ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

WS 2014-2015, ENAC-SIE/CSE, No. DISAL-SP69 Project Summary

Generating Lausanne Pollution Maps using The OpenSense Network

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We were interested in generating air-pollution maps form data collected by the OpenSense deployment in Lausanne, Switzerland. Since December 2013, up to 10 mobile sensor boards, mounted on buses of Lausanne's public transportation, have collected air-pollution data during their journeys through the city. Of several air-pollution measurements, LDSA (lung-deposited surface area) is considered here, which is measure for particle matter.

The main approach used to generating maps was to construct a model, that estimates LDSA throughout space and time based on the collected measurements. Then based on the model estimations different kind of maps can be produced.

Based on previous work on modeling the first five months of LDSA from OpenSense, this project adapted the same approach, this time using data up to 27.10.2014. The way LDSA is modeled is to derive a log-linear relationship between input variables (meteorological and other air-pollutants). That is, that the logarithm of LDSA is estimated by a constant offset plus a weighted sum of the logarithms of the input variables. The offset and the weights are the parameters of the model. A different model is calibrated for every street segment since the input data, provided by the Meteoschweiz station in Pully and the NABEL station in Lausanne, is assumed uniformly distributed across the city. In addition to the previous work, the model has been systematically computed on all the streets concerned by LDSA measurements. Once allocated to a street, the data has been divided in a training set and a validation set. For calibrating the parameters of the log-linear relationship, the training set was used and the model performance has been evaluated on the validation set. Globally the models did not perform sufficiently well. Figure 1 shows box plots of model performances, R^2, over all the streets for every time-resolution. This result is mainly due to low correlations between input variables and LDSA.

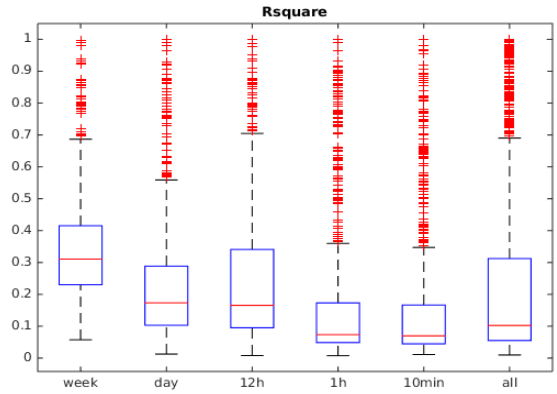

Fig. 1 : Effect of time-resolution on model performance

Reducing the time-resolution resulted in a slight improvement of the model performance.

The next steps could head towards creating one single model for the entire city. This calls for new input data such as Land-use and traffic data.

Also estimating LDSA without any input data, but based on it's measurements alone, would overcome many difficulties that arise from the modeling approach used here. During the project, such an approach has been suggested but not implemented.