

## **Review: TurnsMap: Enhancing Driving Safety at Intersections with Mobile Crowdsensing and Deep Learning**

### **Problem:**

- Left turns are known to be one of the most severe driving maneuvers that account for a large percentage of fatal traffic accidents. According to a survey report by the U.S. Department of Transportation, left-turns-related accidents alone constitute 53% of all intersection-related crashes in the U.S.

### **Solution:**

- A system that exploits mobile crowdsensing and deep learning to classify the protection settings of left turns.
- TurnsMap is empowered by two key enablers: a novel data mining engine for extracting left-turn hotspots and a deep learning-based pipeline for learning the model for classifying left-turn enforcements.
- TurnsMap first collects IMU sensor data from mobile devices or smartphones carried by the driver in a moving car. It then feeds the data to an analytics engine powered by a data mining engine for extracting and clustering left turns by processing raw IMU data.

### **Experimental Results:**

- The evaluation of TurnsMap is collected from smartphones of 18 different drivers building a 1.6GB dataset over a cumulated travel distance of more than 3,589km.
- The evaluation for TurnsMap's accuracy and capability of identifying different left-turn enforcements with 90.3% accuracy.

### **Pros:**

- An effective way to mitigate this safety risk is to install a left-turn enforcement at every turn that preserves a traffic phase exclusively for left turns.
- TurnsMap is a novel way of utilizing crowdsensing mobile IMU data and deep learning for enhancing driving safety.
- The left-turns information uncovered by TurnsMap is essential for driving safety and can benefit many vibrant apps in the automotive and transportation ecosystem.

### **Cons:**

- Currently, TurnsMap is trained based on driving data that is mostly collected during day-time. Also, some intersections are equipped with advanced traffic regulation systems that change the left-turn protection setting according to different times-of-day to accommodate the varying traffic conditions.

- TurnsMap by using the driving data collected from the Detroit metropolitan region in the U.S. that covers various on-road environments (e.g., suburban and urban areas). Moreover, since TurnsMap harvests interruptions, the root cause of risks at intersections.

**Doubt:**

- Sometimes, smartphones have limited resources, there is an overhead of the data-collection app could consume lots of the mobile device's resources. How to deal with it?
- Since, different drivers since different driving habits may incur diverse driving maneuvers at left turns. How to build a comprehensive classifier that is resilient to the changing environment and users.