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Citizen-science urban environmental monitoring for the development of an inter-urban environmental prediction model for the city of Los Angeles

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High air pollution concentration levels and increased urban heat island intensity, are amongst the most critical contemporary urban health concerns. This is the reason why various municipalities are starting to invest in extensive direct air quality and microclimate sensing networks. Through the study of these datasets it has become evident that the understanding of inter-urban environmental gradients is imperative to effectively introduce urban land-use strategies to improve the environmental conditions in the neighborhoods that suffer the most, and develop city-scale urban planning solutions for a better urban health. However, given economic limitations or divergent political views, extensive direct sensing environmental networks have yet not been implemented in most cities. While the validity of citizen science environmental datasets is often questioned given that they rely on low-cost sensing technologies and fail to incorporate sensor calibration protocols, they can offer an alternative to municipal sensing networks if the necessary Quality Assurance / Quality Control (QA/QC) protocols are put in place.

This research has focused on the development of a QA/QC protocol for the study of urban environmental data collected by the citizen science PurpleAir initiative implemented in the Bay Area and the city of Los Angeles where over 700 purple air stations have been implemented in the last years. Following the QA/QC process the PurpleAir data was studied in combination with remote sensing datasets on land surface temperature and normalized difference vegetation index, and geospatial datasets on socio-demographic and urban fabric parameters. Through a footprint-based study, and for all PurpleAir station locations, the featured variables and the buffer sizes with higher correlations have been identified to compute the inter-urban environmental gradient predictions making use of 3 supervised machine learning models: - Regression Tree Ensemble, Support Vector Machine, and a Gaussian Process Regression.