Relationship Between New Features and Risk Events - Running Lights and Cornering

Methodology: collect stats/articles for the relation between new features and risk events
Question: What features should be added in running lights and cornering?

The current features to estimate the motor scores include brake, acceleration, stop situation, tailgating, cornering, and vehicles. We want to add features essential to motor scores, specifically emphasising features such as running lights and cornering.

Features in the event:

```
EVENT_SEVERITY_TABLE: Dict[str, float] = {
    # brake and accel event severities
    "brake_6mph": 1,
    "brake_halfg": 2,
    "brake_oneg": 3,
    "accel_6mph": 1,
    "accel_halfg": 2,
    "accel_oneg": 3,
    # stop sign event severities
    "full_stop": 0,
    "rolling_stop": 0.5,
    "no_stop": 3,
    # tailgating event severities
    "tailgate_time_to_collision_1.5-1.0s": 0.75,
    "tailgate_time_to_collision_1.0-0.5s": 1.75,
    "tailgate_time_to_collision_<0.5s": 3,
    # cornering event severities
    "cornering_6mph": 1,
    "cornering_halfg": 2,
    # vehicle safety system event severities
    "vss_abs": 1,
    "vss_traction": 1,
    "vss_stability": 1,
}
```

Running Lights

> Nearly a third (28%) of crash fatalities at intersections with traffic lights are due to drivers going through a red light. In the United States, Arizona has the highest rate of red-light running deaths, while New Hampshire has the lowest rate. About 46% of such fatalities were passengers or people in other vehicles, while more than 5% were pedestrians or cyclists. Over 35% of the fatalities were the drivers who ran the red light.

New feature considerations:

- Speed - Effects of speed on crashes and crash severity
- Speed limitation - the maximum speed limit of the road
- Presence of alcohol, medicinal, or recreational drugs
- Color blindness
- Poor eyesight of road users
- Driving in darkness
- Running a red light at an intersection (counts for a third of crash fatalities)
- Mounted overhead (How the traffic light is mounted)
- Ego Driver going forward (no turns)
- Driver fatigue, stress and emergencies
- Driving too fast and unable to stop the vehicle

The above feature lists derive from reported essential factors contributing to the fatality of running lights and corner events. We can classify four features in the following categories: the environment/vehicle and the other is related to the drivers' conditions and drivers' demography.

Related to environment/vehicle

- Speed of vehicle
- Speed limit of the road
- Poor eyesight
- Driving in darkness
- Weather conditions
- Running a red light at an intersection (counts for a third of crash fatalities)
- Mounted overhead (How the traffic light is mounted)

Related to drivers

- Presence of alcohol, medicinal, or recreational drugs
- Driver fatigue
- Driver inattention
- Ego Driver going forward (no turns)

- Driver fatigue, stress and emergencies
- Driving too fast and unable to stop the vehicle

Driver demography

- Gender
- Age
- Driving experience

Distracted Driving:

Types of Distraction

Anything that takes your attention away from driving can be a distraction—sending a text message, talking on a cell phone, using a navigation system, and eating while driving is a few examples of distracted driving. Any of these distractions can endanger you, your passengers, and others on the road.There are three main types of distraction:

- Visual: taking your eyes off the road
- Manual: taking your hands off the wheel
- Cognitive: taking your mind off driving2

Illegal Red Light Example:

Not stopping at red light:

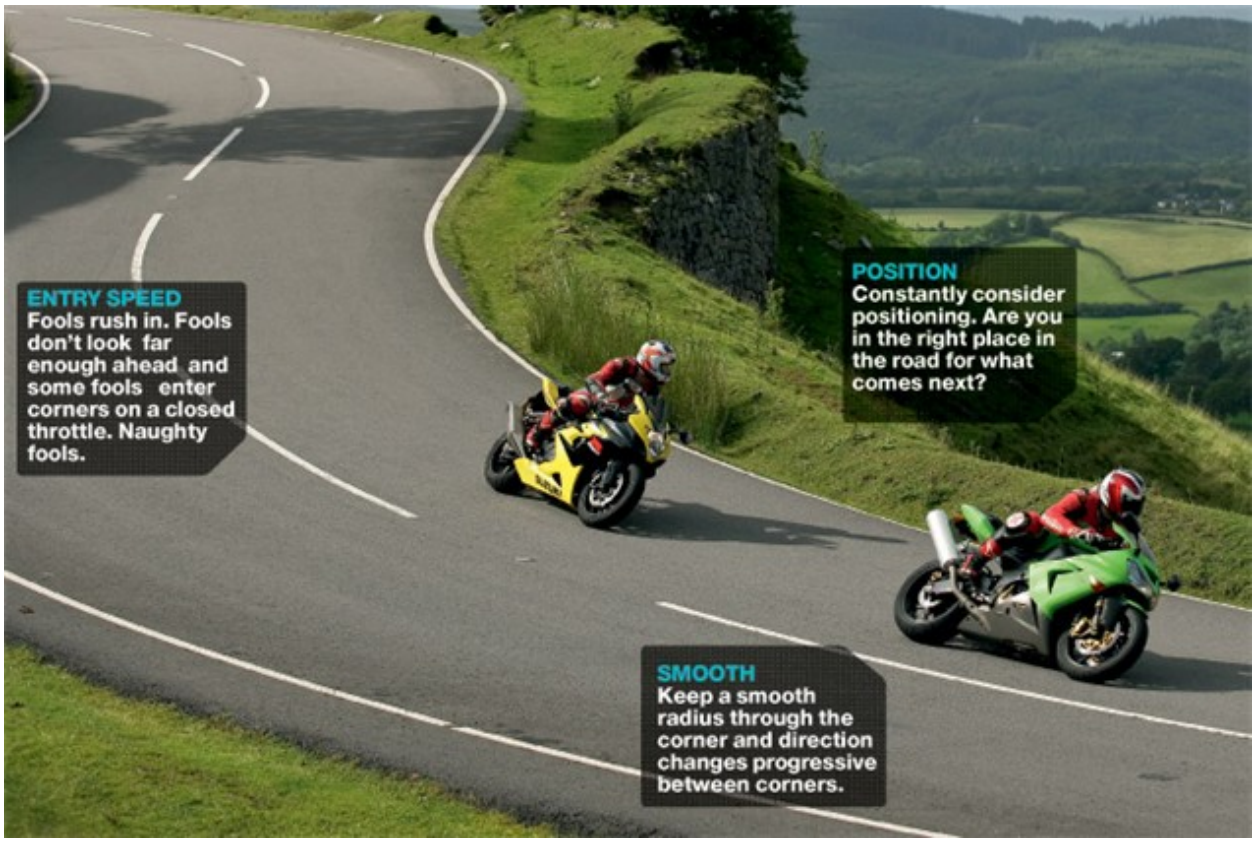
Distracted Driving:

Cornering

New feature considerations

- Off path or out of control on curb [1]

- “Run off road on a curb” - pushed/pressured “off road” by another vehicle [1]
- Accidents on curves [1]
- Left cornering events - likely left turns
- At intersections only
- Right cornering events



From Reckless cornering fatality statistics in an Australian study,

Australian states don’t record reckless cornering as a behavioral cause of accidents. However, New South Wales, Western Australia, and Victoria all record and report data on accidents that occur on or around corners or curves.

The following table presents the number of fatalities recorded for these accidents as a percentage of road fatalities for the relevant year, where data is available.

	2012	2013	2014	2015	2016	Avg
NSW1	22%	27%	22%	25%	22%	24%
VIC2	8%	11%	9%	10%	14%	11%
WA3	28%	24%	27%	28%	–	27%

1NSW fatalities recorded as “Off path or out of control on the curb.” 2VIC fatalities recorded under “Run off-road on a curb.” 3WA fatalities recorded as “Accidents on curves.”
This article addresses the cornering events based on statistical analysis. The authors identify cornering events in NSW, VIC, and WA from 2012 to 2016,
WA experienced the highest number of cornering events among the three places. It seems worth investigating the typical locations of cornering events and include the pertinent features in the motor score estimation.
This is an extract from another article showing the dangers of speeding and lists the top 10 dangerous cities for speeding. We can collect the information of town vs. motor score to determine the weighting factor of speeding better.

References:
https://www.who.int/violence_injury_prevention/road_traffic/activities/roadsafety_training_manual_unit_2.pdf
https://ubicar.com.au/blog/the-fatal-impact-of-reckless-cornering/
https://www.iihs.org/topics/red-light-running
https://www.npr.org/2019/08/29/755441473/deaths-from-red-light-running-at-a-10-year-high-aaa-study-finds
Top 10 Dangerous city for speeding: https://ncsrsafety.org/
https://ncsrsafety.org/national-speed-fatality-map/