Ghahremanloo - Estimating NO_2 Using Remote Sensing and AI

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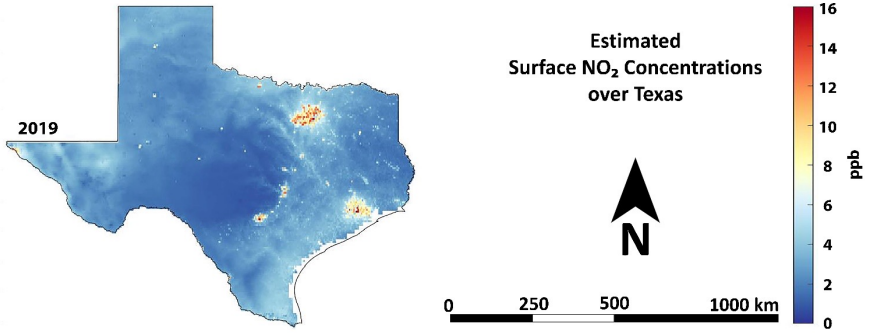
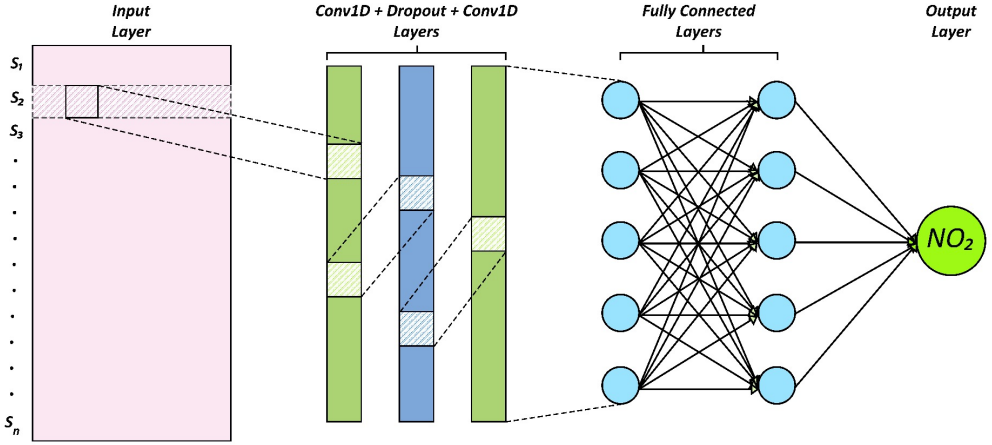
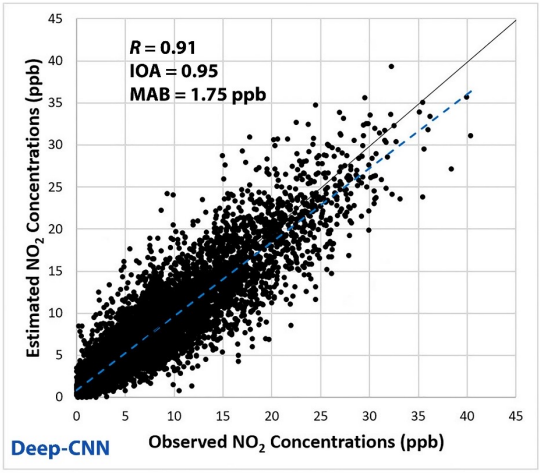
We leverage the TROPOspheric Monitoring Instrument (TROPOMI), along with other predictor variables, to estimate daily surface NO_2 concentrations over Texas in 2019. We use the deep convolutional neural network (Deep-CNN) to obtain estimates and achieve a correlation coefficient (*R*) of 0.91, an index of agreement (IOA) of 0.95, and a mean absolute bias (MAB) of 1.75 ppb in surface NO_2 estimation. Additionally, we leverage a novel approach, SHapley Additive exPlanations (SHAP), to describe how Deep-CNN understands each predictor variable. The SHAP results show that the Deep-CNN model has an advanced understanding of the dataset, revealing that TROPOMI closely captures levels of NO_2.

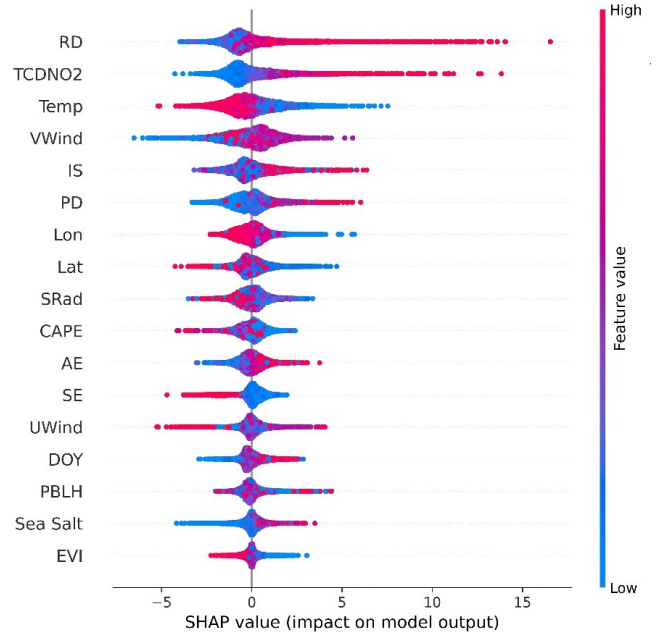




Schematic Structure of the Deep-CNN Model



NO_2 Estimation from Deep-CNN Model



SHAP summary plot of the Deep-CNN model