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Evaluating the causal effects of interventions on air quality using machine learning and synthetic control approaches

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“Air quality interventions” refer to any actions that may lead to a change in air quality, whether intentionally such as clean air zone and unintentionally, such as COVID-lockdowns or Net Zero actions. Quantifying the impact of “interventions” on air quality is one of the key processes in air quality management. Observational data from monitoring networks are often used for assessing the air quality effectiveness of interventions. However, air pollution levels do not change linearly with emissions due to variations in weather conditions and chemical processes. Furthermore, they change on a seasonal and year by year basis at a specific location. Here, we will present our studies on the changes in air pollutant concentrations arising from emission changes due to clean air actions (such as clean air zone, clean heating policies) and the COVID-19 lockdowns based on a machine learning technique and a “synthetic control” method. These methods are able to detect sudden decreases in air pollutant concentrations due to “interventions”. They also provide a quantitative evaluation of “causal” effects of the interventions.

ML method

Random forest

Main air pollutant of interest

PM

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Track Classification: Machine learning applications