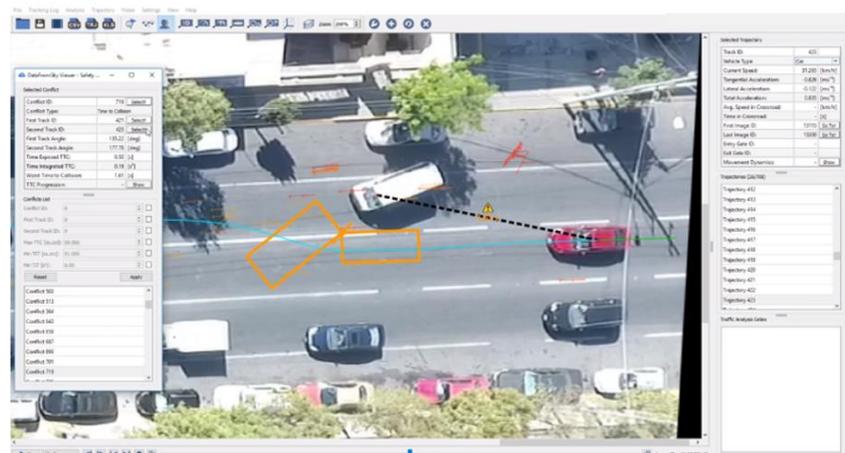
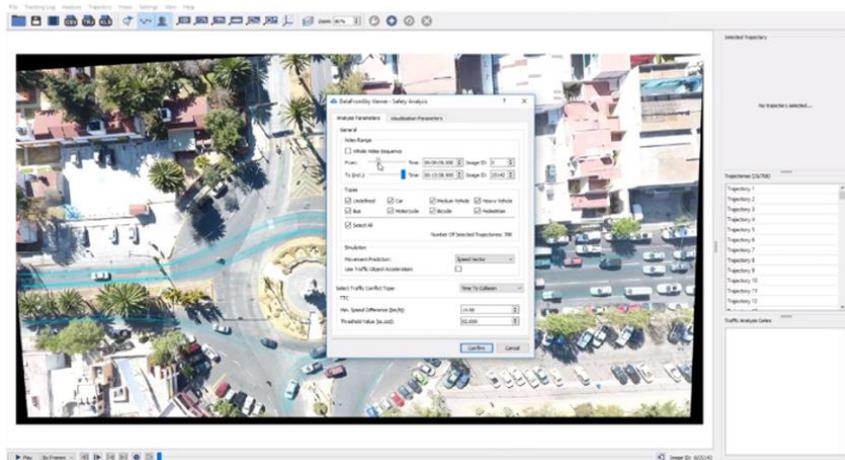




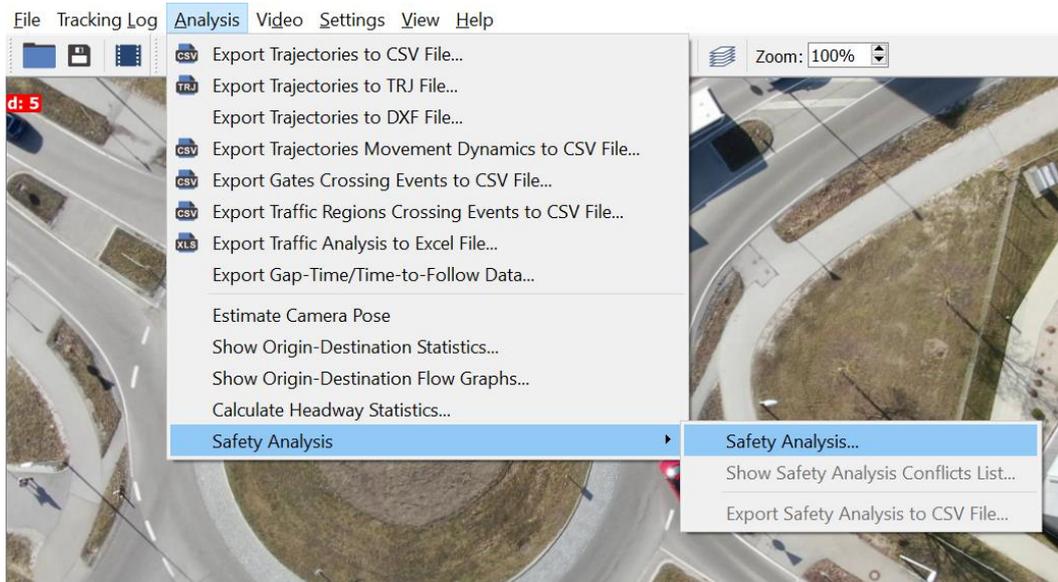
# How to work with safety analysis in the SWISSTRAFFIC.ai Viewer?

Analyse near-by collisions, post encroachment time, heavy braking and other safety data in your video.

Are you designing a new concept of a street or need to identify **dangerous situations** based on **interactions between vehicles**? Use our **safety analysis** that can provide you data about **near-by collisions**, **post encroachment time** or **heavy braking** in your video. You can export these data to a .CSV file for further analysis as well.



You can **set your own Safety analysis** parameters in Analysis – Safety Analysis – Safety Analysis. In the same menu, you can choose the possibility to **Show Safety Analysis Conflicts List**. This option shows you the **list of detected conflicts** that you can go through in a video and **export data** out of it to a .CSV file (in the same menu under Export Safety Analysis to .CSV File).



## Near-by collision

Near-by collision will detect **time to collision** in case vehicles would be **moving at a constant speed and direction** at that moment. You can define which near-by collisions should be listed by setting the **limit for time to collision** (for example 2 seconds from the collision) or **minimal speed difference** of both vehicles.

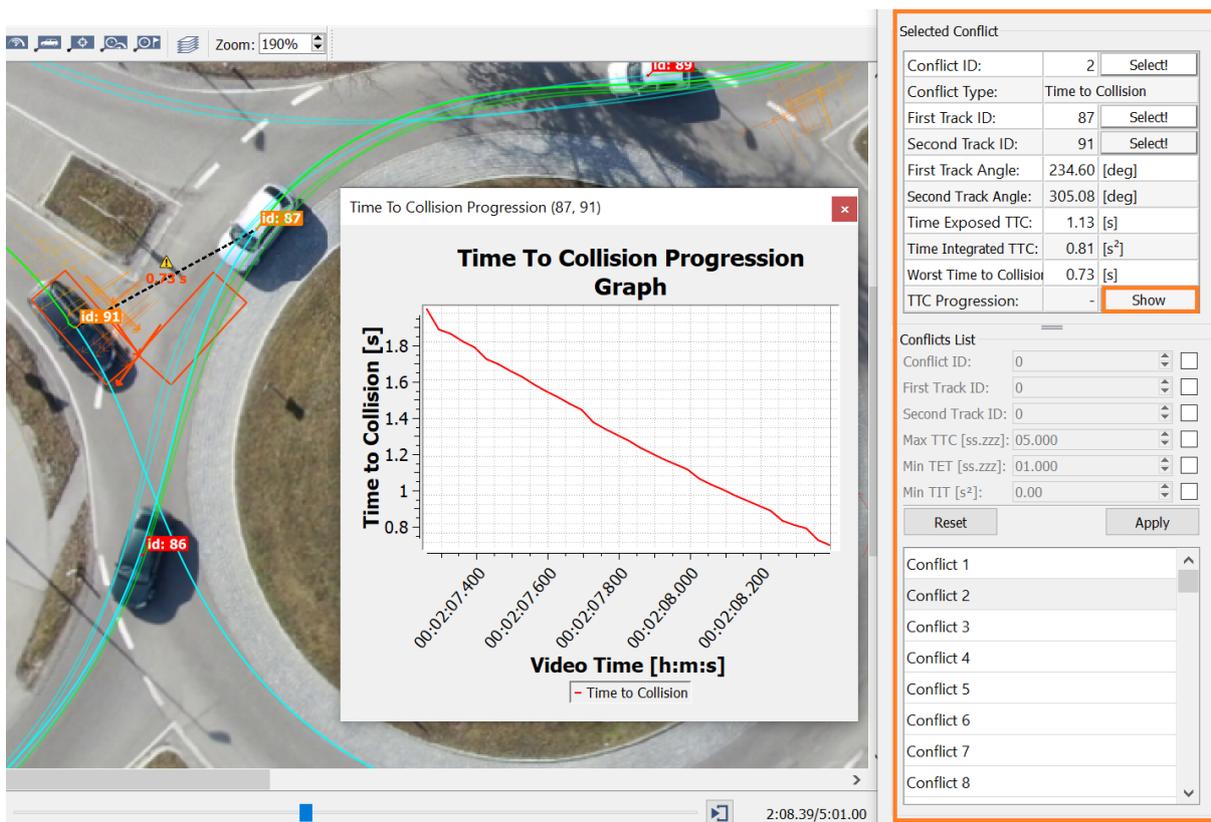
In this case, both detected objects are marked by orange colour, the same colour are boxes interpreting position of vehicles in a time of possible collision. Time to collision is marked by black line with time to collision information.



If you work with time to collision you can choose whether you want to identify risky situations for the **whole duration of the video** or only **for a part of it, type of the vehicles** that you want to include to the analysis and **two models for the movement prediction** of vehicles:

- **Speed Vector** – This is a simple calculation where the movement of the vehicle is considered straight forward. For this reason, the calculation of collisions in a curve is not entirely accurate, but the calculation is less demanding.
- **Ackerman Steer Model** – This is a more precisely defined vehicle model, the calculation is based on the angle of wheels, but for this reason, the calculation is more demanding and takes more time.

Once you confirm your settings, **conflict list appears**. You can **go through each Conflict** and play the video to see the whole scene. Once you click to TTC Progression: Show, **graph of Time to Collision in relation to Video Time** shows.



## Post Encroachment Time

Post-encroachment time is used to **identify the difference between time when the first vehicle enters the conflict point until the time another vehicle arrives at this point**. In this case, you can set a Threshold Value the same way as in Time to Collision.



## Heavy Braking

Another possibility of how to detect dangerous behaviour is through the **heavy braking conflict list**. Define your own deceleration for dangerous behaviour and go through the Conflict list to see and manage identified situations.

Selected Conflict		
Conflict ID:	49	Select!
Conflict Type:	Heavy Braking	
First Track ID:	141	Select!
Braking Time:	3.54 [s]	
Deceleration Rate:	-4.58 [ms <sup>-2</sup> ]	

Conflicts List			
Conflict ID:	0	▼	<input type="checkbox"/>
Track ID:	0	▼	<input type="checkbox"/>
Min Dec. Rate [ms <sup>-2</sup> ]:	-0.01	▼	<input type="checkbox"/>
Min Braking Time [ss.zzz]:	01.000	▼	<input type="checkbox"/>
Reset		Apply	
Conflict 49			
Conflict 50			

## Export to .CSV File

Export .CSV file with all the data for each of safety analyses: near-by collisions, post encroachment time or heavy braking separately. Exported file will look similar for all analysis exports. This one is an example of near-by collision.

Most Critical Conflict ID	Type	First Track ID	Second Track ID	First Track Type	Second Track Type	Time Exposed TTC [s]	Time Integrated TTC [s2]	Conflicts(Image ID)	x [deg]	y [deg]	First Track Angle [deg]	Second Track Angle [deg]	Time to Collision [ms]	Conflicts(Image ID)	x [deg]	y [deg]	First Track Angle [deg]	Second Track Angle [deg]
1 TTC	117	118	119	Heavy Vehicle	Car	1.23	2.48	5639	48.791878	11.377348	120.16	63.93	266	5640	48.791877	11.377351	120.94	64.62
2 TTC	87	91	91	Car	Car	1.13	0.81	8214	48.791325	11.377392	202.29	305.31	2667	8215	48.791326	11.377393	203.14	305.31
3 TTC	167	179	179	Car	Car	0.93	0.78	8374	48.791229	11.377409	25.97	141.26	1693	8375	48.791227	11.377409	26.72	141.16
4 TTC	111	114	114	Car	Car	1.10	0.99	5198	48.791344	11.377391	202.67	320.81	1579	5199	48.791343	11.377393	203.36	320.70
5 TTC	86	91	91	Car	Car	1.13	0.87	8756	48.791302	11.377402	203.99	305.82	2954	8757	48.791301	11.377402	204.03	305.82
6 TTC	60	62	62	Car	Car	1.27	0.86	2349	48.791274	11.377404	141.83	149.73	1962	2350	48.791276	11.377404	141.54	149.72
7 TTC	187	173	173	Car	Car	1.00	0.55	8076	48.791329	11.377394	308.47	394.07	1980	8077	48.791323	11.377395	308.36	394.48
8 TTC	83	91	91	Car	Car	1.17	1.07	3394	48.791265	11.377388	203.04	323.82	1781	3395	48.791267	11.377389	203.79	323.82
9 TTC	124	141	141	Car	Car	1.33	1.02	6558	48.791352	11.377396	206.30	322.07	1698	6559	48.791354	11.377396	206.98	321.95
10 TTC	144	159	159	Medium Vehicle	Car	0.90	0.53	7568	48.791323	11.377383	314.74	397.71	1973	7569	48.791325	11.377384	314.74	398.43
11 TTC	171	179	179	Car	Car	0.90	0.56	8634	48.791277	11.377412	23.49	138.19	1971	8635	48.791275	11.377411	23.51	138.19
12 TTC	121	122	122	Car	Car	1.33	0.80	5797	48.791277	11.377424	23.66	142.78	1976	5798	48.791276	11.377413	24.28	142.54
13 TTC	18	24	24	Car	Car	0.90	0.59	712	48.791596	11.377110	99.76	207.71	1725	713	48.791596	11.377111	100.76	207.68
14 TTC	98	84	84	Medium Vehicle	Car	1.03	0.52	2481	48.791486	11.377669	25.48	196.96	1991	2482	48.791486	11.377669	25.49	197.00
15 TTC	144	156	156	Medium Vehicle	Car	0.90	0.49	7495	48.791350	11.377386	314.74	398.23	1993	7496	48.791351	11.377387	314.74	398.86
16 TTC	51	60	60	Car	Car	0.97	0.49	2397	48.791752	11.377414	22.93	199.87	1887	2398	48.791750	11.377413	23.80	199.36
17 TTC	144	154	154	Medium Vehicle	Car	0.90	0.48	7604	48.791327	11.377384	314.74	397.27	1998	7605	48.791325	11.377385	314.74	398.01
18 TTC	84	91	91	Car	Car	0.83	0.41	3885	48.791354	11.377413	210.19	307.95	1999	3886	48.791356	11.377414	210.94	307.70
19 TTC	125	134	134	Car	Car	1.13	0.81	6517	48.791582	11.377141	205.50	307.27	1868	6518	48.791582	11.377141	205.49	307.55
20 TTC	144	148	148	Medium Vehicle	Car	0.93	0.48	7337	48.791333	11.377387	314.74	200.50	1958	7338	48.791334	11.377388	314.74	201.13
21 TTC	109	110	110	Car	Car	0.80	0.45	4876	48.791750	11.377418	137.27	173.31	1991	4877	48.791747	11.377417	137.27	18.36
22 TTC	167	170	170	Car	Car	0.90	0.48	8019	48.791325	11.377395	312.63	396.53	1954	8020	48.791325	11.377396	312.52	397.13
23 TTC	68	71	71	Car	Car	0.83	0.41	2895	48.791349	11.377401	205.28	316.21	1959	2896	48.791349	11.377402	205.93	316.03
24 TTC	39	43	43	Car	Car	0.93	0.34	1889	48.791468	11.377690	276.86	23.00	1998	1889	48.791470	11.377688	277.76	23.00
25 TTC	167	175	175	Car	Car	0.87	0.46	8233	48.791480	11.377652	291.10	29.07	1974	8232	48.791481	11.377649	291.41	29.09
26 TTC	124	135	135	Car	Car	1.10	0.48	6337	48.791599	11.377113	209.71	308.26	1995	6338	48.791598	11.377113	209.70	309.32
27 TTC	127	128	128	Car	Car	1.10	0.55	6087	48.791725	11.377411	142.35	24.90	1982	6088	48.791724	11.377410	142.10	25.50
28 TTC	115	119	119	Medium Vehicle	Car	0.73	0.36	3689	48.791723	11.377396	26.22	151.62	1976	3686	48.791722	11.377395	27.02	151.51
29 TTC	144	161	161	Medium Vehicle	Car	0.83	0.40	7623	48.791332	11.377388	314.74	399.05	1979	7624	48.791334	11.377389	314.74	399.73
30 TTC	32	37	37	Car	Medium Vehicle	0.80	0.37	5426	48.791170	11.377324	172.63	329.66	1984	5427	48.791170	11.377322	172.01	329.66
31 TTC	129	144	144	Car	Medium Vehicle	0.97	0.45	6795	48.791361	11.377402	211.86	313.66	1973	6796	48.791361	11.377402	212.34	313.63
32 TTC	62	68	68	Car	Car	1.07	0.51	2643	48.791583	11.377139	106.91	207.63	1979	2644	48.791583	11.377139	107.11	207.56

## See the description of all values below:

- **Most Critical Conflict ID and Type of the Safety analysis** - Unique ID and name of conflict (Time to Collision (TTC), Post Encroachment Time (PET) and Heavy braking (HB)).
- **First Track ID and Second Track ID with First Track Type and Second Track Type** - (in case of time to collision list) - unique ID and type of both vehicles.
- **Time Exposed TTC [s] and Time Integrated TTC [s2]** - How long the threshold value was under specified value set in Time to Collision and area of the TTC that was below the threshold value.
- **Conflicts (Image ID)** - Image ID when conflict was detected.
- **x [deg] and y [deg] position** - (in case of time to collision list) - Exact position of possible conflict location at a specific frame - Conflicts (Image ID)
- **x [deg] and y [deg] position** (in case of post encroachment time and heavy braking list) - Exact position of the vehicle at a specific frame - Conflicts (Image ID)
- **First Track Angle [deg] with Second Track Angle [deg]** - Shows the angle of first and second track at the time conflict occurs.
- **Time to Collision [ms]** - (in case of time to collision list) Time to collision at that moment.
- **Post Encroachment Time [ms]** - (in case of post encroachment time list) - Time between 2 vehicles that has passed the same point.

- **Braking Time [s]** - (in case of heavy braking list) - How long the deceleration rate was higher than set value.
- **Tan. Acc. [ms-2]** - (in case of heavy braking list) - Tangential Acceleration at a specific moment (frame of the video).

In case of **Time to collision export**: columns Conflicts (Image ID), x [deg] and y [deg] position, First Track Angle [deg] with Second Track Angle [deg] and Time to Collision [ms] are repeating for the whole duration of a conflict. Data are changing per each frame of the video. In case of **heavy braking export**: columns Conflicts (Image ID), x [deg] and y [deg] and Tan. Acc. [ms-2] are repeating for the whole duration of a conflict. Data are changing per each frame of the video.

Are you looking for more information to detect relations between objects? Check the article **How to visualize objects and their interactions?**