



Modeling Eye-level Greenness Visibility in Detroit

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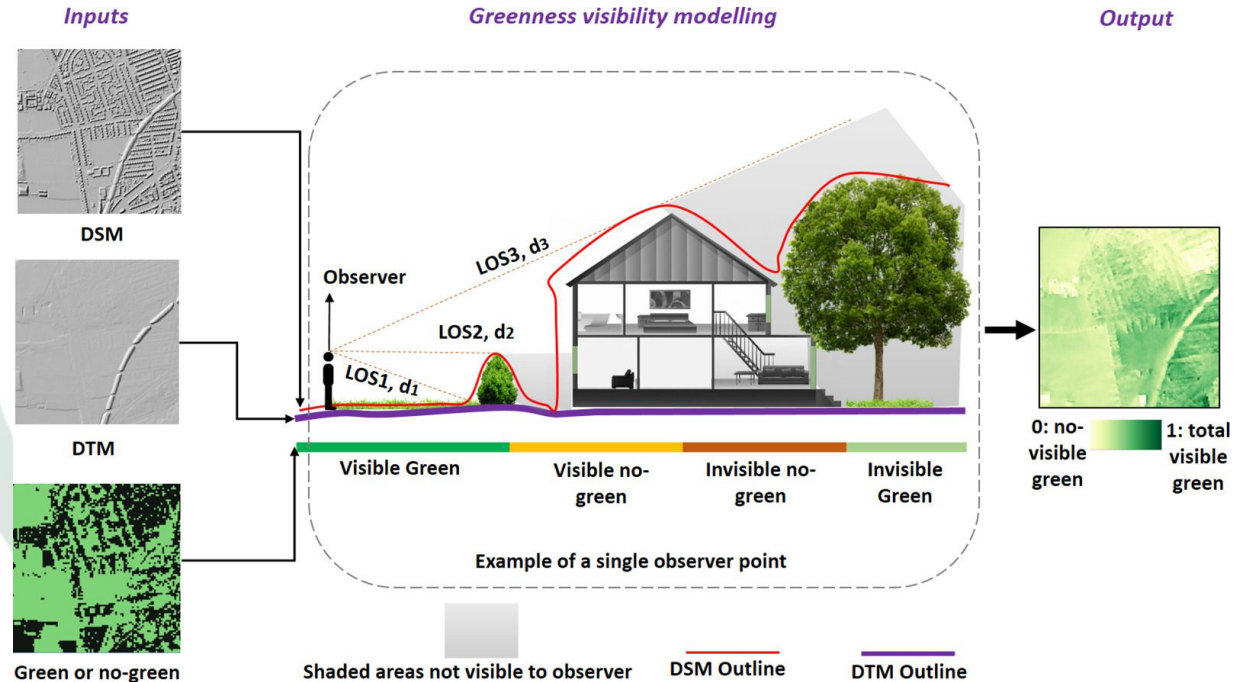
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Background

- Exposure to green spaces is associated with better mental health.
- In an urban area, the view of green space can be blocked.
- How greenspace visibility varies geographically?



Labib, S. M., Jonny J. Huck, and Sarah Lindley. "Modelling and mapping eye-level greenness visibility exposure using multi-source data at high spatial resolutions." *Science of the Total Environment* 755 (2021): 143050.



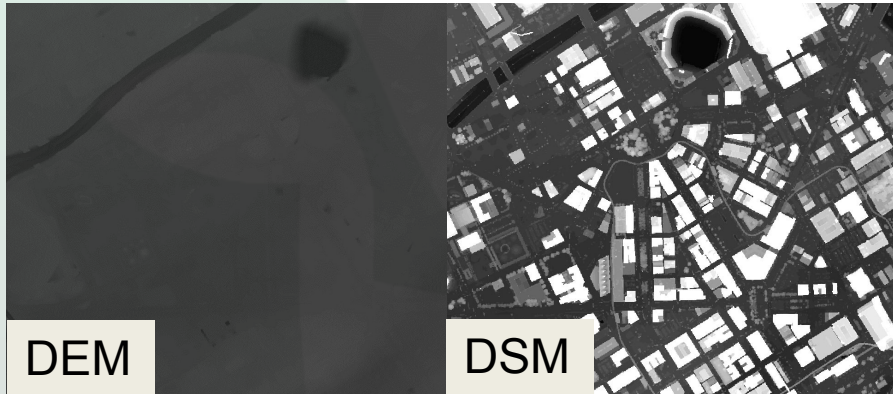
Aim of the study

- Use cloud computing to perform green space visibility analysis to calculate green space visibility index scores at a human-eye level from the road network in Detroit.
- Test the association between visibility scores and health outcomes.
- Main reason for employing cloud service: calculation speed (8 hours per run on a staff laptop)



Input Data

- Observation points: every 10 meter along road network within Detroit
- DEM/DTM: downloaded from United States Geological Survey (USGS)
- DSM: created from 2017 Wayne County Lidar data
- Green space: 1. based on Normalized Difference Vegetation Index (NDVI) from the National Agriculture Imagery Program (NAIP) remote sensing images; 2. parks in Detroit.





Cloud Resources

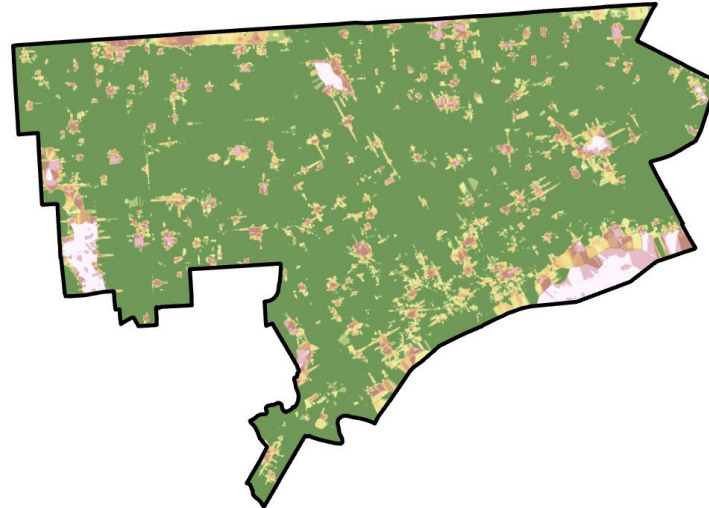
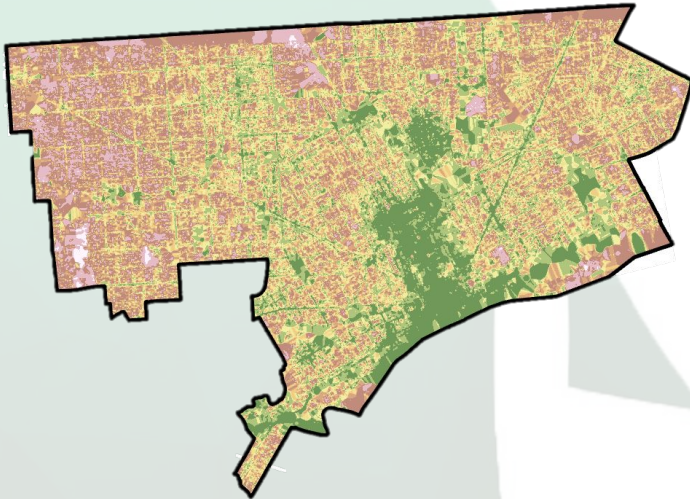
- Standard D8ds v5 (8 vcpus, 32 GiB memory) Data Science Virtual Machine (VM)
- Temporary storage
- Two experiments at the same time using 2 VMs

VM/Device	Staff laptop (8 cores, 16 GB RAM)	VM1: Standard DS3 v2 (4 vcpus, 14 GiB memory)	VM2: Standard D8ds v5 (8 vcpus, 32 GiB memory)
Avg. processing time/point	60 milliseconds	53.3 milliseconds	27.12 milliseconds
Cost	None	\$0.5040/h	\$0.82/h



Outcomes

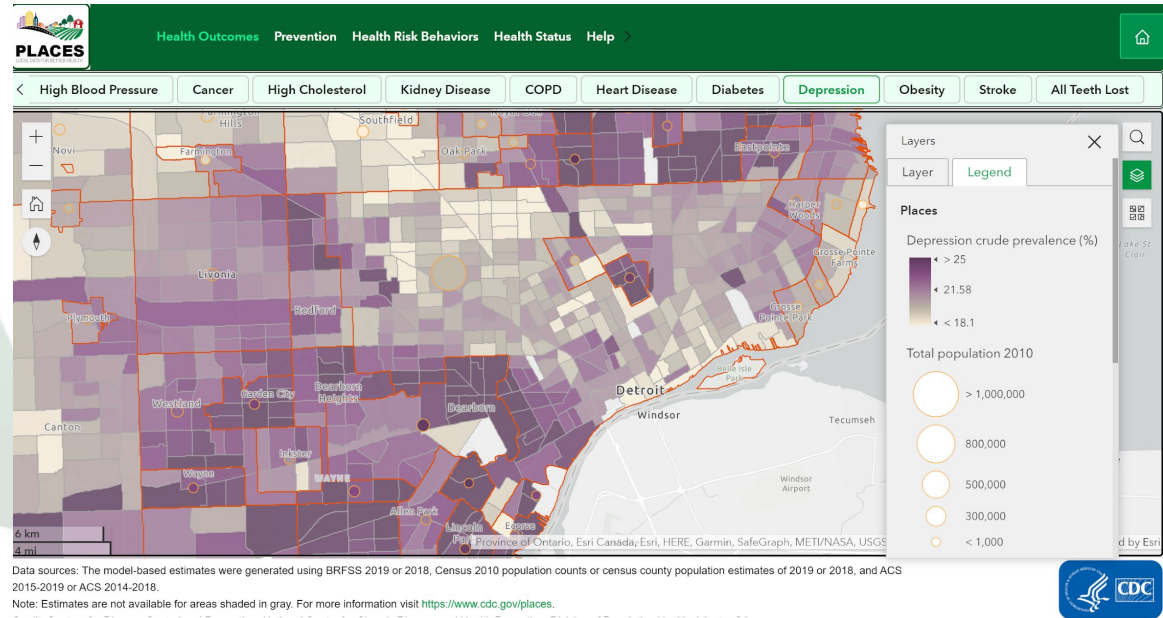
- Visibility scores of 578612 points was calculated in two “greenspace” scenarios in 3.4 hours
- Continuous visibility surfaces were created





Future works

- Test association with health outcomes
 - Individual level
 - Census tract level





Conclusion

- VM outperforms the staff/lab computers
- Can run multiple experiments at the same time using multiple VMs
- Easy to learn and use
- Plenty of different types of tools/resources that I can use for my future research



Acknowledgement

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MSU Cloud Computing Fellows

Thank you!