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Google Street View as a Remote Sensing Tool for Urban Street Tree Data Collection and Benefits Analysis

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Overview:

- Urban greenery provides benefits including energy savings and stormwater capture
- The USDA's i-Tree Streets program uses tree data to calculate ecological benefits of street tree populations, but field data collection is expensive
- Estimating tree species and size using street level imagery can reduce the need for field surveys

Background: The USDA's i-Tree Streets model calculates ecological benefits of urban trees, but collecting the necessary field data is costly and time consuming. However, with the growing wealth of publicly accessible satellite and street level imagery data available online, conducting a virtual urban tree benefits analysis is becoming increasingly feasible. Google Street View provides publicly accessible street level imagery and has been used to conduct a variety of virtual neighborhood audits and greenery assessments. This study leverages Street View's platform to conduct a virtual analysis or street tree benefits using the i-Tree Streets model.

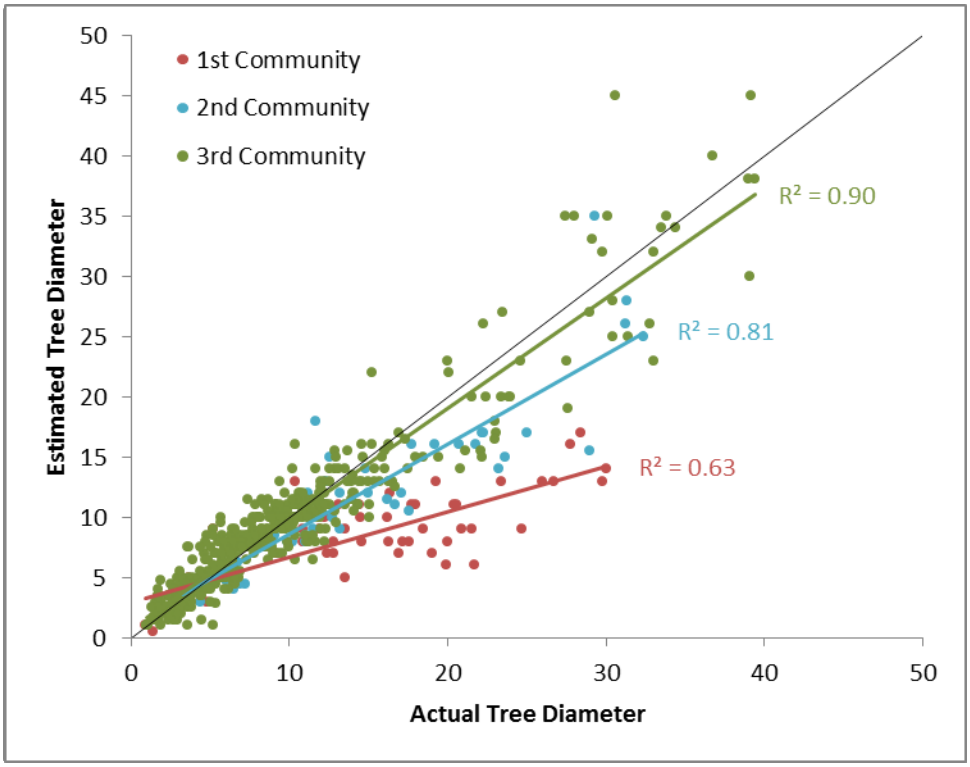

Figure 1: Comparison between virtual estimations and actual tree diameters for matched specimen

Methodology: Virtual tree data was generated for three communities in metropolitan Cincinnati, OH, where an existing field survey could be used to compare results. The virtual survey revisited the same study sites in Street View, and the survey analyst estimated the species and diameter of each tree. Trees from the virtual survey were then spatially matched to the field survey, discarding inappropriate matches (e.g. tree obviously replanted with a different species).

Results/Discussion: Examination of matched trees shows a 90% agreement in tree identification at the genus level and a 66% agreement at the species level. Virtual identification was more accurate with larger trees as characteristics are easier to differentiate in the street level imagery. Species identification was less accurate in genera with multiple species. Tree diameter was on average underestimated in the virtual survey, and less accurate for larger specimen, although estimations improved with each subsequent community surveyed (Figure 1). Ecological benefits calculated by i-Tree Streets for the virtual survey were on average around 10% lower than the field survey, primarily due to the underestimation of tree diameters.

This shows promise for the use of freely available street-level imagery to conduct virtual analyses of street trees and associated ecological benefits.

FOR FURTHER READING:

Berland A, Hopton ME. 2014. Comparing street tree assemblages and associated stormwater benefits among communities in metropolitan Cincinnati, Ohio, USA. Urban Forestry & Urban Greening 13(4):734-741.

i-Tree. 2016. i-Tree tools for assessing and managing forests & community trees. http://www.itreetools.org.