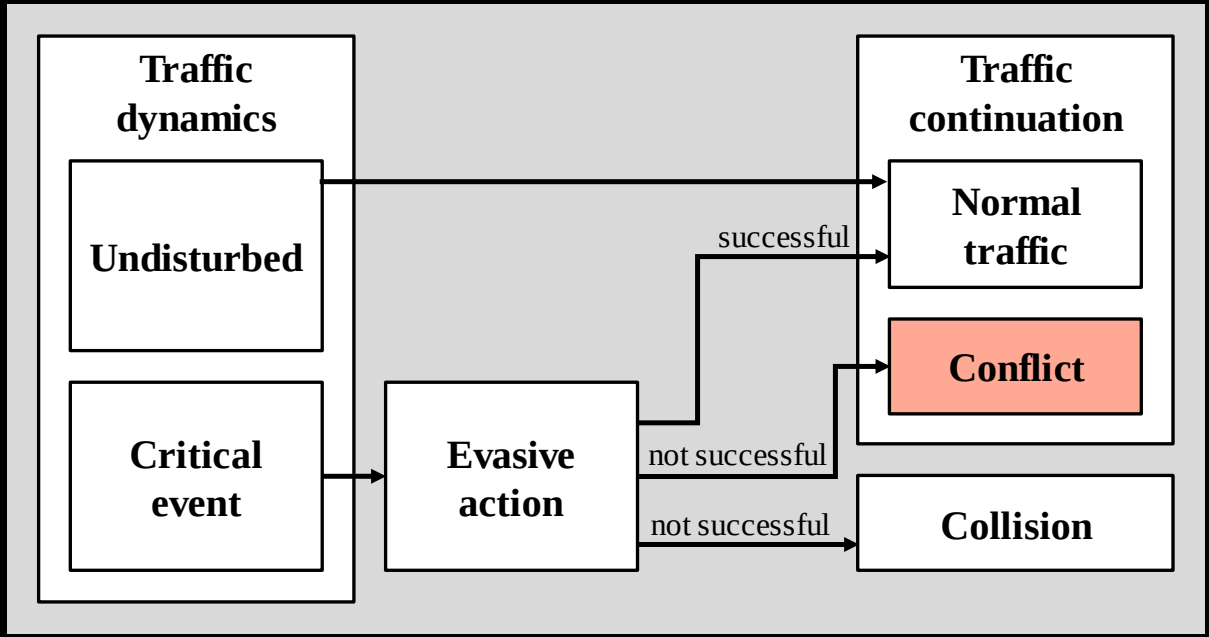


Güttinger, 1982

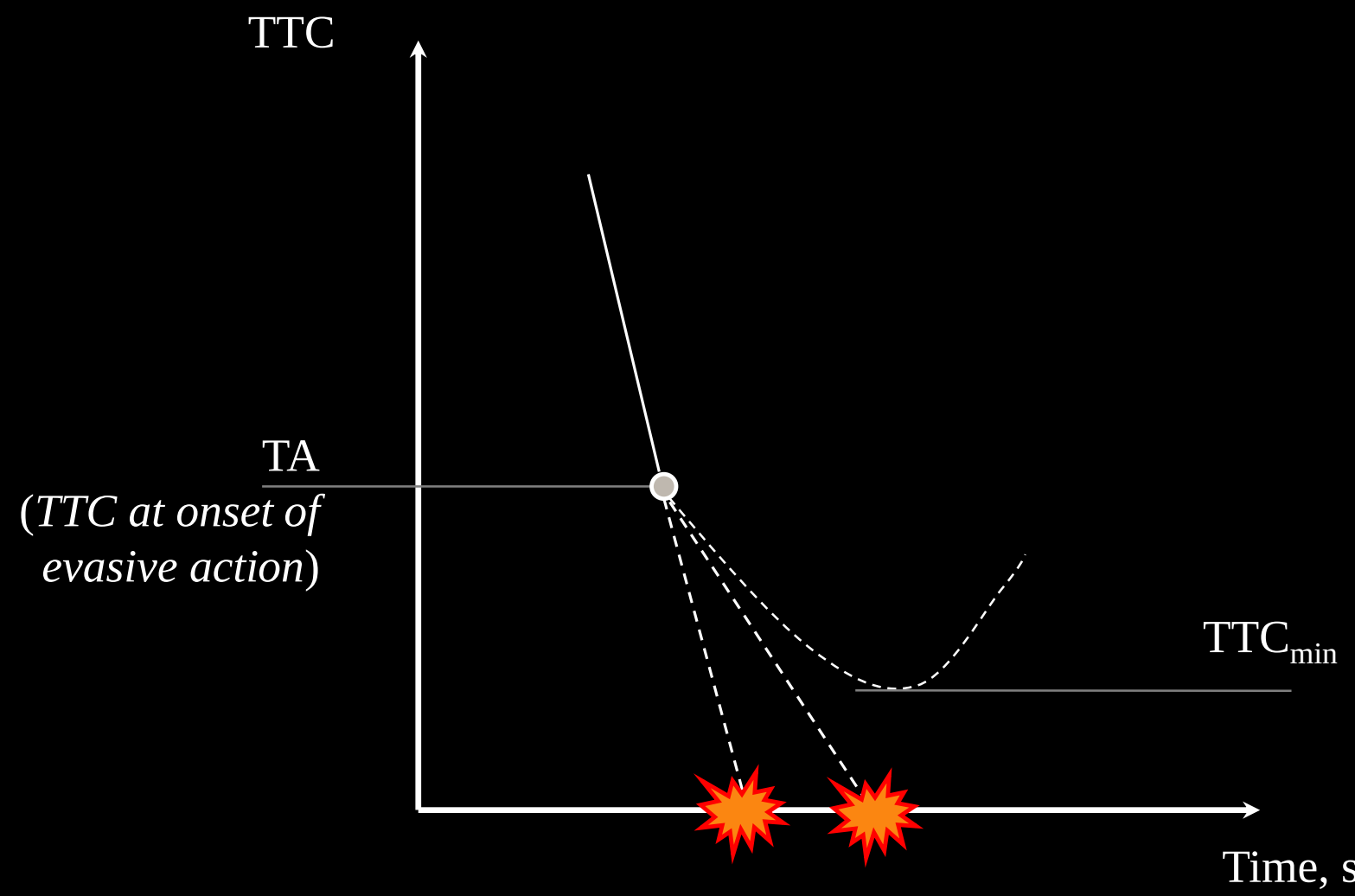
Why bother?



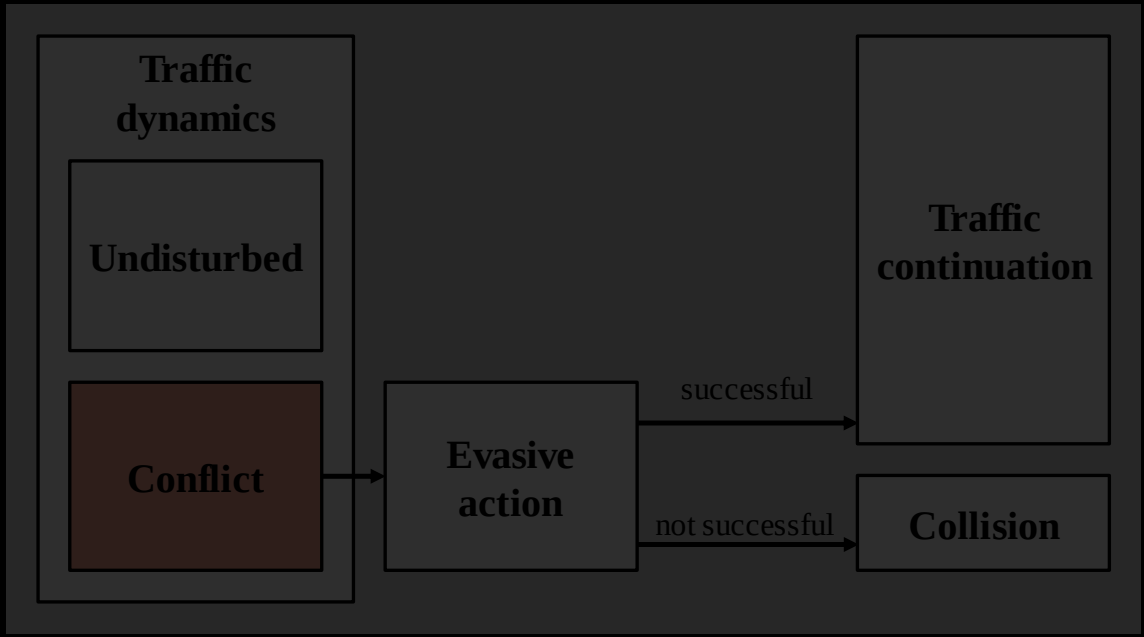


Güttinger, 1982

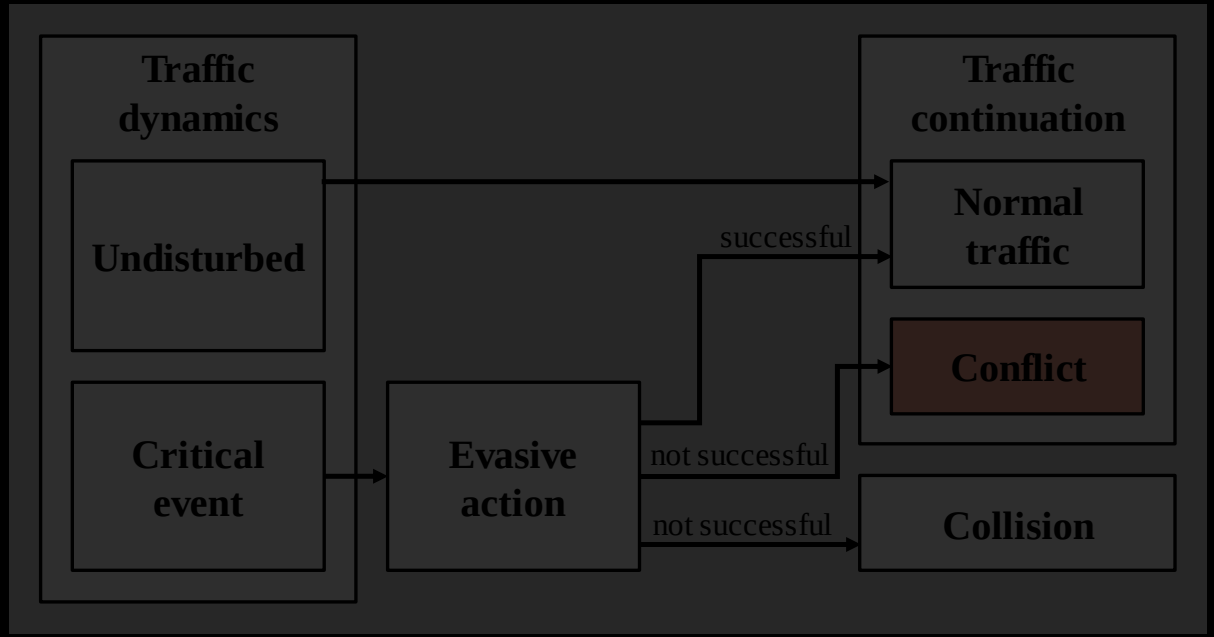
Continuous indicators (t.ex. TTC)



Why bother?



TA
(*TTC at onset of Evasive Action*)



TTC_{min}

Güttinger, 1982

Why bother?

Continuous indicators

Motion prediction issues

Lefèvre et al. (2014)
Mohamed & Saunier (2013)

Why bother?

Continuous indicators

Motion prediction issues

Severity is ‘decided’ at EA onset

Yastremska-Kravchenko (2022)
Kruysse & Wijlhuizen (1992)
Kruysse (1991)

Why bother?

Continuous indicators

Motion prediction issues

Severity is ‘decided’ at EA onset

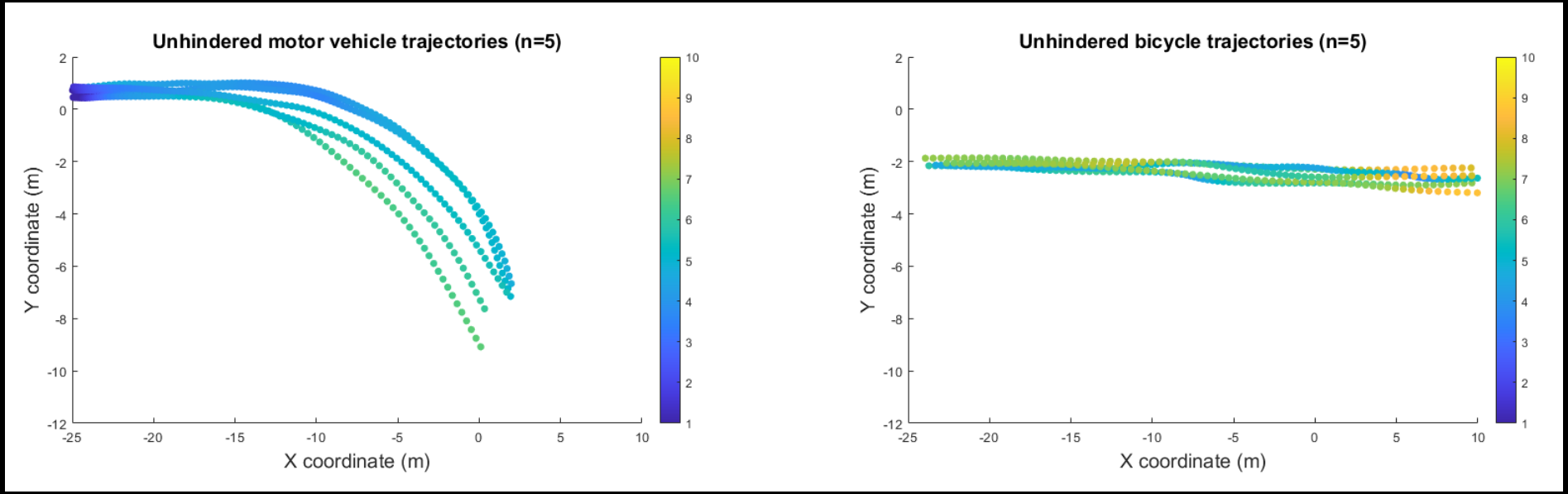
Validation studies

Svensson (1992)
Grayson (1984)

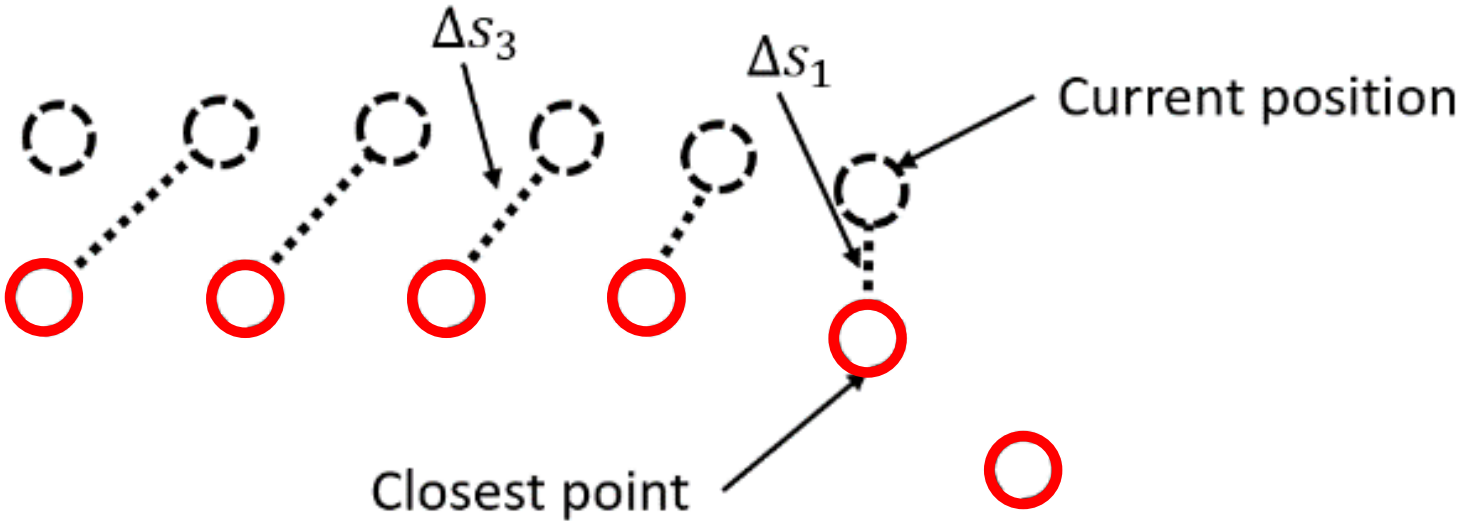
Method

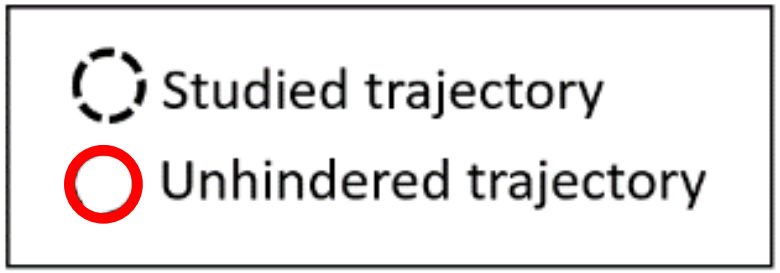
Studied site & interaction

Trajectory ‘similarity’



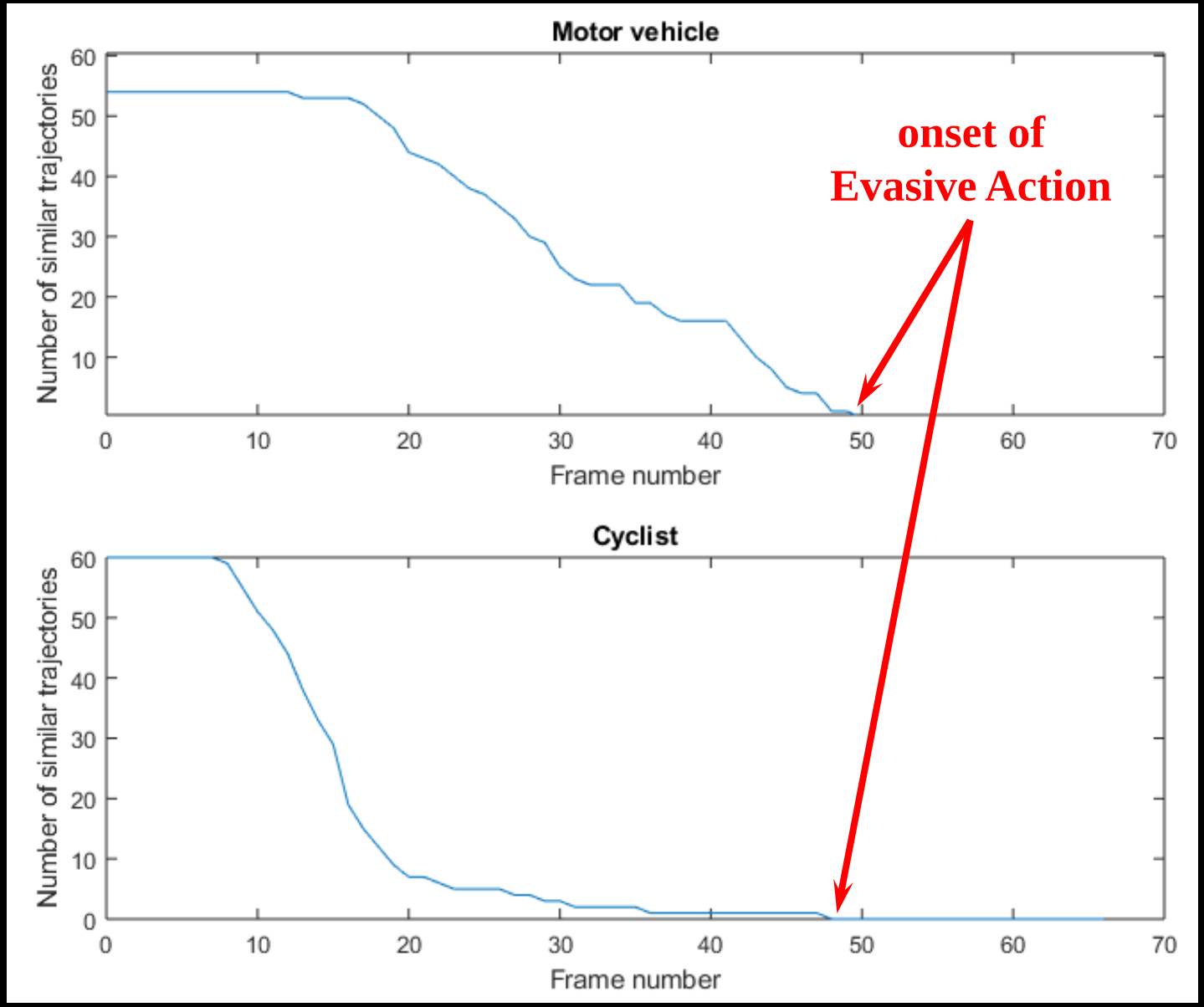
Similarity measure



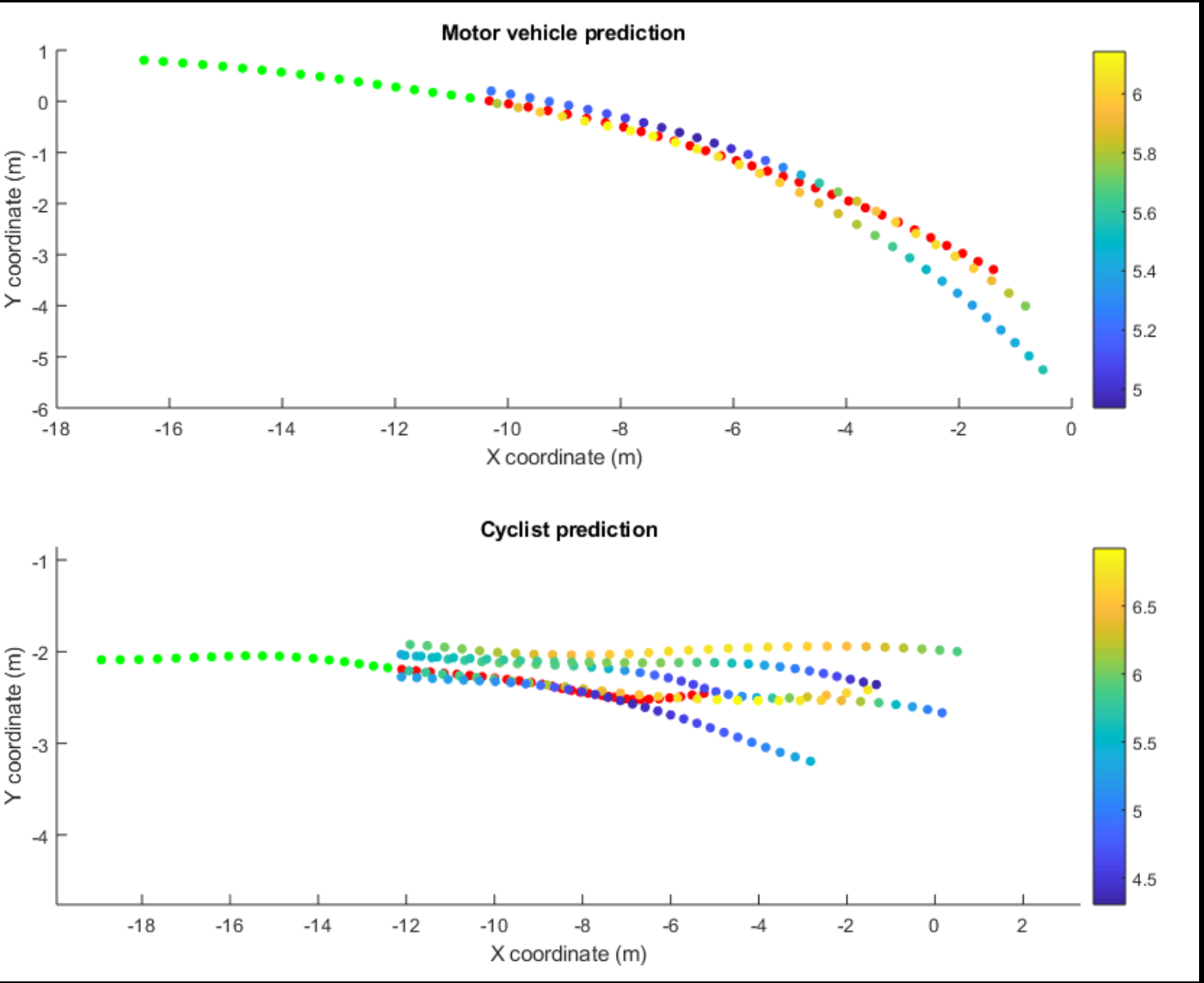


$$Similarity_t = \frac{\sum_1^n \Delta s_i}{n}$$

Number of ‘similar’ trajectories



Motion prediction



Probability of a collision course (PCC)

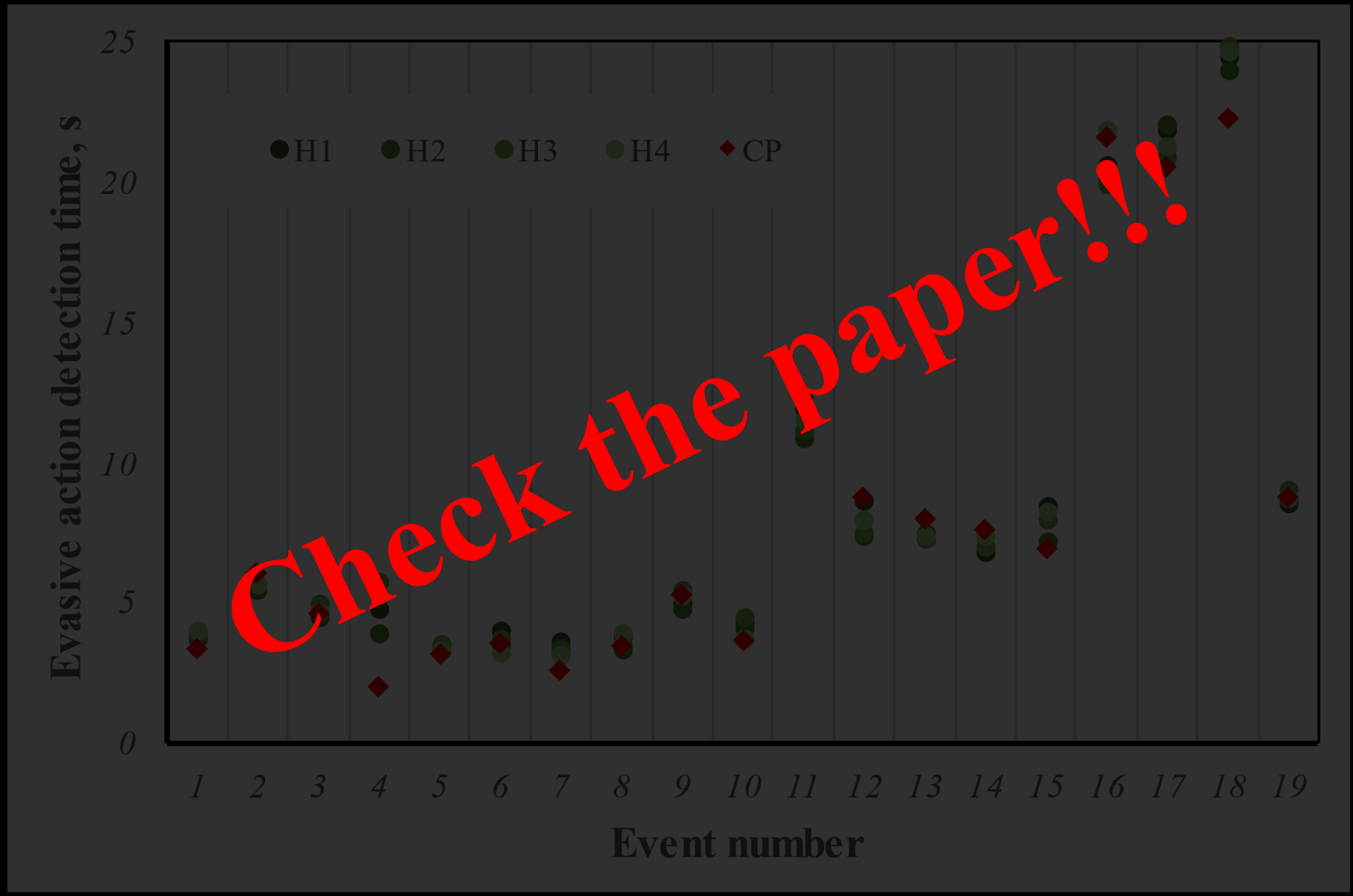
+

Probabilistic TTC

$$TTC = \frac{\sum_{i=1}^{n}(p_i \cdot TTC_i)}{\sum_{i=1}^{n} p_i},$$

Saunier et al. (2010)

Calibration & validation


Evasive action detection time, s
25
20
15
10
5
0
H1
H2
H3
H4
CP
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
Event number
Check the paper!!!

Exploration

Interaction types

No detected evasive action

Interaction types

No detected evasive action

Detected evasive action, no collision course (PCC=0)

Interaction types

No detected evasive action

Detected evasive action, no collision course (PCC=0)

Detected evasive action, PCC>0

Interaction types

No detected evasive action,

Detected evasive action, no collision course (PCC=0)

Detected evasive action, PCC>0

Immediately detected evasive action:

Interaction types

No detected evasive action,

Detected evasive action, no collision course (PCC=0)

Detected evasive action, PCC>0

Immediately detected evasive action:

- ‘abnormal’ manoeuvres
- already in an interaction

Normal interactions vs. conflicts

Category	All encounters (24 hours)
1. No evasive action	*26 (6%)*
2. Evasive action detected, PCC=0	*286 (69%)*
3. Evasive action detected, PCC>0	*62 (15%)*
4. Evasive action detected immediately	*43 (10%)*
Total	***417 (100%)***

Normal interactions vs. conflicts

Category	All encounters (24 hours)	Traffic conflict (6 weeks)
1. No evasive action	*26 (6%)*	*3 (2%)* ↓
2. Evasive action detected, PCC=0	*286 (69%)*	*68 (48%)* ↓
3. Evasive action detected, PCC>0	*62 (15%)*	*48 (34%)* ↑
4. Evasive action detected immediately	*43 (10%)*	*23 (16%)* ↑
Total	***417 (100%)***	***142 (100%)***

Normal interactions vs. conflicts

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Total	*417 (100%)*	*142 (100%)*

mostly ‘abnormal’ manourves

mostly secondary interactions

Conclusions

High reliability in primary interactions

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High reliability in primary interactions

Fails in secondary interactions

Conclusions

High reliability in primary interactions

Fails in secondary interactions

Many traffic conflicts involve secondary interactions

Conclusions

High reliability in primary interactions

Fails in secondary interactions

Many traffic conflicts involve secondary interactions

Increased reference dataset may solve abnormal manoeuvres, but not multiple interactions

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