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AI techniques to evaluate the effectiveness of NBS in reducing urban heat islands

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Background

Urban green infrastructure is increasingly being promoted as a nature-based solution to reduce urban heat islands (UHIs) and heat risks in a city environment. In this project we want to evaluate the effectiveness of urban green infrastructure in a city in the Netherlands in reducing UHIs under different climate change scenarios, based on open source data on climate, vegetation and urban characteristics.

Objective

Develop a scalable data-driven model to predict land surface temperatures over the Netherlands as a function of climate, vegetation and urban characteristics. Explore the use of amateur weather data and other urban weather data in the model.
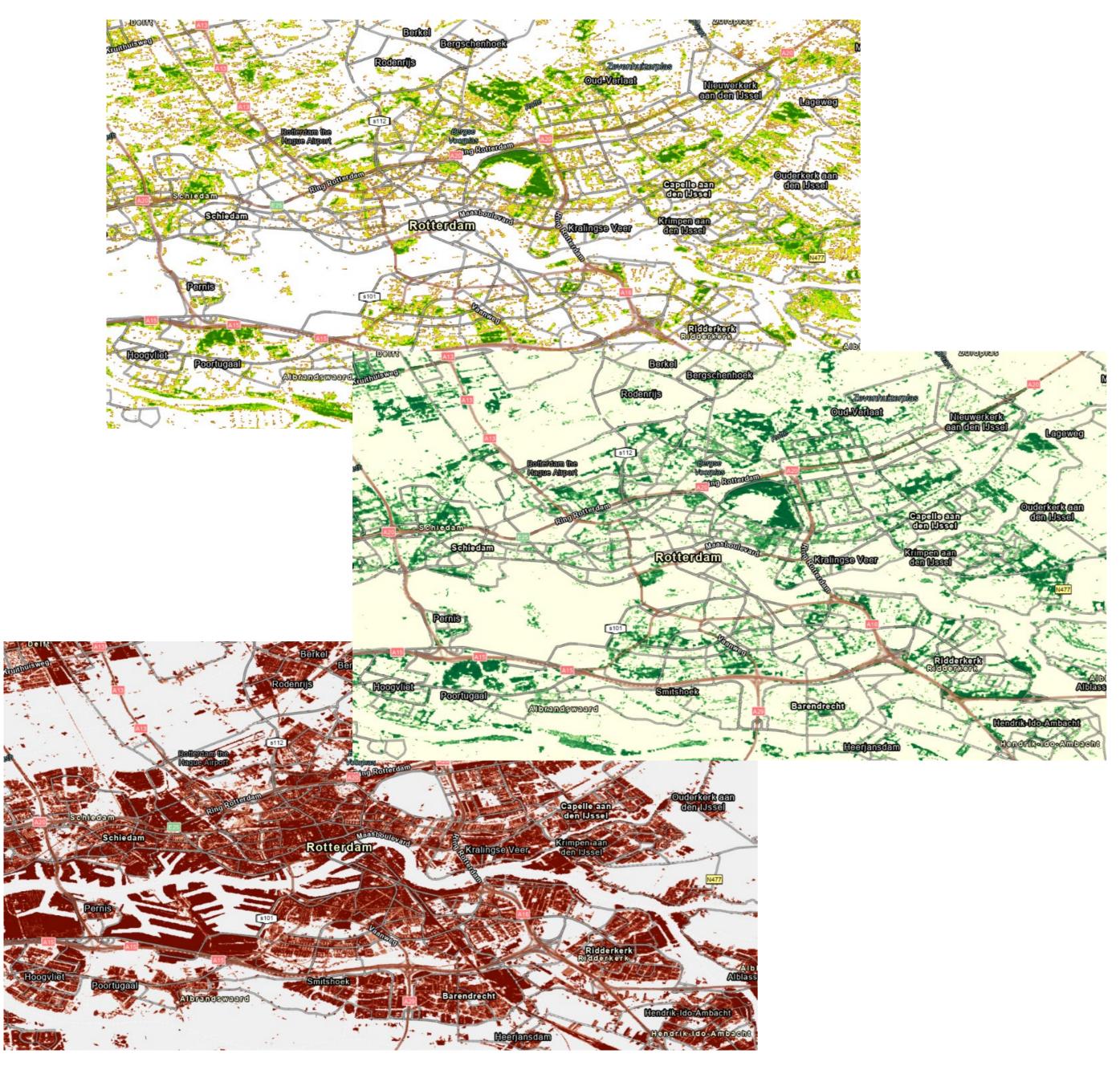

Figure 1. Examples of open source input data for Rotterdam and surroundings: satellite estimates of tree cover fraction (top); tree height (second row); artificial or impervious surface(third row);
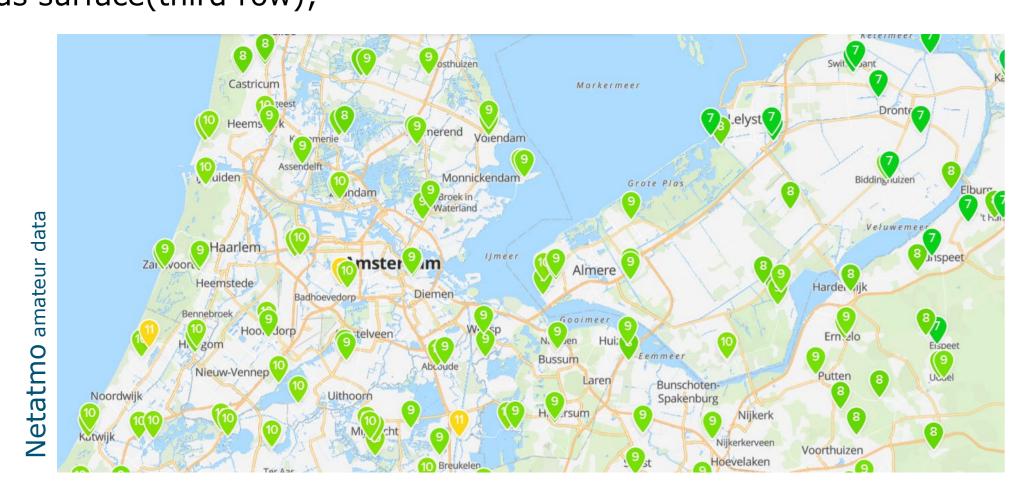

Figure 2. Amateur weather stations located in the Netherlands.

Results

An Extreme gradient boosting model has been developed to predict land surface temperature at high resolution as a function of urban vegetation and climate characteristics
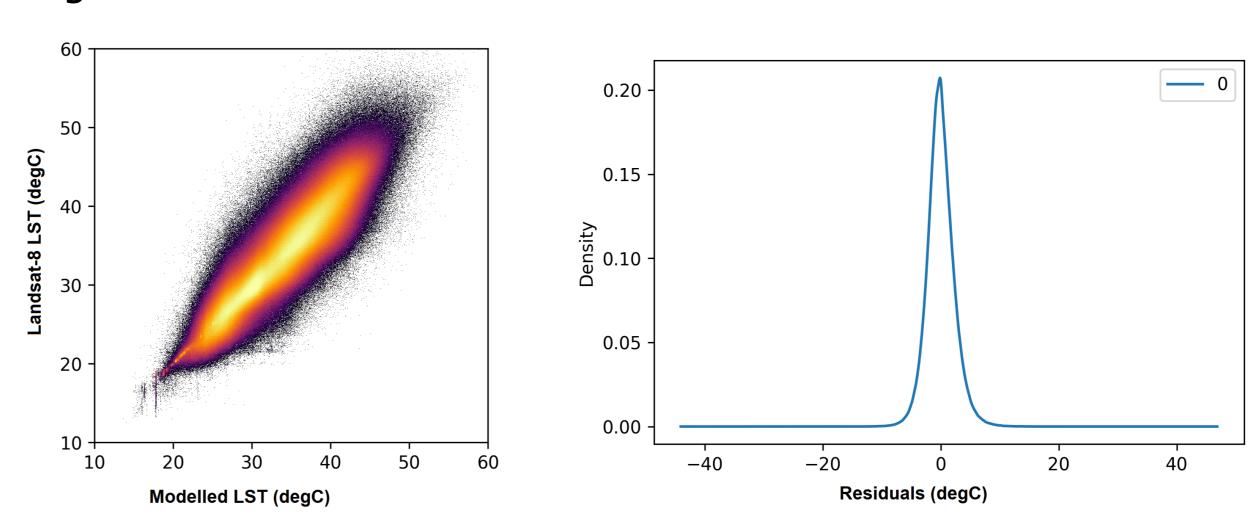

Figure 3. Evaluation of the extreme gradient boosting model. Scatterplot diagram on the left and the residual density plot on the right

Next step – scenario analysis

Using the model developed in the first step based on historical data, we will predict and compare surface UHIs with and without urban green infrastructure expansion plans under different climate scenarios for a city in the Netherlands.

Figure 4. Scenarios to be assessed. Green roofs on the left and urban parks on the right

Deliverables

- A rapid assessment tool for urban nature-based adaptation solutions based on open-source data
- a research paper to be submitted to a peer-reviewed journal with high impact factor.
- a web-based interactive platform for viewing the spatial data in an attractive visual way (e.g., a storymap or infographic (in collaboration with WANDER lab).