Online Structure Learning for Traffic Management

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CER

Introduction

Applied OSLα structure learner to **learning definitions** for traffic incidents using real sensor data collected in the context of the SPEEDD project.

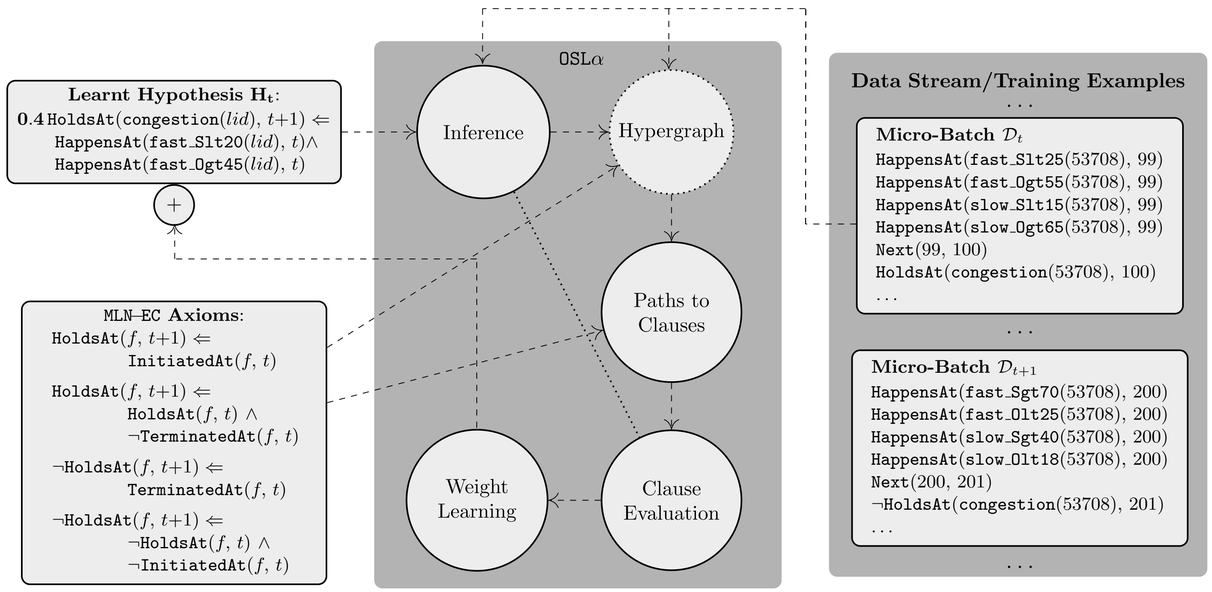
- High volume dataset
  - Required an online learning strategy
- OSLα constructs and refines event definitions
- Definitions are used to forecast/detect traffic incidents

Data

Real data collected from sensors placed at 19 collection points along a 12km stretch on the southern part of the Grenoble ring road (Rocade Sud).

- Consists of one month of sensor readings ($\approx$ 3.3GiB)
- Annotated by human traffic controllers for congestion
- Sensor data are collected every 15 seconds
  - A sensor per lane at each collection point
  - Counting number of vehicles passing through a lane, average speed and sensor occupancy.

OSLα: An Online Structure Learner using Background Knowledge Axiomatization



Learning Challenges

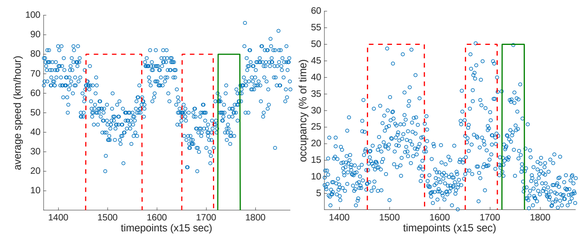


Figure 1: Location 353708, fast lane: speed (left), occupancy (right).

- Traffic congestion annotation is very incomplete
- Quality of information of each sensor differs
  - Sensors of queue lanes are largely uninformative.

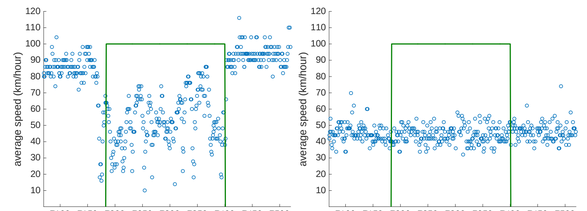
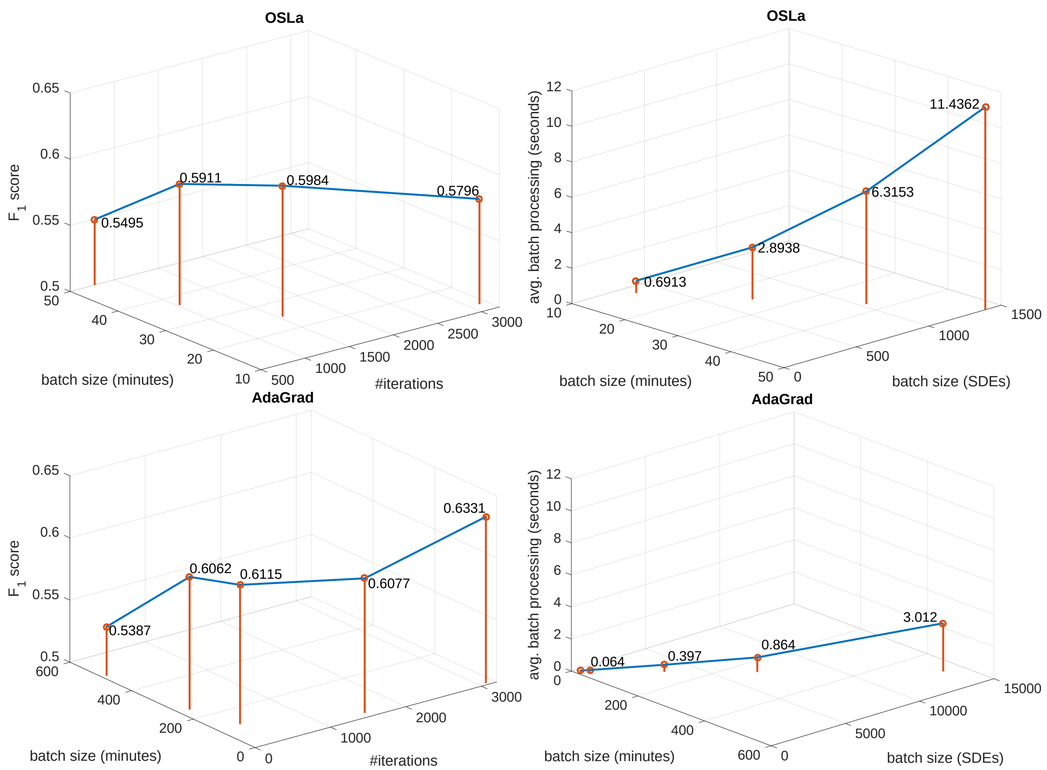


Figure 2: Location 347549: fast lane (left) vs queue lane (right).

- Location- and lane-agnostic rules are insufficient
  - They capture the concept of traffic congestion in specific locations, and completely fail in others.

$$\texttt{InitiatedAt}(\texttt{congestion}(lid), t) \Leftarrow \texttt{HappensAt}(\texttt{aggr}(lid, occupancy, avgspd), t) \wedge avgspd < 50 \wedge occupancy > 25$$

Experimental Results



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