

# Workshop Discussion: VVMethods Approach for dealing with Edge Cases

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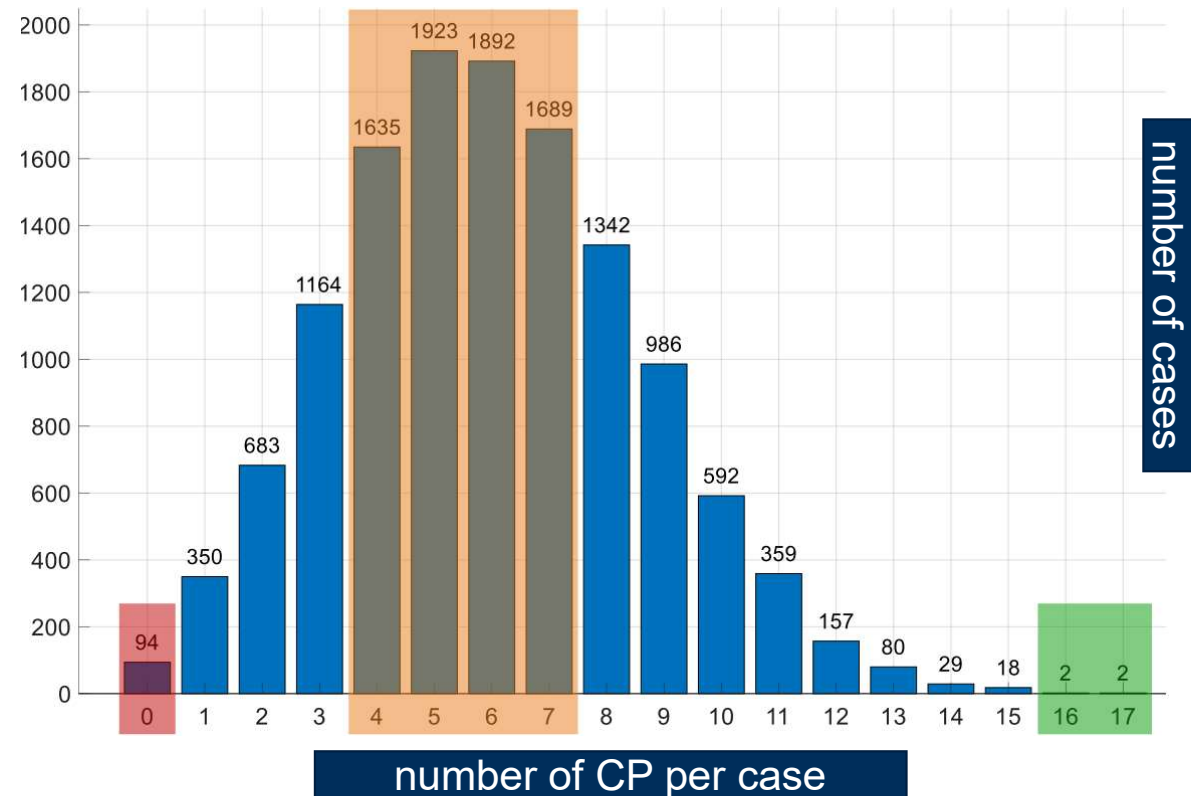
Gefördert durch:



aufgrund eines Beschlusses  
des Deutschen Bundestages

# Edge Cases as Combinations of Criticality Phenomena

- Accidents in (human) traffic are **multi-causal**.
- After filtering out abstraction/refinement relations ...
  - most accidents (~55%) in urban areas feature **between 4 and 7 CPs** per case
  - 94 accidents feature no CP; either **not relevant for AVs** or due to **incompleteness of CP collection**
  - 4 special „loaded“ cases with **more than 15 CP** will be discussed in the afternoon session



# Edge Case #1: Car vs. Pedestrian (featuring 16 CP)

## ➤ Environment

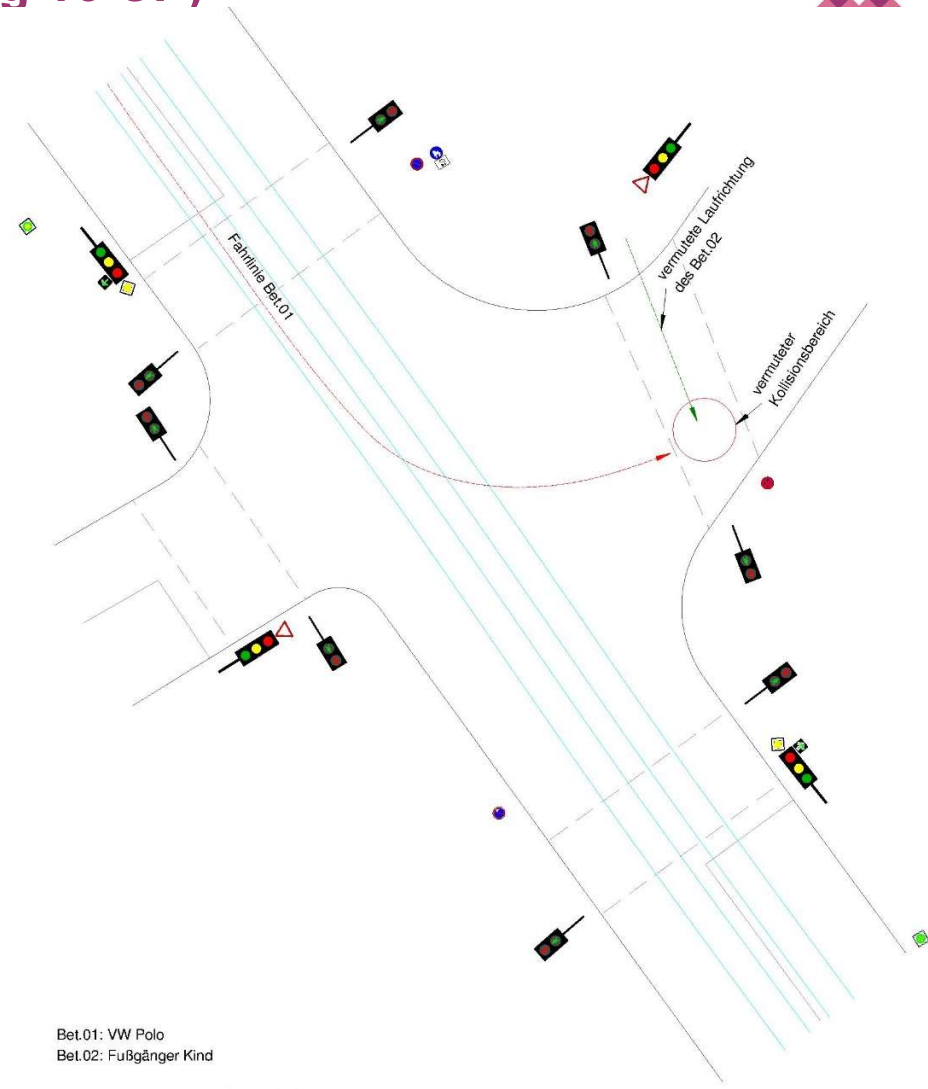
- Rain
- Reduced Friction on Road
- Limited Global Light Source

## ➤ Infrastructure

- Intersection
- Pedestrian Crossing
- Degraded Road Quality
- Degraded Lane Markings
- Intersecting Tram Rails

## ➤ Involved Actors, Maneuvers, Misconduct

- Intersecting Planned Trajectories of TPs
- Presence of VRUs with Road Access
- Presence of URUs with Road Access
- Dark Clothing of VRU
- Pedestrian crossing Road directly
- Non-Ego-TP running a Red Traffic Light
- Non-Ego-TP violating Right of Way
- Strong Braking Maneuver of Ego/Non-Ego-TP



Bet.01: VW Polo  
Bet.02: Fußgänger Kind

## Edge Case #2: Car vs. Car vs. Pedestrian (featuring 17 CP)

### ➤ Environment

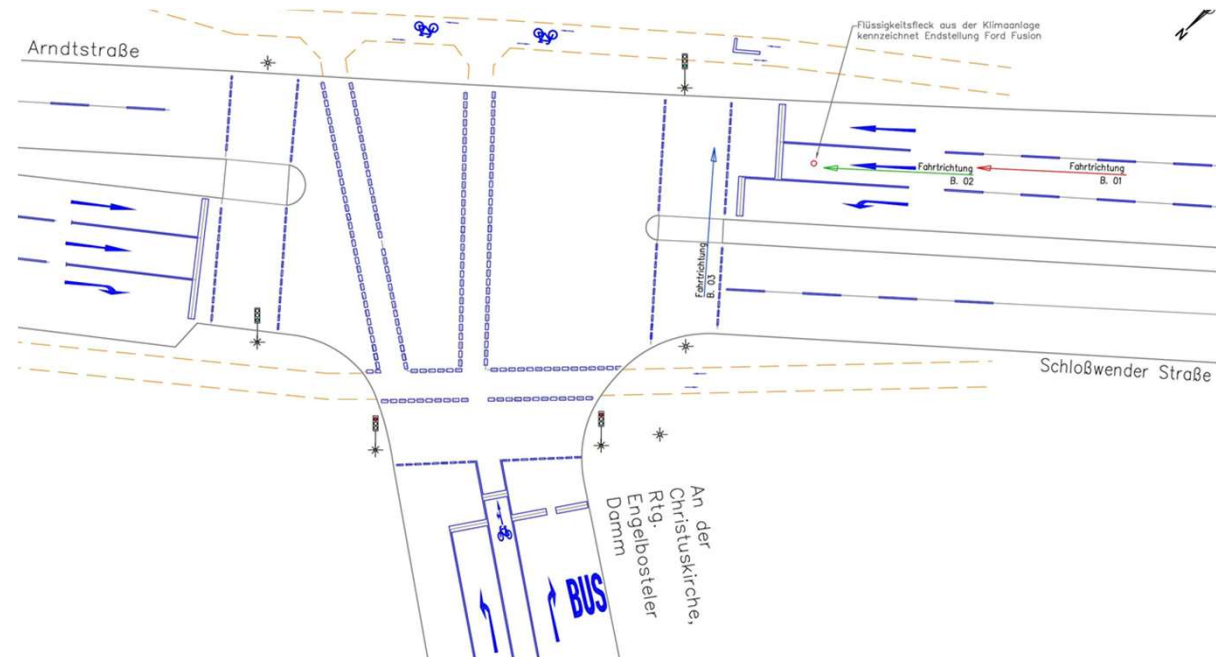
- Wind

### ➤ Infrastructure

- Intersection
- Pedestrian Crossing
- Degraded Road Quality

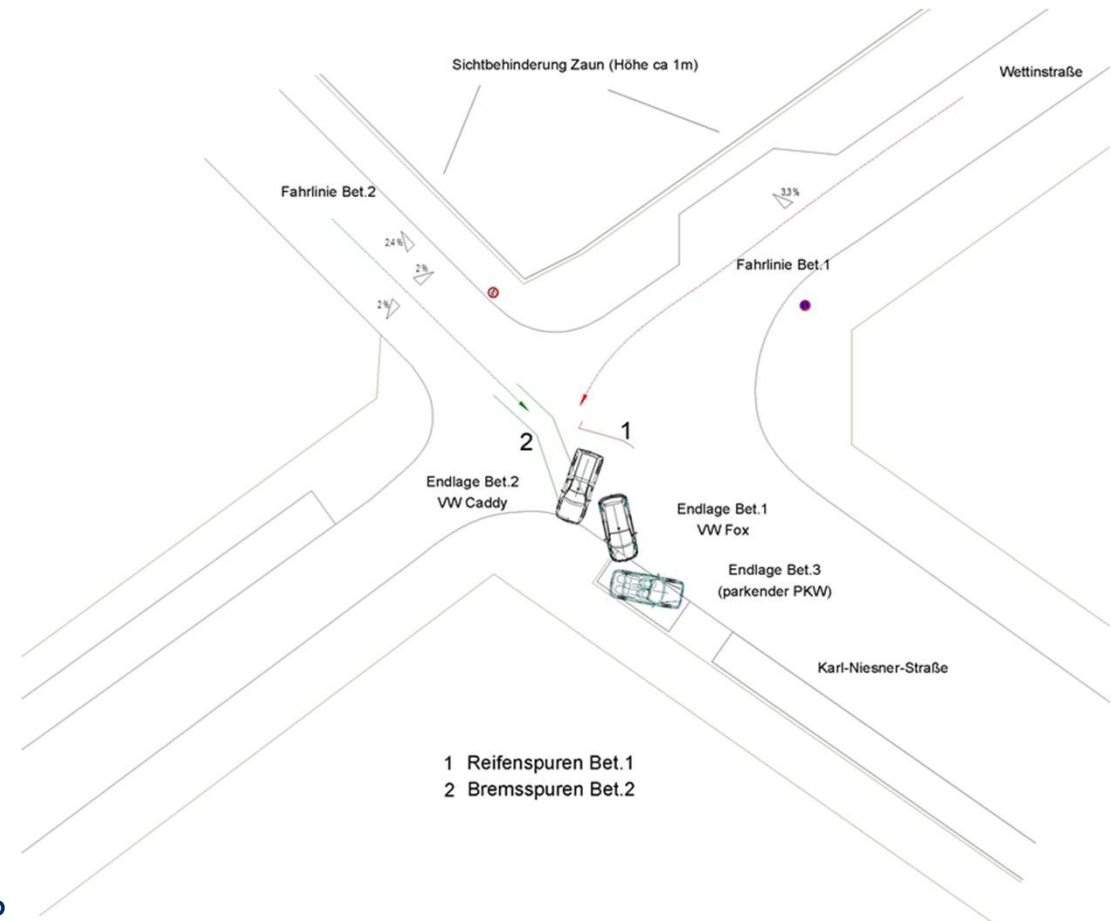
### ➤ Involved Actors, Maneuvers, Misconduct

- Intersecting Planned Trajectories of TPs
- Presence of VRUs with Road Access
- Impaired VRU with Road Access
- Presence of URUs with Road Access
- Occluded Pedestrian
- Pedestrian crossing Road directly
- Dark Clothing of VRU
- Non-Ego-TP running a Red Traffic Light
- Non-Ego-TP violating Right of Way
- Strong Braking Maneuver of Ego/Non-Ego-TP
- Strong initial Braking Maneuver of Ego/Non-Ego-TP
- Small Distance to Front
- Small Distance to Back



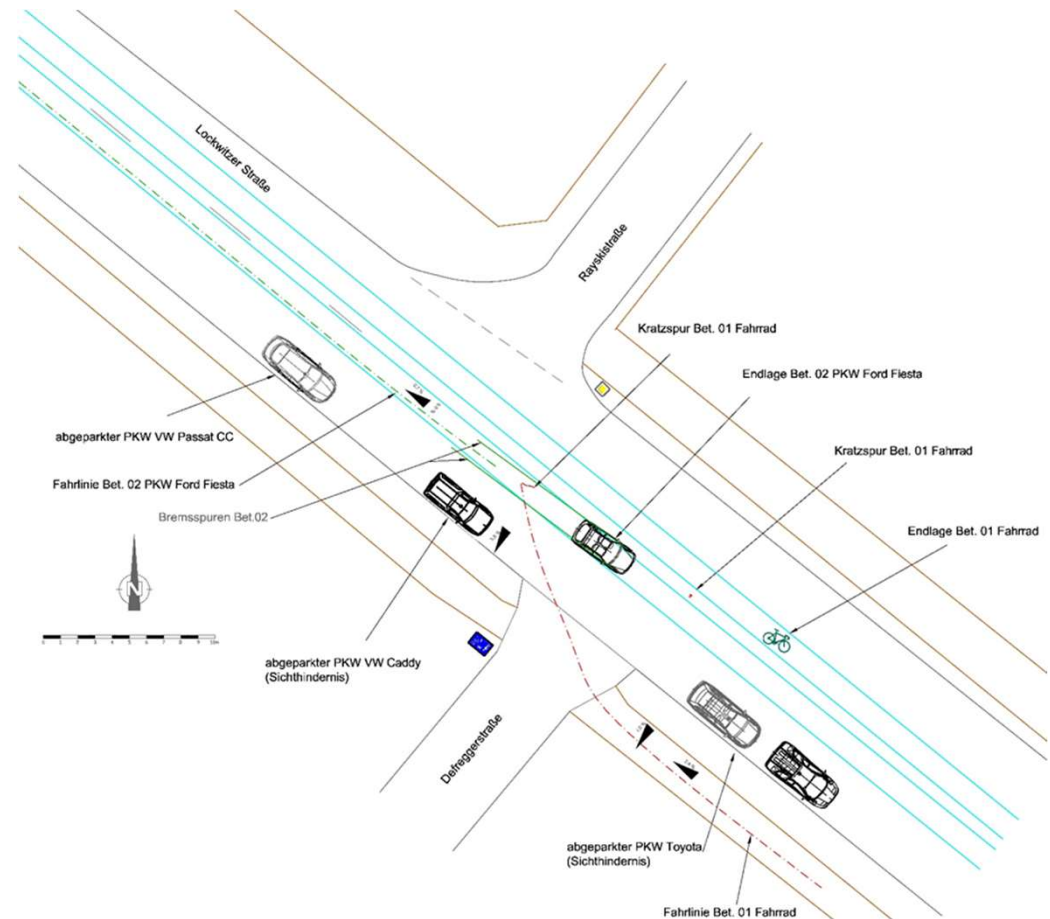
## Edge Case #3: Car vs. Car vs. Parking Car (featuring 17 CP)

- **Environment**
  - Extreme (change in) Temperature
- **Infrastructure**
  - Intersection
  - Bad Road Surface
- **Perception**
  - Occluded Traffic Sign
  - Occluded Intersecting Vehicle
  - Occluded Vehicle
- **Involved Actors, Maneuvers, Misconduct**
  - Intersecting Planned Trajectories of TPs
  - Non-Ego-TP violating Right of Way
  - Non-Ego-TP aggressive driving
  - Passing of Parking Vehicle
  - Non-Ego-TP impaired driving ability
  - Excessive Speed of Non-Ego-TP
  - High Relative Speed
  - Presence of URUs with Road Access
  - Strong Braking Maneuver of Ego/Non-Ego-TP
  - Interaction with Emergency Vehicles



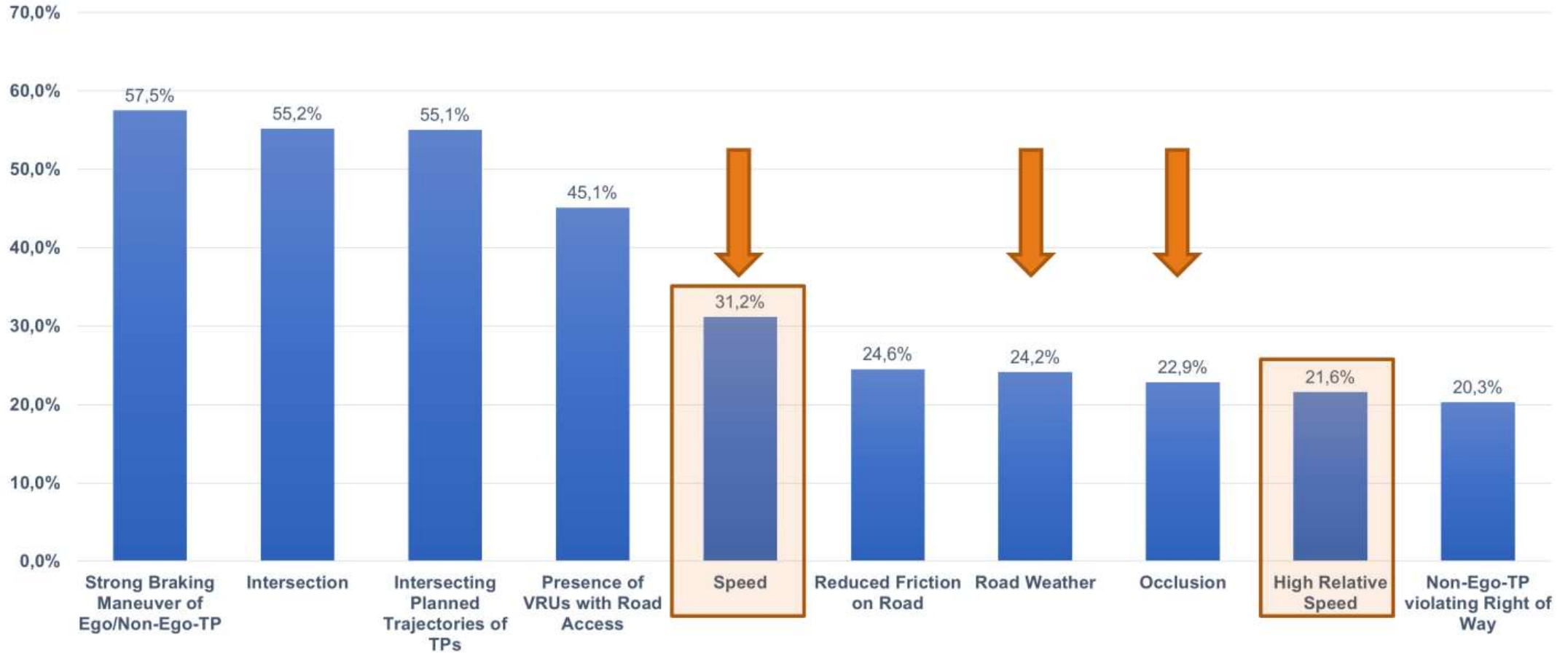
## Edge Case #4: Car vs. Bicyclist (featuring 16 CP)

- **Environment**
  - Extreme (change in) Temperature
- **Infrastructure**
  - Intersection
  - Bad Road Surface
  - Degraded Road Quality
- **Perception**
  - Occluded Bicyclist
- **Involved Actors, Maneuvers, Misconduct**
  - Intersecting Planned Trajectories of TPs
  - High Relative Speed
  - Non-Ego-TP violating Right of Way
  - Lane Closure
  - Passing of Parking Vehicle
  - Risky Lane Change of Non-Ego-TP
  - Bicycle Lane Change onto Road
  - Wrong-Way Bicyclist
  - Strong Braking Maneuver of Ego/Non-Ego-TP
  - Presence of VRUs with Road Access
  - Dark Clothing of VRU
  - Non-Ego-TP on Wrong Non-Driveable Lane

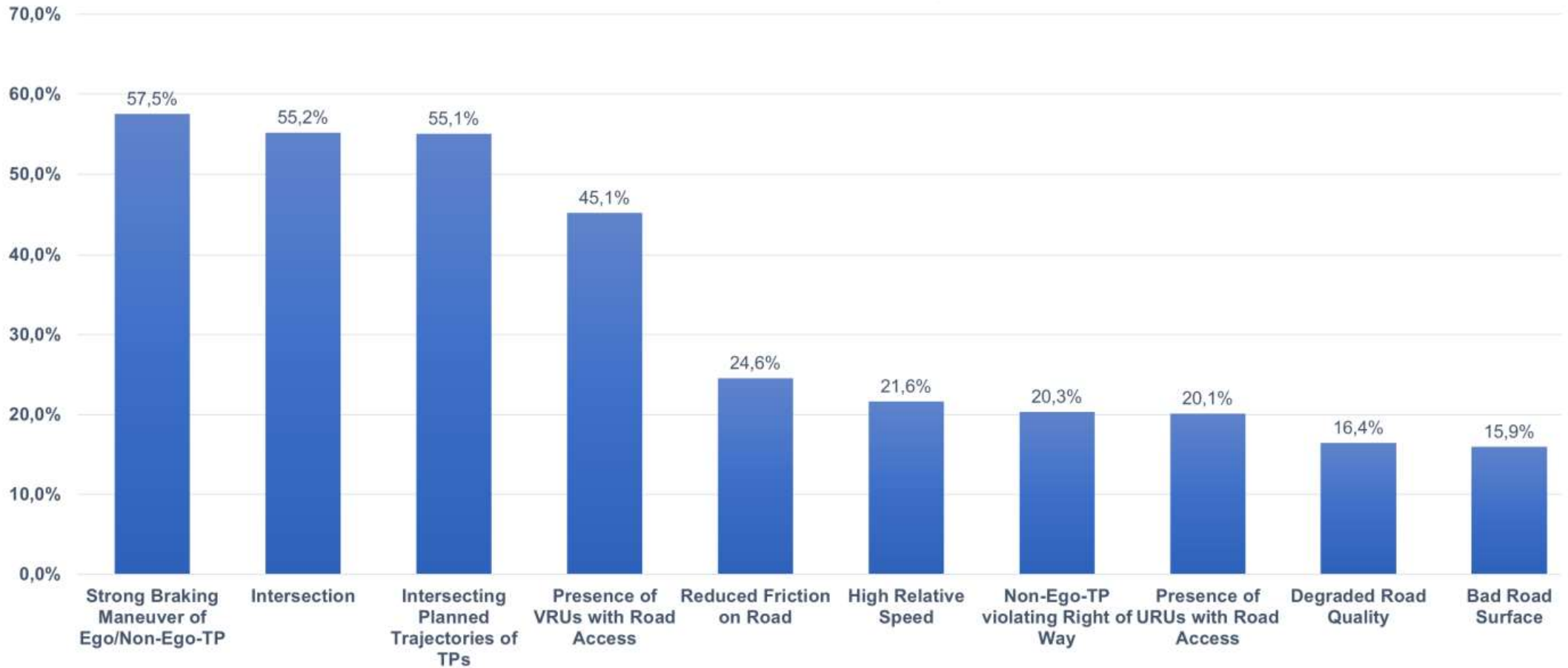




# Top Criticality Phenomena



# Top Criticality Phenomena (no abstractions)





# Thank you for your attention!

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