

# Spatially varying coefficients modelling in large-scale air pollution mapping

Atmosphere behaves less coherently over larger areas with respect to the dispersion and emission processes. Same traffic loads in a certain area may lead to different NO<sub>2</sub> concentration levels due to different types of fuel (e.g. ethanol vs. petrol), car (e.g. electric car), and filter systems used in cars. The Tropomi measured column density relates to surface concentrations differently under different meteorological conditions. The relationship between NO<sub>2</sub> and wind also differs under different city morphology. An effective city topology may contribute to efficiently modelling Spatially Heterogeneous response-covariate Relationships (SHR). A commonly-used method is GWR (Geographically Weighted Regression) but GWR does not have a formal uncertainty quantification. Bayesian SVC models coefficients as GP and fully quantify uncertainty in predictions but a computationally efficient solution is needed for modelling with large data volumes. The task of this study is to develop GWR and Bayesian SVC methods in modeling SHR and compare the models.

Keywords: geostatistics, spatial varying coefficients, Bayesian modeling, air pollution

Reading Material:

Gelfand, Alan E., Hyon-Jung Kim, C. F. Sirmans, and Sudipto Banerjee. "Spatial Modeling with Spatially Varying Coefficient Processes." *Journal of the American Statistical Association* 98, no. 462 (2003): 387-96. Accessed August 2, 2021. <http://www.jstor.org/stable/30045248>.