

To
Media and Knowledge Engineering Students

From
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Subject
Master Thesis Assignment in Pattern Recognition and Image Processing

Mobility
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Dear student,

Team Smart Mobility of the Mobility department at TNO is looking for smart and enthusiastic students who are interested in doing state of the art research in the field of Pattern Recognition and Machine Learning applied to the field of Mobility and traffic flow.

Problem description

The Dutch highway network is densely monitored by Induction Detector Loops (ILD). Around every 500 meter (see figure 1) there is a ILD that measures each minute average speed(km/h) and intensity(veh/h). Furthermore, TNO maps and fuses different data sources together in the vicinity of the ILD locations such as rainfall and incident information. The data can be visualized in a space time domain using density plots (see figure 2).

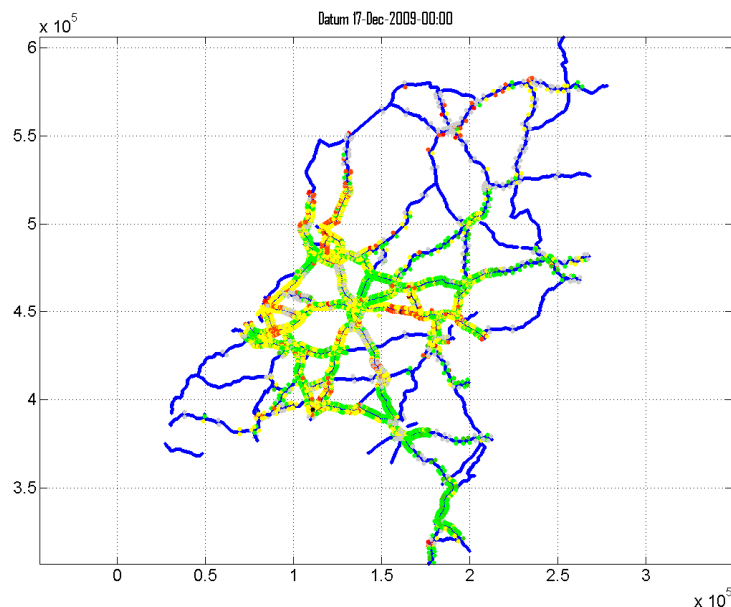


Figure 1 Location Induction Loop Detectors in the Dutch Highway Network in 2009

In the x-axis represents we see the time of the day plotted against location (y-axis) on the road. The time is coded as the minute number (1-1440 for one day).

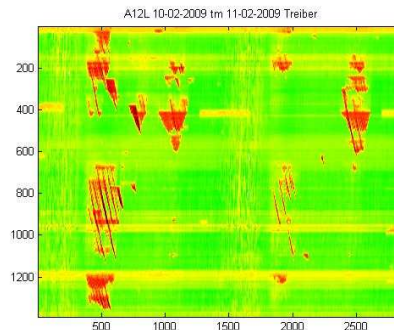
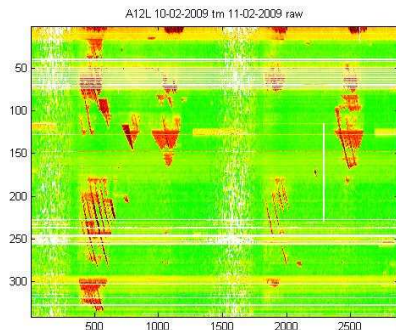


Figure 2 Raw data A12 left side for 2 days **Figure 3** Filtered data A12 left side for 2 days

The red spots in the figures represent area's in the space time where the speed drops below 60 km/h which corresponds to traffic jams. TNO disposes of many of these images dating from 2007 until now. We are looking for an automated way to classify the red spots per highway per driving direction in the Netherlands. This is needed in order to classify and understand traffic jams in general. We are for example interested in traffic jams that are reoccurring each day and those that are not.

Assignment

TNO has already tried different approaches like: hierarchical clustering per highway per direction and K-means clustering per ILD location. The results of these approaches were partly promising. The problem we noticed, is that each density plot is divided into regions of interests (ROI) that should be matched separately. We all know that there are morning peaks, evening peaks, etc. in traffic, which could be seen as multi instances within each image. We therefore think that this is the right path to tackle the problem and we are looking for a student who wants to take the challenge to explore the capability of this technique (multi instance learning) to solve this problem.

Conditions

- Student must be capable of working independently
- TNO supplies data and supervisors to explain how the data is organized and provides background information / literature and coaching
- Student gets an own desk at TNO office in Delft and a monthly allowance.
- The assignment can start as soon as possible and requires a minimum time of 9 months.
- The deliverables will be fixed in common agreement between the University and TNO

Are you interested in taking this assignment as your challenge for your Master Thesis? Please contact: taoufik.bakri@tno.nl or paul.vandenhaak@tno.nl

Date
17 November 2011

Our reference
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