
Scenario2Vector: Scenario Description Language Based Embeddings for Traffic Situations

— Aron Harder(ah2ph),
Jaspreet Ranjit (jr4fs),
Manisha Sudhir (ms8jd) —

Problem Definition

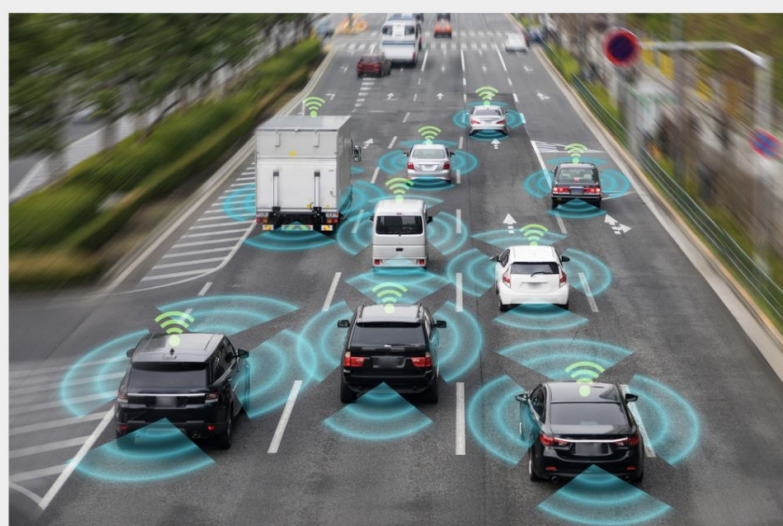
Introduction

1. Objective:

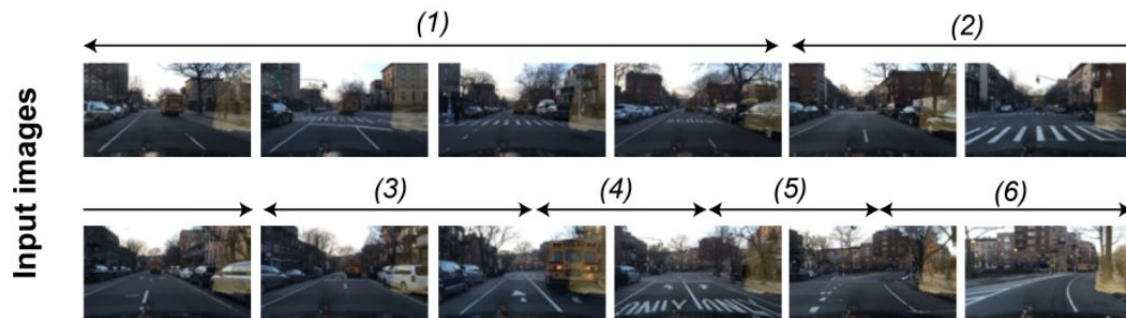
- a. We propose **Scenario2Vector** - a Scenario Description Language (SDL) based embedding for traffic situations that allows us to automatically search for similar traffic situations from the large data-sets obtained from different AVs
- b. **Input:** traffic scenario (i.e lane change)
- c. **Output:** A similar traffic scenario (semantically and temporally) in a different dataset, standard metric of comparison

2. Key questions:

- a. *Given a traffic scenario (5-15 second video clip), can we query another database for a similar video using spatio temporal properties of that video, and a high level video description as the label?*



Berkeley Deep Drive-X Dataset



Action description:

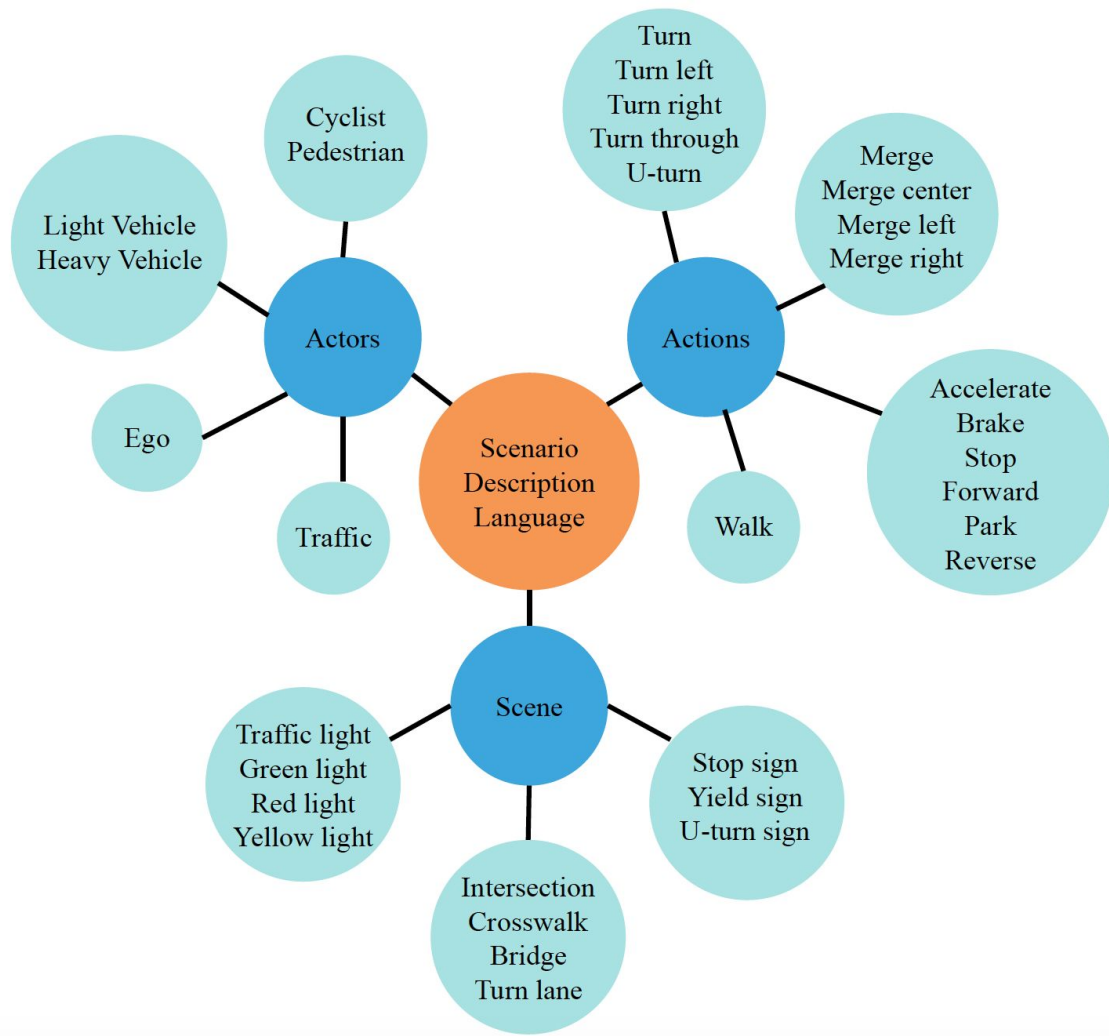
- (1) The car is driving
- (2) The car is moving into the right lane
- (3) The car moves back into the left lane
- (4) The car drives in the left lane
- (5) The car moves into the right lane
- (6) The car proceeds down the road

Action justification:

- as* there is nothing to impede it.
- because* it is safe to do so.
- because* the school bus in front of it is stopping.
- in order to* pass the school bus.
- since* it has now passed the school bus and it is taking the right fork.
- as* there is nothing in its way.

Methodology

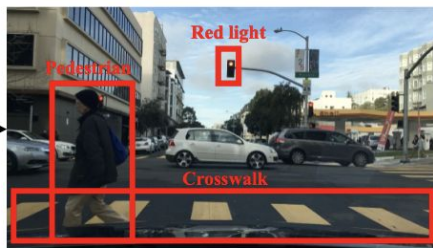
Scenario Description Language (SDL)



SDL Extraction Process



(1) BDDX Ground Truth:
The **car** is **stopped** at a **crosswalk** as the **light** is **red** and **pedestrians** are crossing the street



(2) Actions and Scene Elements

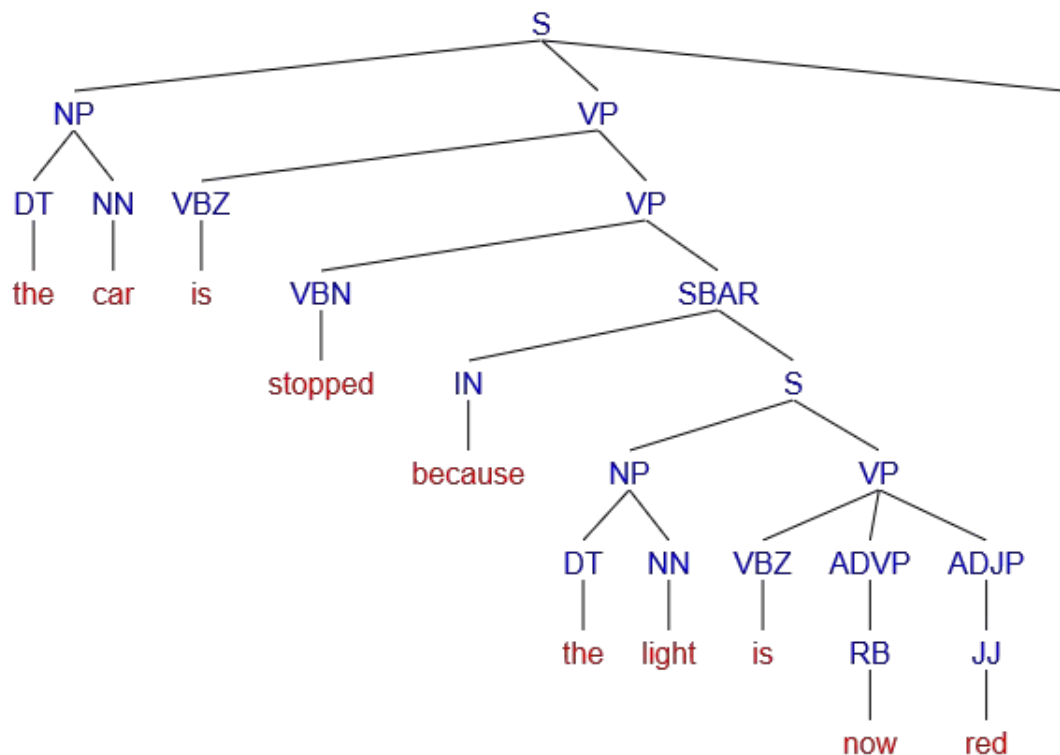
$S = \langle AT, AC, SC \rangle$
$AT = [Ego, Pedestrian]$
$AC = [Stop, Walk]$
$SC = [Red\ light, Crosswalk]$

(3) SDL Extraction

$$\begin{aligned} AA &= \begin{bmatrix} Ego & Pedestrian \\ Stop & Walk \end{bmatrix} \\ SC &= [Red\ light, Crosswalk] \end{aligned}$$

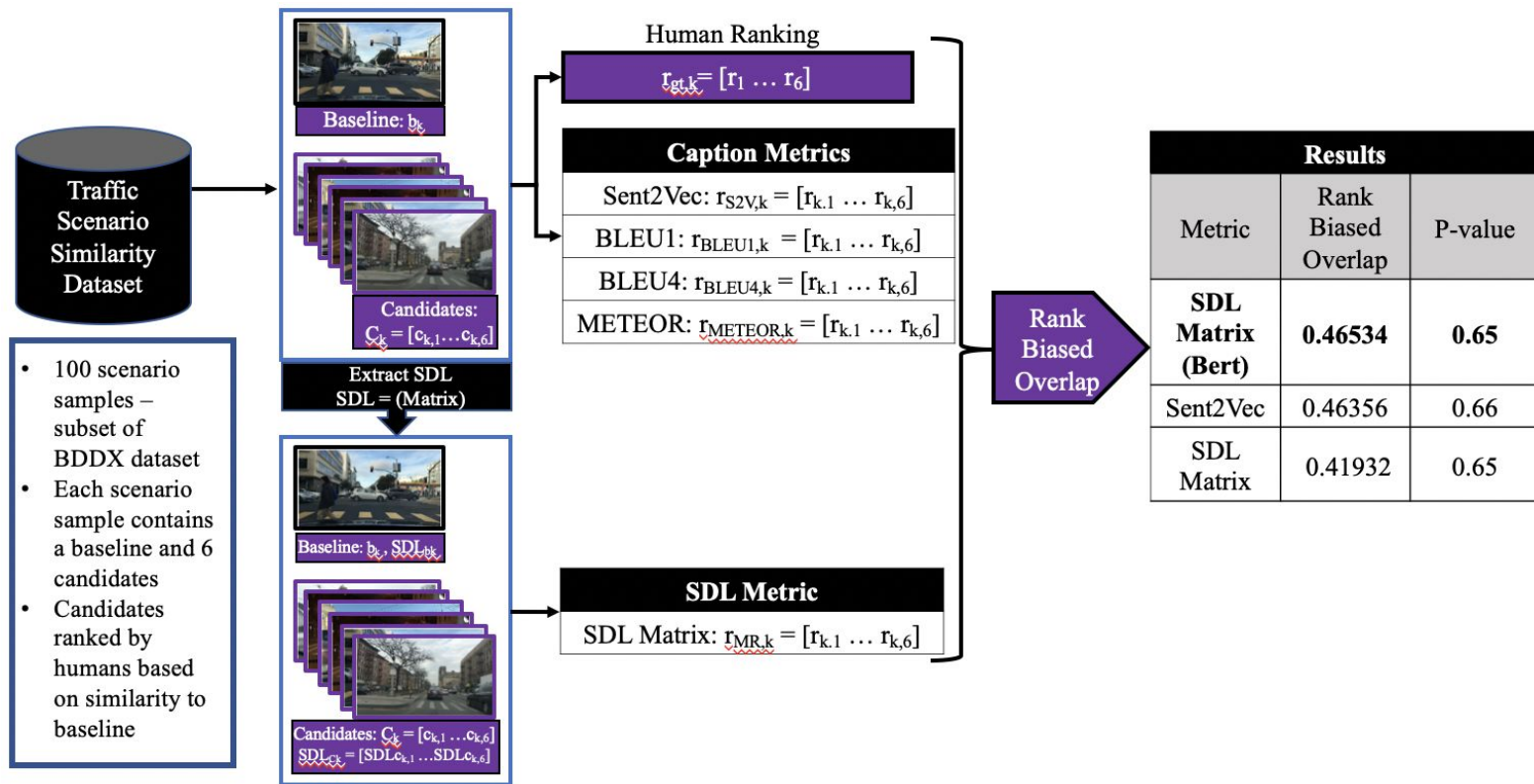
(4a) SDL Matrix Embedding

SDL Extraction Details

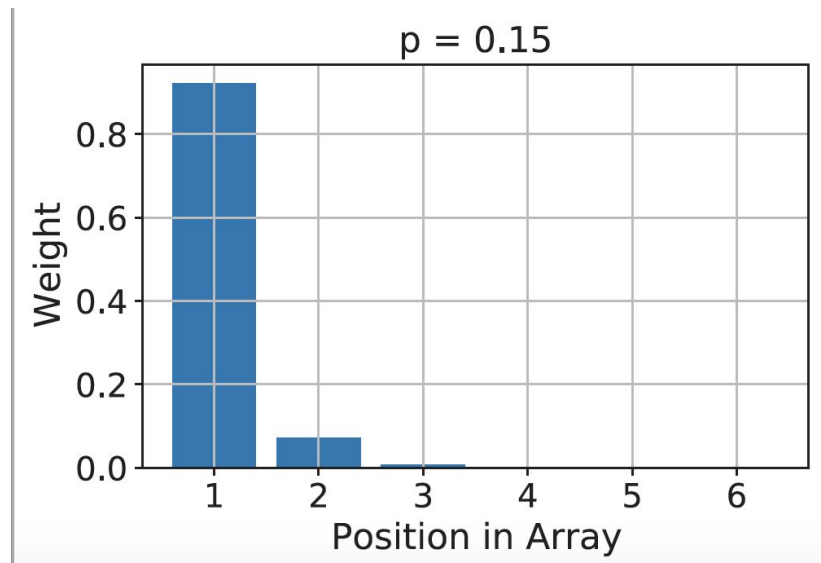
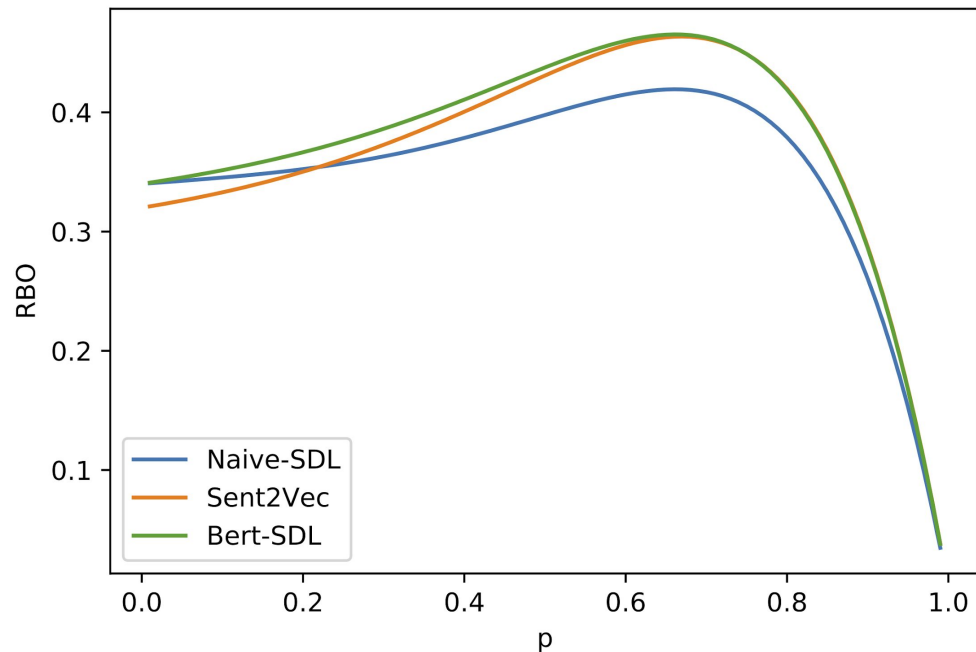


Experiments

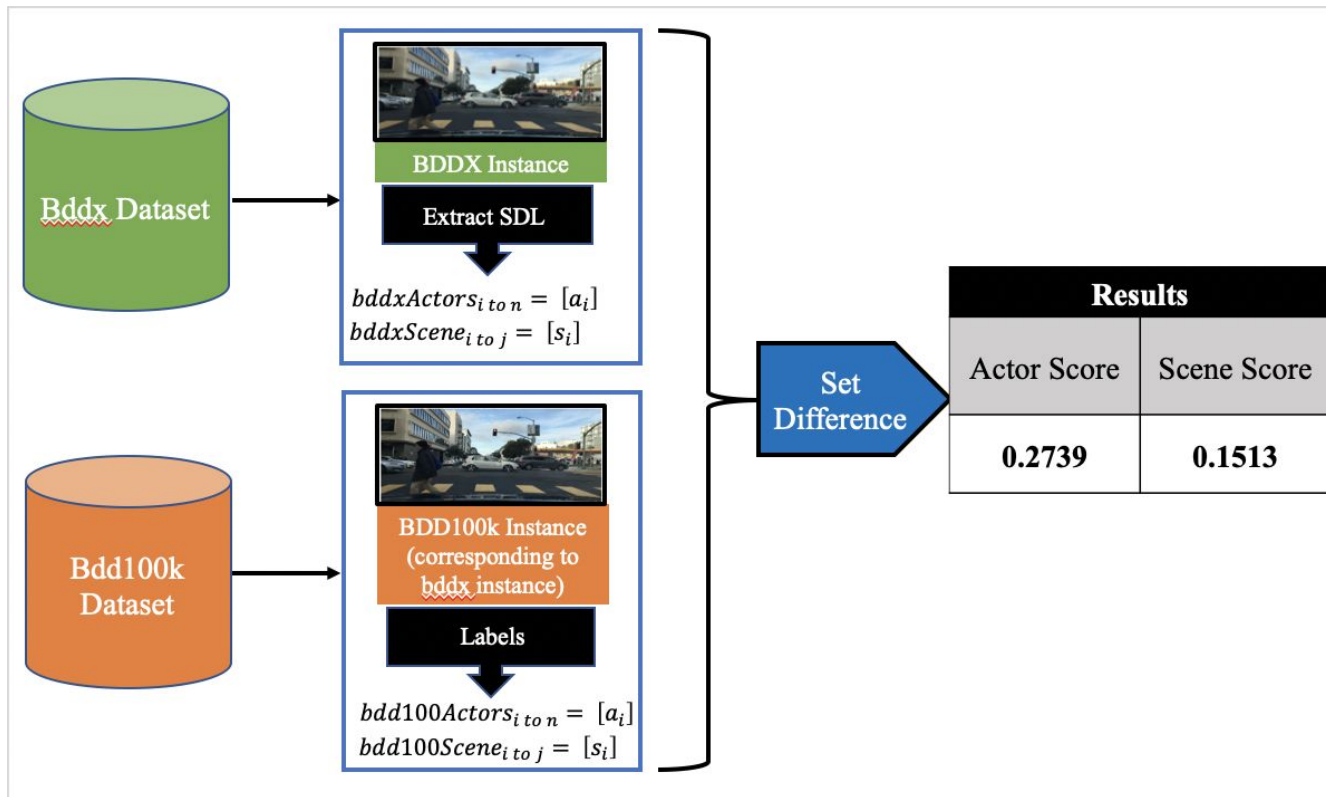
Similarity Ranking



Similarity Ranking Results



Object Detection vs. SDL Extraction Setup and Results



Object Detection vs. SDL Extraction Analysis

