

# Assessing the Impact of Streetscape on Shared Bike Ridership with Street View Imagery

*Shengxiang Jin*  
*Department of Applied Social Sciences*  
*Metropolitan College*  
*Boston University*

# Outline

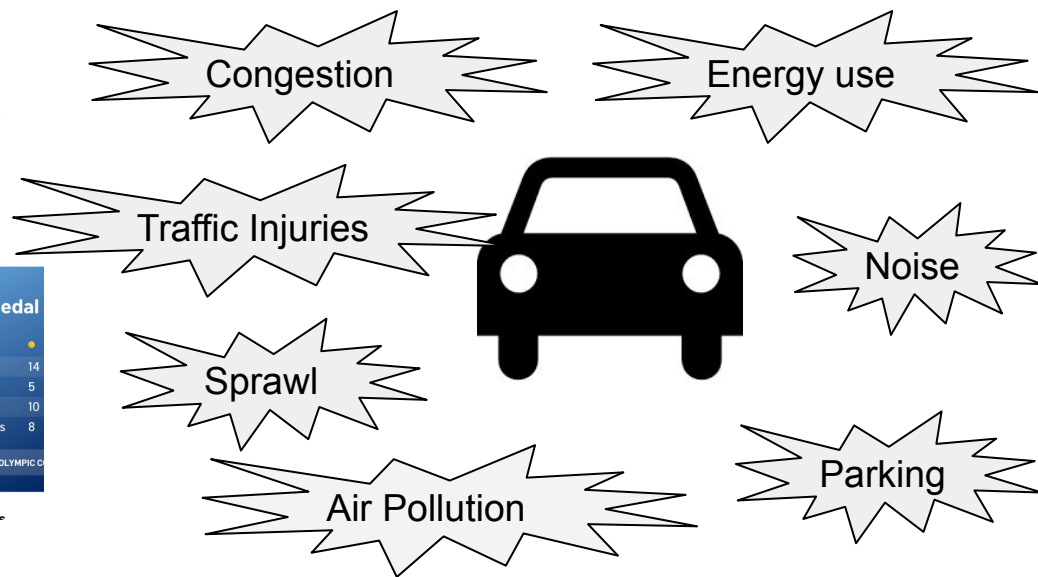
- **Motivation and Goal**
- Literature Review
- Proposed Method
- Result
- Discussion & Future Work

# We Are Too Car-dependent

## Boston's Traffic Congestion Roared Back in Late 2020, Research Says

Boston's 2020 delays were estimated to be 58% lower than in 2019

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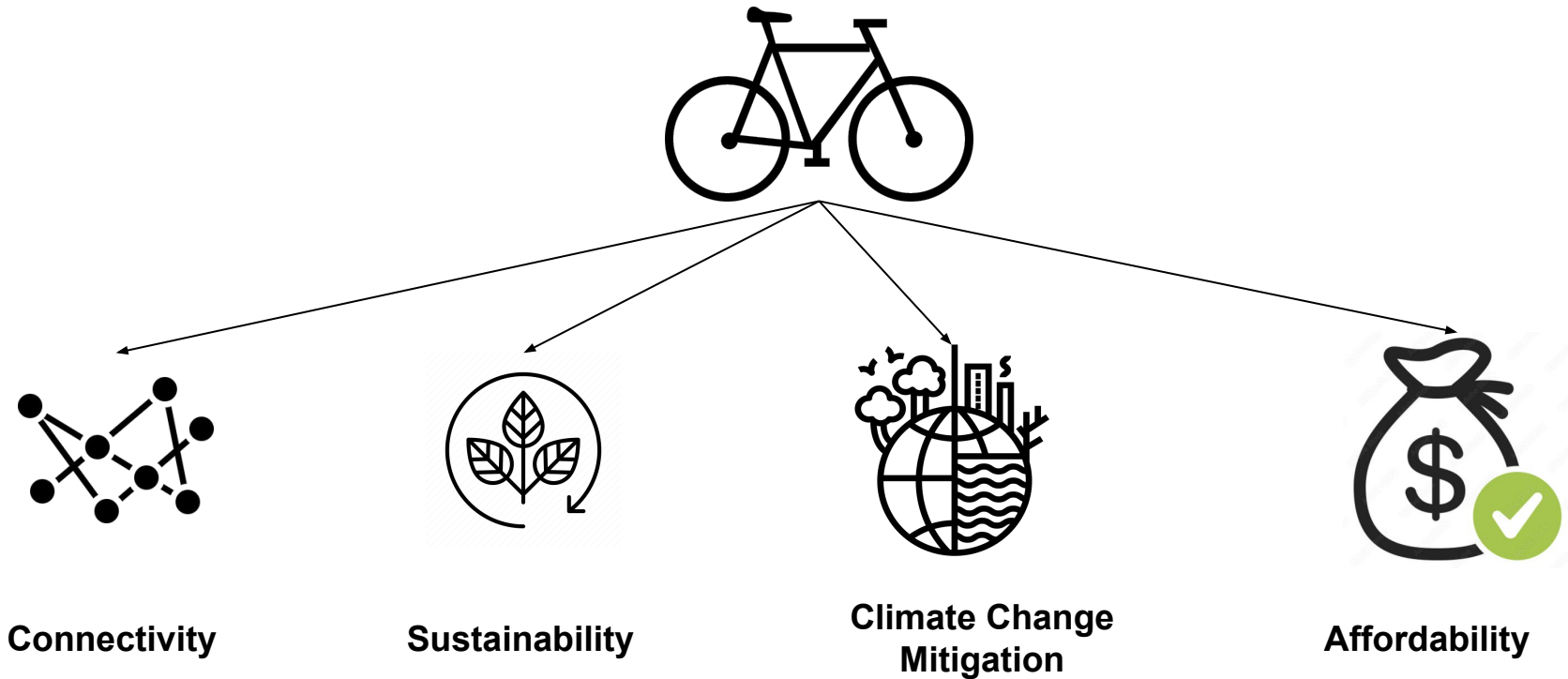


Average 50 hours of traffic congestion.

The average cost of congestion in the Boston area was estimated at \$1,103 in 2020.

[1] NBC, Boston's Traffic Congestion Roared Back in Late 2020, Research Says, 06/29/2021

# Bicycling As an Alternative



[1] Brand, Christian, et al. "The Climate Change Mitigation Effects of Daily Active Travel in Cities." *Transportation Research Part D: Transport and Environment* 93 (2021): 102764. Web.

[2] Pucher, John, and Ralph Buehler. "Cycling Towards a More Sustainable Transport Future." *Transport reviews* 37.6 (2017): 689-94. CrossRef. Web.

# Getting More People on Bikes



Greenery?

How do they interact?

Land use?

Bike Infrastructure?



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# Social Demographic, Build Environment, and Bicycling

*Distance to CBD & University* -

*The Number of Bike stations and docks* +

*Presence of Public Transit* +

*Connectivity* +

*The Number of Restaurants* +

*Area of Green Space* -

*Job & Population Density* +

*Bike Infrastructure* +

*Users' Age*

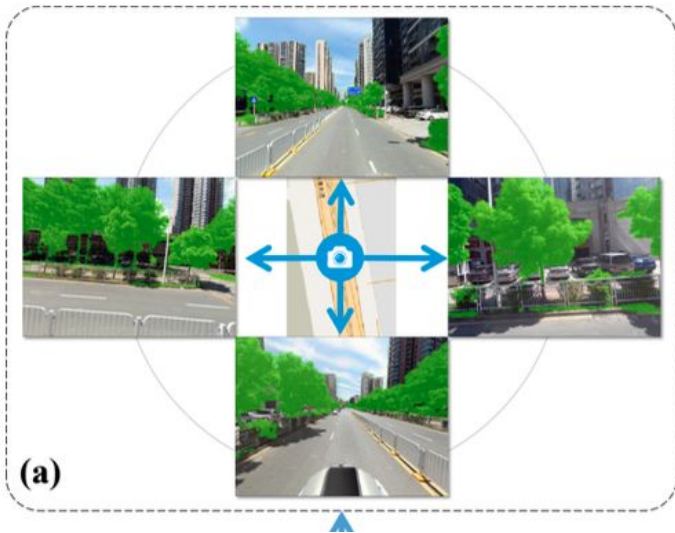
[1]Faghih-Imani, Ahmadreza, et al. "How Land-use and Urban Form Impact Bicycle Flows: Evidence from the Bicycle-Sharing System (BIXI) in Montreal." *Journal of transport geography* 41 (2014): 306-14. CrossRef. Web.

[2] Yan, Qiang, et al. "Spatio-Temporal Usage Patterns of Dockless Bike-Sharing Service Linking to a Metro Station: A Case Study in Shanghai, China." *Sustainability (Basel, Switzerland)* 12.3 (2020): 851. CrossRef. Web.

[3]Wang, Kailai, Gulsah Akar, and Yu-Jen Chen. "Bike Sharing Differences among Millennials, Gen Xers, and Baby Boomers: Lessons Learnt from New York City's Bike Share." *Transportation research. Part A, Policy and practice* 116 (2018): 1-14. CrossRef. Web.

# Study of Bicycle Usage through Street View Image (SVI)

*Street elements e.g.  
Traffic Light, Potholes,  
Buildings etc.*



*Urban Greenness*

- [1] Ito, Koichi, and Filip Biljecki. "Assessing Bikeability with Street View Imagery and Computer Vision." *Transportation research. Part C, Emerging technologies* 132 (2021): 103371. CrossRef. Web.
- [2] Feng Gao, et al. "How is Urban Greenness Spatially Associated with Dockless Bike Sharing Usage on Weekdays, Weekends, and Holidays?" *ISPRS international journal of geo-information* 10.4 (2021): 238. Publicly Available Content Database. Web.



## Research Question

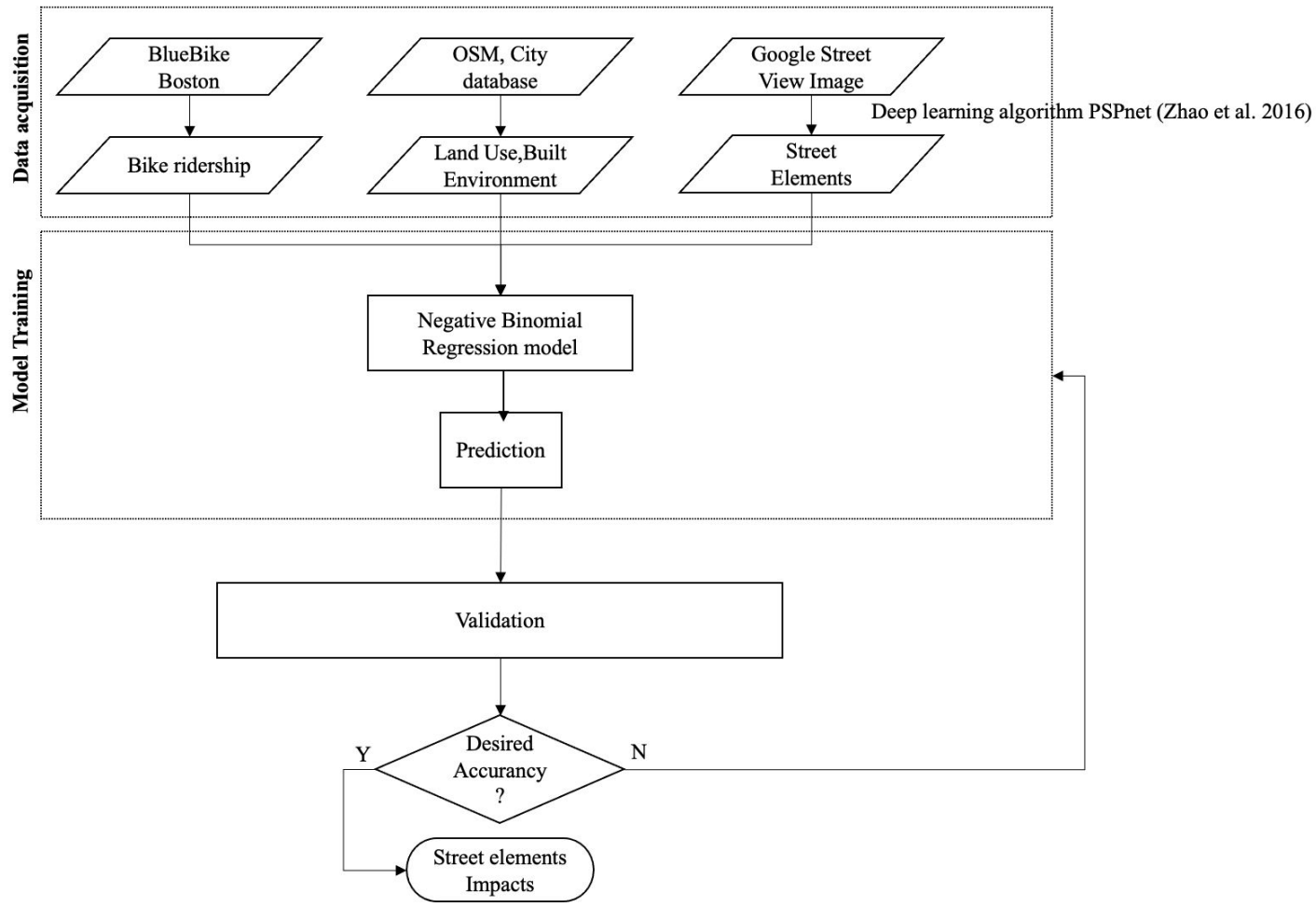
**What is the impact of streetscape on bike-sharing rides while controlling for land use and built environment impacts?**



# Outline

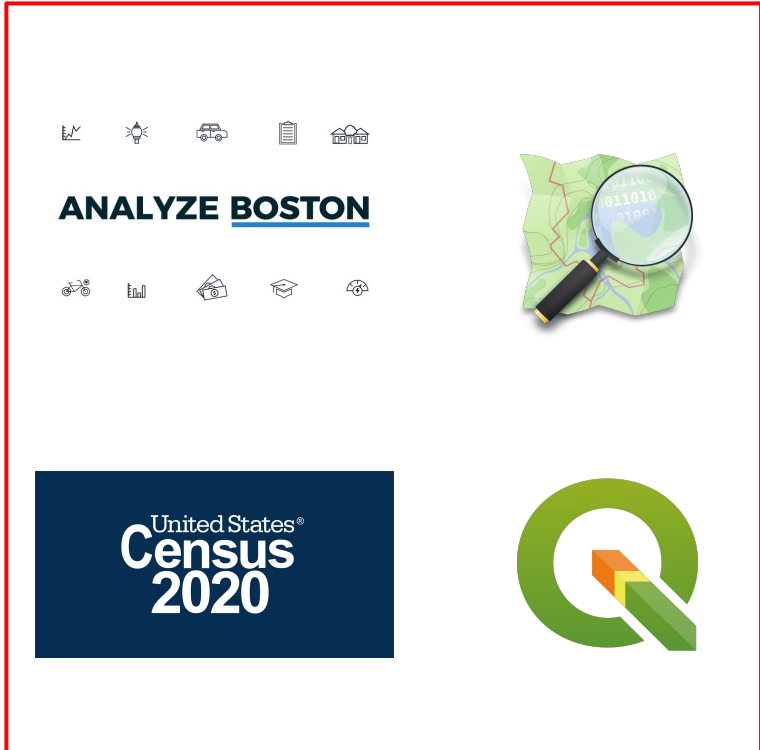
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# Propose Method

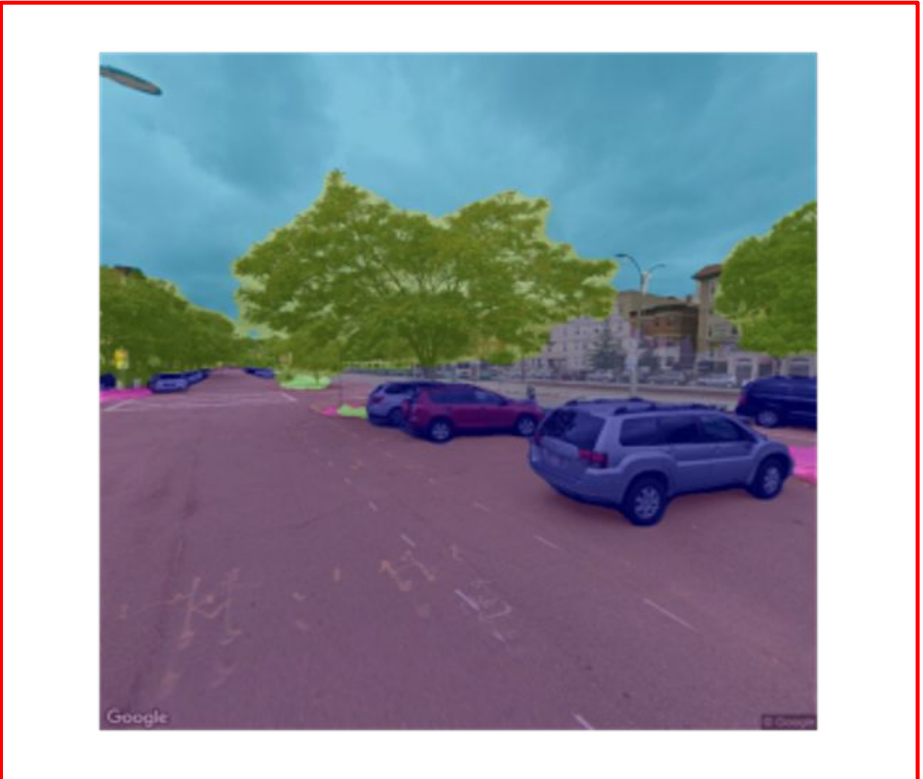


# Data

*Non SVI Attributes*



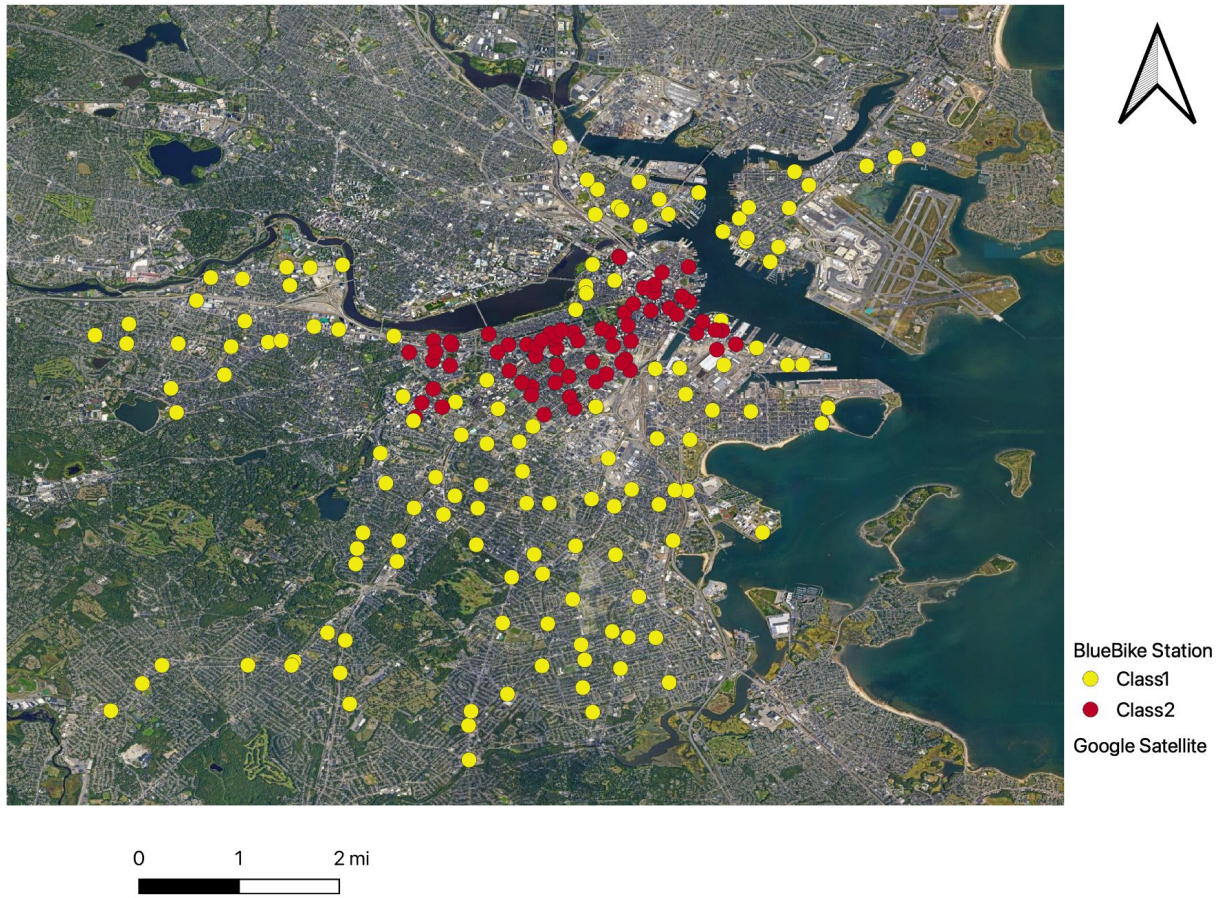
*SVI Attributes*



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# The Distribution of Bluebike Station



# Model Result

## Non-SVI variables:

### *Significant at 5% and 10%:*

Total number of Bluebike dock within 500m buffer +

Total number of Bluebike station within 500m buffer -

Total length of bike lane within 500m buffer -

Total number of Food services within 500m buffer +

Distance to University -

Total area of openspace within 500m buffer -

Total number of traffic light within 500m buffer -

Population density at the census tract level +

Total number of bus station within 500m buffer -

Whether stations are located in the city ( 0 = no, 1 = yes) +

### *No Significant :*

Total number of intersection within 500m buffer

Total length of sidewalk within 500m buffer

Total number of subway station within 500m buffer

Job density at the census tract level

# Model Result

## SVI variables:

### *Significant at 5% and 10%:*

Road pixel % +

Building pixel % +

Fence pixel % +

Greenery pixel % +

Sky pixel % +

### *No Significant :*

Sidewalk pixel %

Wall pixel %

Pole pixel %

The presence of traffic light

The presence of traffic sign



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## Discussion

- *Social demographic, land use and built environment play an important role in affecting people's decision of using shared bike system.*
- *Shared bike infrastructure is a critical factor.*
- *People may tend to use shared bikes for non-leisure purposes.*
- *Education facility can affect the use of shared bike system.*

## Discussion

- *“Pro-walk” environment is no equal to “pro-bike” environment*
- *In Boston, public bus and bike share systems are in a competitive relationship*
- *Users prefer to use bike-sharing in places that have a “city feel”*
- *In the same time, better urban greenness and sky openness would encourage people to use shared bike.*

## Future work

- *Bring data from other cities into model training to improve the model generalization capability.*
- *More POIs should be considered in the model.*
- *User characteristics should be considered in the model.*
- *Try different buffer size ( 400m? 600m?)*

**Thank you and feel free to ask any questions**

# Appendix

# Streetscape Variable

**Road:** Part of ground on which cars usually drive.

**Sidewalk:** Part of ground designated for pedestrians or cyclists.

**Building:** Building, skyscraper, house, bus stop building, garage, car port.

**Wall:** Individual standing wall. Not part of a building.

**Fence:** Fence including any holes.

**Pole:** Small mainly vertically oriented pole.

**Traffic Light:** The traffic light box without its poles.

**Traffic Sign:** Sign installed from the state/city authority, usually for information of the driver/cyclist/pedestrian in an everyday traffic scene

**Vegetation:** Tree, hedge, all kinds of vertical vegetation.

**Terrain:** Grass, all kinds of horizontal vegetation, soil or sand.

***Greenery: Vegetation + Terrain***

**Sky:** Open sky, without leaves of tree.

Source: <https://www.cityscapes-dataset.com/dataset-overview/>