

# Usage

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1. Place the four scripts: `MAIN_5.m`, `MAIN_6_7.m`, `C_PROB.m`, `reachable.m`, `roadBoundaryEncounter.xlsx`, `encounter6.xlsx` and `encounter7.xlsx` in one folder.
2. Run `MAIN_5.m` from MATLAB to create figure 5
3. RUN `MAIN_6_7.m` to create Figure 6 and 7. Follow the instructions in line 2 and 4 to choose between the two figures.

## Description of the scripts

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These scripts were used to create [Figure 8](#) and [Figure 9](#) in the following article:

Mullakkal-Babu, Freddy A., et al. "Probabilistic field approach for motorway driving risk assessment." *Transportation research part C: emerging technologies* 118 (2020): 102716.

### MAIN\_5.m

- This calculates the single-step PDRF risk of an encounter in which the subject vehicle avoids a crash with the right lane boundary by corrective steering.
- The trajectories of the two vehicles are obtained from `roadBoundaryEncounter.xlsx`.
- This function calls two helper functions: `reachable.m` and `C_PROB.m`

### MAIN\_6-7.m

- This calculates the single-step PDRF risk of the ego with the neighbouring vehicle.
- The trajectories of the two vehicles are obtained from `encounter6.xlsx` for Figure 6 and `encounter7.xlsx` for figure 7.
- This function calls two helper functions: `reachable.m` and `C_PROB.m`

### C\_PROB.m

This function calculates the crash probability between two vehicles at a given future time step. This function calls the helper `reachable.m` to estimate the reachable region of a vehicle.

### reachable.m

This function calculates the reachable region of a vehicle at a future time step, based on its initial kinematic state and vehicle dynamics constraints.

### .xlsx files

These are trajectory samples from three near-crash events selected from 100 vehicles naturalistic study dataset. The `roadBoundaryEncounter.xlsx` corresponds to trip number 8299; `encounter6.xlsx` corresponds to trip number 8450, and `encounter7.xlsx` corresponds to trip number 8424

The xlsx file contains the following columns

1. X: Longitudinal position of the subject in m
2. Y: Lateral position of the subject in m
3. VX: Longitudinal velocity of the subject in m/s
4. VY: Lateral velocity of subject in m/s
5. Longitudinal position of leader in m
6. Lateral position of leader in m
7. Longitudinal velocity of leader in m/s
8. Lateral velocity of leader in m/s