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Geographically Weighted Regression for Low-Cost Sensors Calibration

Low-cost sensors are a new tool for improving air quality maps, which are of major interest in the current era of high-resolution, urban-scale air quality monitoring. These sensors require calibration using reference analyzers. A variety of strategies can be employed, ranging from individual pointwise calibration models to network calibration models. Here, we propose using geographically weighted regression (GWR) as an alternative method for calibrating or correcting micro-sensors. GWR is a local spatial statistical technique that can be used to model real-world phenomena by incorporating spatial nonlinearities. The additional flexibility that GWR provides, in the form of spatially varying coefficients, makes it possible to model the fact that the coefficients of a micro-sensor's calibration model change according to its position. We present a comprehensive approach, covering the selection of learning and test sets, the choice of spatial window, and the final evaluation using a spatial cross-validation scheme. The calibration results for Nitrogen dioxide (NO₂) are provided alongside some remarks about the estimated GWR model and the spatial content of the estimated coefficients. This study was carried out using the publicly available SensEURCity dataset in Antwerp. This dataset is especially relevant since it comprises 9 reference stations and 34 micro-sensors, all of which were collocated and deployed within the city.

More details can be found here: <https://revstat.ine.pt/index.php/REVSTAT/article/view/1012>

Special/ Invited session

Classification

Mainly application

Keywords

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